As confidentially submitted to the Securities and Exchange Commission on August 2, 2019. This draft registration statement has not been publicly filed with the Securities and Exchange Commission and all information herein remains confidential.

Registration No. 333–

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM S-1
REGISTRATION STATEMENT

Under

The Securities Act of 1933

CABALETTA BIO, INC.

(Exact name of registrant as specified in its charter)

Delaware	2836	82-1685768
(State or other jurisdiction of incorporation or organization)	(Primary Standard Industrial Classification Code Number)	(I.R.S. Employer Identification Number)

Cabaletta Bio, Inc.
2929 Arch Street, Suite 600
Philadelphia, PA 19104
(267) 759-3100
(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Steven Nichtberger, M.D.
Chief Executive Officer and President
2929 Arch Street, Suite 600
Philadelphia, PA 19104
(267) 759-3100
(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies to:

Mitchell S. Bloom, Esq. Michael J. Minahan, Esq. Goodwin Procter LLP 100 Northern Avenue Boston, Massachusetts 02210 (617) 570-1000	Patrick O'Brien, Esq. Benjamin Kozik, Esq. Ropes & Gray LLP 800 Boylston Street Boston, Massachusetts 02199 (617) 951-7000

Approximate date of commencement of proposed sale to the public: As soon as practicable after the effective date of this registration statement .

If any of the securities being registered on this Form are to be offered on a delayed or continuous basis pursuant to Rule 415 under the Securities Act of 1933, as amended, check the following box. ☐

If this Form is filed to register additional securities for an offering pursuant to Rule 462(b) under the Securities Act, please check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this Form is a post-effective amendment filed pursuant to Rule 462(c) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

If this form is a post-effective amendment filed pursuant to Rule 462(d) under the Securities Act, check the following box and list the Securities Act registration statement number of the earlier effective registration statement for the same offering. ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large Accelerated Filer	☐	Accelerated Filer	☐
Non-Accelerated Filer	☐	Smaller Reporting Company	☒
		Emerging Growth Company	☒

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

CALCULATION OF REGISTRATION FEE

TITLE OF EACH CLASS OF SECURITIES TO BE REGISTERED	PROPOSED MAXIMUM AGGREGATE OFFERING PRICE(1)	AMOUNT OF REGISTRATION FEE(2)
Common Stock, par value $0.00001 per share		

(1) Estimated solely for the purpose of calculating the registration fee pursuant to Rule 457(o) under the Securities Act of 1933, as amended. Includes the aggregate offering price of shares that the underwriters have the option to purchase to cover over-allotments, if any.

(2) Registration fee will be paid when registration statement is first publicly filed under the Securities Act of 1933, as amended.

The registrant hereby amends this registration statement on such date or dates as may be necessary to delay its effective date until the registrant shall file a further amendment that specifically states that this registration statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933, as amended, or until this registration statement shall become effective on such date as the Commission, acting pursuant to said Section 8(a), may determine.

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The information in this preliminary prospectus is not complete and may be changed. We may not sell these securities until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell these securities and we are not soliciting offers to buy these securities in any jurisdiction where the offer or sale is not permitted.

SUBJECT TO COMPLETION, DATED , 2019
PRELIMINARY PROSPECTUS

Shares

Cabaletta Bio™

Common Stock

We are offering shares of our common stock. This is our initial public offering. Prior to this offering, there has been no public market for our common stock. We expect the initial public offering price to be between $ and $ per share. We intend to apply to list our common stock on The Nasdaq Global Market under the symbol "CABA."

We are an "emerging growth company" under the federal securities laws and, as such, we have elected to comply with certain reduced public company reporting requirements for this prospectus and future filings. See "Prospectus Summary—Implications of Being an Emerging Growth Company."

Investing in our common stock involves a high degree of risk. Before buying any shares, you should carefully read the discussion of the material risks of investing in our common stock under the heading "Risk Factors" beginning on page 12 of this prospectus.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of the securities that may be offered under this prospectus, nor have any of these organizations determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

	PER SHARE	TOTAL
Public offering price	*$*	*$*
Underwriting discounts and commissions (1)	*$*	*$*
Proceeds, before expenses, to Cabaletta Bio, Inc.	*$*	*$*

(1) See "Underwriters" beginning on page 192 of this prospectus for additional information regarding the compensation payable to the underwriters.

We have granted the underwriters an option for a period of 30 days to purchase an additional shares of our common stock.

Delivery of the shares of common stock is expected to be made on or about , 2019.

MORGAN STANLEY *COWEN* *EVERCORE ISI*

, 2019

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Neither we nor the underwriters have authorized anyone to provide you with information different from, or in addition to, that contained in this prospectus, any amendment or supplement to this prospectus and any related free writing prospectus prepared by or on behalf of us or to which we have referred you. We and the underwriters take no responsibility for, and can provide no assurances as to the reliability of, any information that others may give you. This prospectus is not an offer to sell, nor is it seeking an offer to buy, these securities in any jurisdiction where the offer or sale is not permitted. The information contained in this prospectus or in any free writing prospectus is only accurate as of its date, regardless of its time of delivery or the time of any sale of our common stock. Our business, financial condition, results of operations and future growth prospects may have changed since that date.

We own or have rights to various trademarks, service marks and trade names that we use in connection with the operation of our business. This prospectus may also contain trademarks, service marks and trade names of third parties, which are the property of their respective owners. Our use or display of third parties' trademarks, service marks, trade names or products in this prospectus is not intended to, and does not imply a relationship with, or endorsement or sponsorship by us. Solely for convenience, the trademarks, service marks and trade names referred to in this prospectus may appear without the ®, ™ or SM symbols, but the omission of such references is not intended to indicate, in any way, that we will not assert, to the fullest extent under applicable law, our rights or the right of the applicable owner of these trademarks, service marks and trade names.

For investors outside of the United States: We have not, and the underwriters have not, done anything that would permit this offering or possession or distribution of this prospectus in any jurisdiction where action for that purpose is required, other than the United States. Persons outside of the United States who come into possession of this prospectus must inform themselves about, and observe any restrictions relating to, the offering of the shares of common stock and the distribution of this prospectus outside of the United States.

Numerical figures included in this prospectus have been subject to rounding adjustments. Accordingly, numerical figures shown as totals in various tables may not be arithmetic aggregations of the figures that precede them.

PROSPECTUS SUMMARY

This summary highlights information contained in greater detail elsewhere in this prospectus. This summary does not contain all of the information that you should consider in making your investment decision. Before investing in our common stock, you should carefully read this entire prospectus, including our financial statements and the related notes thereto and the information set forth under the sections titled "Risk Factors," "Special Note Regarding Forward-Looking Statements," and "Management's Discussion and Analysis of Financial Condition and Results of Operations," in each case included in this prospectus. As used in this prospectus, unless the context otherwise requires, references to the "company," "we," "us" and "our" refer to Cabaletta Bio, Inc.

Overview

We are a biotechnology company focused on the discovery and development of engineered T cell therapies for B cell-mediated autoimmune diseases. Our proprietary technology utilizes chimeric autoantibody receptor, or CAAR, T cells that are designed to selectively bind and eliminate B cells that produce disease-causing autoantibodies, or pathogenic B cells, while sparing normal B cells. Our lead CAAR T cell product candidate was designed based on chimeric antigen receptor, or CAR, T cell technology that has been successfully developed and is marketed for the treatment of B cell cancers. We believe our technology, in combination with our proprietary Cabaletta Approach for selective B cell Ablation platform, called our CABA platform, has applicability across over two dozen B cell-mediated autoimmune diseases that we have identified, reviewed and prioritized. During the past two years, using our CABA platform, we have discovered and developed four product candidates, including our lead product candidate, which is IND-ready, to potentially treat patients with mucosal pemphigus vulgaris, or mPV, and three additional product candidates that have demonstrated specific and selective target engagement *in vitro*. In order to accelerate product development for our lead program and to access a proven cell therapy manufacturing platform, we have entered into a collaboration with the University of Pennsylvania, or Penn. We hold multiple agreements with Penn to develop CAAR T cell therapies for the treatment of these diseases. Our goal is to leverage our team's expertise in autoimmunity and engineered T cell therapy and our Penn collaboration to rapidly discover and develop our portfolio of CAAR T product candidates.

Our initial focus is on pemphigus vulgaris, or PV, which is an autoimmune blistering skin disease. We plan to submit an Investigational New Drug application, or IND, to the U.S. Food and Drug Administration, or the FDA, in the second half of 2019 and to advance our lead product candidate, DSG3-CAART, into a Phase 1 trial for the treatment of mPV in 2020. We are also advancing additional product candidates currently in discovery-stage or preclinical development for the treatment of muscle-specific kinase myasthenia gravis, or MuSK MG, mucocutaneous PV, or mcPV, and Hemophilia A with Factor VIII, or FVIII, alloantibodies.

B cell-mediated autoimmune diseases occur when certain populations of B cells mistakenly produce autoantibodies, which are directed against specific healthy tissue or cells in the body. The presence of autoantibodies can manifest in a variety of autoimmune diseases and result in the destruction of healthy tissue in the body. Current treatment options for B cell-mediated autoimmune diseases are generally limited to corticosteroids and other generalized immunosuppressants that offer only temporary disease suppression, may require chronic, in-hospital administration and are associated with potentially life-threatening side effects. We believe the ideal therapy for B cell-mediated autoimmune diseases would selectively and completely eliminate the pathogenic B cells while sparing the body's normal B cells.

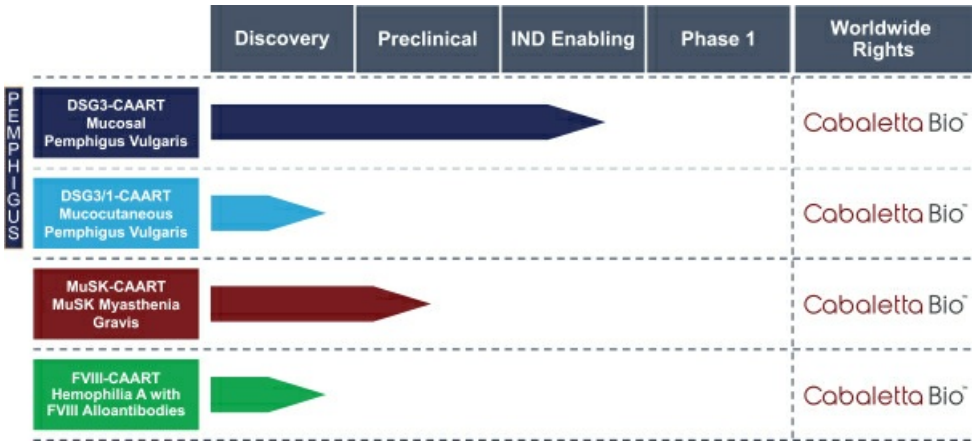
We are pioneering the development of a new class of engineered T cell therapies that express CAARs to selectively engage and eliminate pathogenic B cells. By harnessing the power of targeted cell therapy, we believe our CABA platform, as developed by our team, has the potential to be a one-time curative therapy that may be a safer and more effective therapy option than current treatments. These efforts have attracted the support of many

leading investors, including Adage Capital Partners, 5AM Ventures, Boxer Capital, LLC of Tavistock Group, Cormorant Asset Management, Deerfield Management and RedMile Group as well Penn.

Pipeline

We are developing a portfolio of CAAR T cell product candidates for the treatment of B cell-mediated autoimmune diseases. Our lead product candidate, DSG3-CAART, targets B cells that express pathogenic autoantibodies against the DSG3 protein, which cause mPV. The publication of the first *in vivo* evidence of efficacy and safety of the therapy in an animal model was followed by additional preclinical studies to support our planned IND submission. Upon acceptance of our IND, we plan to open the first clinical trial site for our DSG3-CAART product candidate. Our next PV-directed product candidate, DSG3/1-CAART, is being designed to target B cells that give rise to pathogenic autoantibodies against either the DSG3 or DSG1 protein, which cause mcPV, and could address a broader PV population. Our second product candidate, MuSK-CAART, is being designed to target B cells that give rise to pathogenic autoantibodies against the MuSK receptor in patients with MG. An additional product candidate, FVIII-CAART, targets B cells that produce alloantibodies against exogenous FVIII in Hemophilia A patients who consequently require repeated and increased exogenous FVIII administration. We are exploring additional CAAR T cell product candidates that will focus on patients with B cell-mediated autoimmune diseases with well-defined antibody targets.

The chart below shows our CAAR T cell product candidates currently under development:



Our Approach

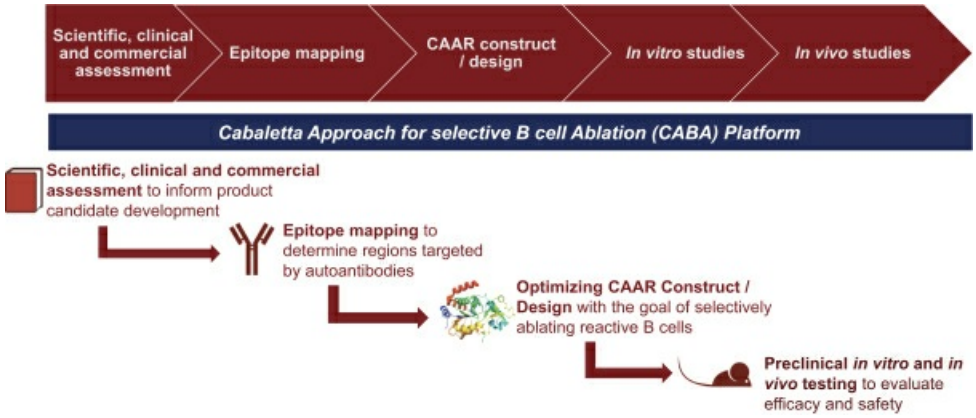
We are developing engineered T cell therapy candidates that express CAARs, which serve as “decoys” for antibodies expressed on the surface of B cells. Our CAAR T platform is based on the foundation of established CAR T therapeutics, differing primarily in their use of the antigen rather than an antibody fragment to target pathogenic B cells. We believe these CAARs enable the T cells to specifically engage and eliminate pathogenic B cells while sparing normal B cells. By harnessing the power of cell therapy, our technology has the potential to overcome the ability of these B cells to evade elimination and thus lead to durable responses.

In contrast to currently available therapies for B cell-mediated autoimmune diseases, we believe our CAAR T cells can recognize the specific autoantibodies that are responsible for causing an underlying disease

and kill the cells that express the autoantibodies on their surface while preserving the rest of the humoral immune system. As a result, we believe CAAR T cell therapy used in B cell-mediated autoimmune diseases has the potential for durable elimination of pathogenic B cells and an associated elimination of clinical recurrences with an improved safety profile relative to the current standard of care. We believe our technology has broad applicability, and we are building a portfolio of product candidates for B cell-mediated autoimmune diseases.

Our CABA Platform

We have developed our CABA platform to inform product candidate development from indication selection through preclinical studies. Using our CABA platform, our team has identified our highest priority target indications following a rigorous analysis of B cell-mediated autoimmune diseases. A deep understanding of the antigenic epitopes targeted in these diseases is required to design and construct a successful CAAR, a competency that we believe we are uniquely positioned to utilize in product candidate development. Finally, we evaluate preclinical efficacy and safety of our optimized CAAR constructs through *in vitro* and *in vivo* studies. We leverage the experience and insight gained from the development of each product candidate to improve the efficiency of our CABA platform in evaluating additional potential product candidates.



Our History and Team

Our scientific co-founders, Aimee Payne, M.D., Ph.D., and Michael Milone, M.D., Ph.D., began partnering at Penn in 2013 to combine Dr. Payne's expertise in B cell-mediated autoimmune diseases with Dr. Milone's deep and experienced insights into the design and implementation of CAR T products. Dr. Payne is a worldwide leader in characterizing B cell-mediated autoantibody repertoires in PV and other autoimmune diseases. Dr. Milone is a renowned scientist in CAR T therapy and was a co-inventor of and a key driver in the preclinical discovery and development efforts that yielded Kymriah, the first FDA-approved CAR T cell therapy for the treatment of B cell cancers. Dr. Payne's laboratory surmised that by incorporating an antigen instead of an antibody fragment as the extracellular domain of the CAAR, specific pathogenic B cells could be targeted. This resulted in a collaboration between the two investigators to apply the scientific foundation of CAR T technology in B cell-mediated autoimmune diseases.

Steven Nichtberger, M.D., our Chief Executive Officer and President, is an adjunct professor at the Wharton School at the University of Pennsylvania and has experience creating and building companies, including a novel cellular therapy company, which required transferring technology from an academic institution, establishing a

research and development organization, hiring of manufacturing and quality teams, creating novel manufacturing processes, reaching agreement with the FDA on novel clinical development pathways and constructing a commercial-scale Good Manufacturing Practices, or GMP, facility that manufactured autologous cell therapy products for clinical trials. In 2017, based on over a year of interaction and strategic discussions regarding development of a commercial cell therapy product portfolio that could offer potentially curative treatment options to patients, Drs. Payne, Milone and Nichtberger decided to launch Cabaletta Bio.

Gwendolyn Binder, Ph.D., our Executive Vice President, Science and Technology, was an early member of the Translational Research Operations team at Penn for over five years and participated in the submission and acceptance of multiple INDs for novel engineered T cell therapy products. In partnership with Dr. Milone, the two collaborated along with other members of the team at Penn to drive the IND-enabling translational studies that facilitated the initial CAR T clinical trial in B cell cancers at Penn. Dr. Binder also built and led a clinical stage biotechnology company's manufacturing operations and quality teams, including creation of a fully functioning commercial grade GMP facility. Dr. Binder also built the translational research program and ultimately led the company's research organization.

Our Research and Manufacturing Collaboration with Penn

Our CABA platform has already produced multiple product candidates through our sponsored research agreements, or SRAs, with Penn for the laboratories of our scientific co-founders, Drs. Payne and Milone. Our contractual relationship with Penn through ongoing licensing and research arrangements also provides important services around manufacturing supply. In July 2019, we amended and restated our worldwide license agreement with Penn to develop our CAAR T technology to treat B cell-mediated autoimmune and alloimmune diseases. This license agreement provides us with access to multiple patent families covering CAAR T cell therapy as applied to the field of B cell-mediated autoimmune and alloimmune diseases and to the robust IP portfolio created by Penn under these SRAs in this field. Our ongoing collaboration with Penn is also based on a Master Translational Research Services Agreement, or Services Agreement, that we entered into in October 2018, along with multiple additional agreements under the Services Agreement to engage and partner with individual Penn entities, including cell product manufacturing, correlative research, vector manufacturing, clinical trial operations and protocol development.

We believe Penn is uniquely suited to be our partner in our efforts to develop product candidates leveraging our CAAR T technology based on a decade of experience, including manufacturing and clinical support for approximately a dozen active cell therapy clinical trials. The original manufacturing process for the first FDA-approved CAR T cell therapy was developed at Penn before being transferred to Novartis Pharmaceuticals Corporation during late-stage clinical trials. We currently plan to leverage Penn's experience, validated standard operating procedures, manufacturing facilities and staffing to accelerate initial development efforts for our lead product candidate.

Our Strategy

Our goal is to build upon our first mover advantage and expertise in cell therapies for B cell-mediated autoimmune diseases to accelerate the discovery, development and commercialization of our CAAR T cell therapies, with a focus on reliable manufacturing. We believe achieving this goal could result in potentially curative therapies for patients with unmet medical needs who suffer from certain B cell-mediated autoimmune diseases. To achieve this goal, key elements of our strategy include:

- ***Achieving clinical proof-of-concept for our lead product candidate, DSG3-CAART in mPV, the first in a series of well-understood and validated B cell-mediated autoimmune diseases for which we are developing CAAR T cell product candidates.*** We believe our biologic understanding coupled with the

well-understood clinical signs, symptoms and natural course of the disease, identify mPV as a model disease to evaluate our CAAR T approach. In addition, we have designed and developed DSG3-CAART, our lead product candidate that has demonstrated robust target engagement and no off-target toxicities in preclinical studies. We believe our planned Phase 1 clinical trial evaluating DSG3-CAART for the treatment of mPV represents an optimal first opportunity to establish initial clinical proof-of-concept of our CABA platform.

- ***Leveraging our CABA platform to identify optimal targets for the CAAR T approach and apply learnings from DSG3-CAART to advance additional product candidates.*** Shortly after inception, we undertook a comprehensive review of all known B cell-mediated autoimmune diseases in order to evaluate and prioritize the opportunity for selective destruction of B cells in an effort to cure B cell-mediated autoimmune diseases. We intend to continue to apply our proprietary learnings from DSG3-CAART, including scientific and regulatory learnings, to most effectively advance these additional opportunities.
- ***Expanding upon our established IP position and first mover advantage in CAAR T therapy targeted towards B cell-mediated autoimmune diseases.*** We believe there is a particularly high value to the first mover advantage including, but not limited to, experience in discovery, preclinical development, regulatory efforts, intellectual property and insights from clinical trials that can be translated across programs. We are focused on protecting our intellectual property as we continue pursuing the development of future product candidates. We believe the issued U.S. patent on our initial CAAR constructs is the first patent covering cells engineered to express the known pathogenic epitopes recognized by DSG3 and DSG1 autoantibodies, which we are continuing to supplement with additional patent filings.
- ***Leveraging our cellular therapy experience and knowledge in addition to knowledge gained through our Penn collaboration to rapidly build our own fully-integrated internal infrastructure.*** We have differentiated expertise that we believe is uniquely suited for the continued buildout of our CABA platform specializing in B cell-mediated autoimmune diseases. In combination with a management team possessing significant experience in executing on manufacturing strategies for cell therapy products, our partnership with Penn allows us to utilize their existing infrastructure to accelerate our ability to submit our first IND. In parallel, we continue to build out an experienced team to develop and continue implementing a path to our manufacturing independence.

Risks Associated with Our Business

Our business is subject to a number of risks of which you should be aware before making an investment decision. These risks are discussed more fully in the section of this prospectus entitled “Risk Factors” beginning on page 12. These risks include, among others:

- We are a preclinical-stage company with a limited operating history, have incurred significant losses since our inception, and anticipate that we will continue to incur significant losses for the foreseeable future.
- We are highly dependent on our relationship with Penn for our preclinical research and development activities, key technology and our current manufacturing needs for our Phase 1 clinical trial of DSG3-CAART.
- We are reliant on intellectual property licensed to us by Penn and termination of our license agreement with Penn would result in the loss of significant rights, which would have a material adverse effect on our business.

- If we are unable to obtain and maintain sufficient intellectual property protection for DSG3-CAART, our other product candidates and technologies or any future product candidates, we may not be able to compete effectively in our markets.
- Even if this offering is successful, we will need to raise substantial additional funding before we can expect to complete development of any of our product candidates or generate any revenues from product sales.
- Our limited operating history may make it difficult for you to evaluate the success of our business to date and to assess our future viability.
- If we are unable to successfully develop our current programs into a portfolio of product candidates, or experience significant delays in doing so, we may not realize the full commercial potential of our current and future product candidates.
- If we encounter difficulties enrolling patients in our clinical trials, our clinical development activities could be delayed or otherwise adversely affected.
- If we are unable to advance our product candidates through clinical development, obtain regulatory approval and ultimately commercialize our product candidates, or experience significant delays in doing so, our business will be materially harmed.
- Results of earlier studies may not be predictive of future study or trial results, and we may fail to establish an adequate safety and efficacy profile to conduct clinical trials or obtain regulatory approval for our product candidates.
- If serious adverse events, undesirable side effects or unexpected characteristics are identified during the development of any of our product candidates, we may need to delay, abandon or limit our further clinical development of those product candidates.
- Manufacturing and administering our product candidates is complex and we may encounter difficulties in technology transfer from Penn to a contract manufacturing organization.
- We face substantial competition, which may result in others discovering, developing or commercializing products before or more successfully than we do.
- We may establish our own manufacturing facility and infrastructure in addition to or in lieu of relying on third parties for the manufacture of our product candidates, which will be costly and time-consuming, and which may not be successful.
- Our future success depends in part upon our ability to retain our key employees, consultants and advisors and to attract, retain and motivate other qualified personnel.

Corporate History

We were incorporated under the laws of the State of Delaware in April 2017 under the name Tycho Therapeutics, Inc. In August 2018, our corporate name was changed to Cabaletta Bio, Inc. Our principal executive offices are located at 2929 Arch Street, Suite 600, Philadelphia, PA 19104 and our telephone number is (267) 759-3100. Our website address is www.cabalettabio.com. We do not incorporate the information on or accessible through our website into this prospectus, and you should not consider any information on, or that can be accessed through, our website to be part of this prospectus. We have included our website address in this prospectus solely as an inactive textual reference.

Implications of Being an Emerging Growth Company

We qualify as an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012, as amended. As an emerging growth company, we may take advantage of specified reduced disclosure and other requirements that are otherwise applicable generally to public companies. These provisions include:

- being permitted to provide only two years of audited financial statements in addition to any required unaudited interim financial statements with correspondingly reduced "Management's Discussion and Analysis of Financial Condition and Results of Operations" disclosure;
- reduced disclosure about our executive compensation arrangements;
- not being required to hold advisory votes on executive compensation or to obtain stockholder approval of any golden parachute arrangements not previously approved;
- an exemption from the auditor attestation requirement in the assessment of our internal control over financial reporting; and
- an exemption from new or revised financial accounting standards until they would apply to private companies and from compliance with any new requirements adopted by the Public Company Accounting Oversight Board requiring mandatory audit firm rotation.

We may take advantage of these exemptions for up to five years or such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company on the date that is the earliest of: (i) the last day of the fiscal year in which we have total annual gross revenues of $1.07 billion or more; (ii) the last day of our fiscal year following the fifth anniversary of the date of the completion of this offering; (iii) the date on which we have issued more than $1.0 billion in nonconvertible debt during the previous three years; or (iv) the date on which we are deemed to be a large accelerated filer under the rules of the Securities and Exchange Commission. We may choose to take advantage of some but not all of these exemptions. We have taken advantage of reduced reporting requirements in this prospectus. Accordingly, the information contained herein may be different from the information you receive from other public companies in which you hold stock.

THE OFFERING

Common stock offered by us	shares
Common stock to be outstanding immediately after this offering	shares (shares if the underwriters exercise their option to purchase additional shares in full)
Underwriters' option to purchase additional shares	We have granted the underwriters a 30-day option to purchase up to an aggregate of additional shares of common stock from us at the public offering price, less underwriting discounts and commissions on the same terms as set forth in this prospectus.
Use of proceeds	We estimate that we will receive net proceeds from the sale of shares of our common stock in this offering of approximately $ million, or $ million if the underwriters exercise their option to purchase additional shares in full, assuming an initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. We intend to use the net proceeds from this offering, together with our existing cash and cash equivalents, for: the advancement of DSG3-CAART, our lead product candidate; the advancement of our other product candidates; establishment of our planned manufacturing facility; and working capital and other general corporate purposes. For a more complete description of our intended use of the proceeds from this offering, see "Use of Proceeds."
Risk factors	Investment in our common stock involves substantial risks. You should read this prospectus carefully, including the section entitled "Risk Factors" and the financial statements and the related notes to those statements included in this prospectus, before investing in our common stock.
Proposed Nasdaq Global Market symbol	"CABA"

The number of shares of our common stock to be outstanding after this offering is based on 5,772,484 shares of our common stock outstanding as of June 30, 2019, and gives effect to the conversion of all of our outstanding preferred stock into 19,356,835 shares of our common stock upon the completion of this offering, and excludes:

- 2,435,545 shares of common stock issuable upon the exercise of stock options outstanding under our 2018 Stock Option and Grant Plan, or 2018 Plan, as of June 30, 2019, at a weighted average exercise price of $1.97 per share;
- 291,454 shares of common stock reserved for issuance under our 2018 Plan as of June 30, 2019;
- shares of common stock to be reserved for future issuance under our 2019 Stock Option and Incentive Plan to be effective upon the effectiveness of the registration statement of which this prospectus forms a part; and
- shares of common stock to be reserved for future issuance under our 2019 Employee Stock Purchase Plan to be effective upon the effectiveness of the registration statement of which this prospectus forms a part.

Unless otherwise indicated, all information in this prospectus:

- gives effect to a for reverse stock split of our common stock effected on ;
- assumes no exercise of the underwriters' option to purchase up to additional shares of common stock in this offering;
- assumes no exercise of the outstanding options described above;
- gives effect to the automatic conversion upon the completion of this offering of all of our outstanding shares of preferred stock into an aggregate of 19,356,835 shares of common stock; and
- assumes the filing of our amended and restated certificate of incorporation and the effectiveness of our amended and restated bylaws, which will occur upon the closing of this offering.

SUMMARY FINANCIAL DATA

The following tables summarize our financial and operating data for the periods indicated. The summary statements of operations and comprehensive loss data for the period from April 3, 2017 (inception) to December 31, 2017 and for the year ended December 31, 2018 have been derived from our audited financial statements included elsewhere in this prospectus. The summary statements of operations and comprehensive loss data for the six months ended June 30, 2018 and June 30, 2019 and the summary balance sheet data as of June 30, 2019 have been derived from our unaudited financial statements included elsewhere in this prospectus and have been prepared on the same basis as the audited financial statements. In the opinion of management, the interim data reflect all normal recurring adjustments necessary for the fair presentation of the financial information in those statements. The summary financial information below should be read in conjunction with the information contained in "Selected Financial Information," "Management's Discussion and Analysis of Financial Condition and Results of Operations," our financial statements and notes thereto, and other financial information included elsewhere in this prospectus. Our historical results are not necessarily indicative of the results that may be expected in the future, and results for the six-month period ended June 30, 2019 are not necessarily indicative of the results to be expected for the full year ending December 31, 2019.

	Period from April 3, 2017 (inception) to December 31, 2017	December 31, 2018	Six Months Ended June 30, 2018	Six Months Ended June 30, 2019
	(in thousands, except share and per share data)			
Statements of Operations Data:				
Operating expenses:				
Research and development	$ —	$ 4,467	$ 639	$ 5,425
General and administrative	250	1,726	409	2,367
Total operating expenses	250	6,193	1,048	7,792
Loss from operations	(250)	(6,193)	(1,048)	(7,792)
Other income and (expense):				
Interest income	—	235	27	902
Fair value adjustments on convertible notes	—	(6,244)	—	—
Net loss	(250)	(12,202)	(1,021)	(6,890)
Deemed dividend	—	—	—	(5,326)
Net loss to common stockholders	$ (250)	$ (12,202)	$ (1,021)	$ (12,216)
Net loss per share, basic and diluted(1)	$ (0.12)	$ (4.58)	(0.29)	(4.99)
Weighted-average shares used in computing net loss per share, basic and diluted(1)	2,052,588	2,663,207	3,548,955	2,448,788
Pro forma net loss per share, basic and diluted(1)		$ (2.24)		$ (0.56)
Weighted-average shares used in computing pro forma net loss per share, basic and diluted(1)		5,447,398		21,768,343

(1) See Notes 2 and 10 to our audited financial statements and Notes 2 and 10 to our unaudited interim financial statements included elsewhere in this prospectus for a description of how we compute basic and diluted net loss per share and basic and diluted pro forma net loss per share, and the weighted-average number of shares used in the computation of these per share amounts.

	As of June 30, 2019		
	Actual	Pro Forma(2)	Pro Forma As Adjusted(3)
		(in thousands)	
Balance Sheet Data:			
Cash and cash equivalents	$ 75,258	$ 75,258	
Total assets	77,836	77,836	
Working capital(1)	74,446	74,446	
Total liabilities	1,876	1,876	
Convertible preferred stock	97,954	—	
Accumulated deficit	(21,994)	(21,994)	
Total stockholders' deficit equity	(21,994)	75,960	

(1) We define working capital as current assets less current liabilities. See our financial statements and related notes included elsewhere in this prospectus for further details regarding our current assets and current liabilities.

(2) Pro forma amounts give effect to the automatic conversion of all of our outstanding shares of preferred stock into an aggregate of 19,356,835 shares of common stock upon the completion of this offering.

(3) Pro forma as adjusted amounts reflect the pro forma adjustments described in footnote 2 above as well as the sale of shares of our common stock in this offering at the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The pro forma as adjusted information discussed above is illustrative only and will change based on the actual initial public offering price and other terms of this offering determined at pricing. A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover of this prospectus, would increase (decrease) the pro forma as adjusted amount of each of cash and cash equivalents, working capital, total assets and total stockholders' (deficit) equity by approximately $ million, assuming that the number of shares offered by us, as set forth on the cover of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of 1.0 million shares in the number of shares offered by us, as set forth on the cover page of this prospectus, would increase (decrease) the pro forma as adjusted amount of each of cash and cash equivalents, working capital, total assets and total stockholders' (deficit) equity by approximately $ million, assuming the assumed initial public offering price remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

RISK FACTORS

Investing in our common stock involves a high degree of risk. You should carefully consider the risks described below, together with all of the other information in this prospectus, including our financial statements and the related notes, before you make an investment decision. The occurrence of any of the events or developments described below could harm our business, financial condition, results of operations and growth prospects. As a result, the market price of our common stock could decline, and you may lose all or part of your investment in our common stock.

Risks Related to Our Financial Condition and Capital Requirements

We have incurred net losses in every period since our inception and anticipate that we will incur substantial net losses over the next several years, and may never achieve or maintain profitability.

Investment in biopharmaceutical product development is highly speculative because it entails substantial upfront capital expenditures and significant risk that any potential product candidate will fail to demonstrate adequate effect or an acceptable safety profile, gain regulatory approval and become commercially viable. We have only recently acquired rights to license the patents underlying our product candidates and do not plan to initiate our first clinical trial until 2020. We have no products licensed for commercial sale, and we will continue to incur significant research and development and other expenses related to our ongoing operations. Our net losses may fluctuate significantly from quarter to quarter and year to year. We have to date financed our operations primarily through private placements of our preferred stock.

As a result, we are not profitable and have incurred net losses in each period since our inception. For the years ended December 31, 2017 and December 31, 2018, we recorded net losses of $0.3 million and $12.2 million, respectively, and for the period ended June 30, 2019, we recorded net losses of $6.9 million. As of June 30, 2019, we had an accumulated deficit of $22.0 million. We expect to incur significant losses for the foreseeable future, and we expect these losses to increase substantially if, and as, we:

- continue our research and development efforts and submit Investigational New Drug applications, or INDs, for our product candidates;
- conduct preclinical studies and clinical trials for our current and future product candidates;
- further develop our product candidate platform;
- continue to discover and develop additional product candidates;
- maintain, expand and protect our intellectual property portfolio;
- hire additional clinical, scientific manufacturing and commercial personnel;
- establish a commercial manufacturing source and secure supply chain capacity sufficient to provide commercial quantities of any product candidates for which we may obtain regulatory approval, whether through a contract manufacturing organization, or CMO, or through a manufacturing facility that we establish;
- acquire or in-license other product candidates and technologies, including advanced manufacturing and translational capabilities that we will need for the further development and possible commercialization of our product candidates;
- seek marketing approvals for any product candidates that successfully complete clinical trials;
- establish a sales, marketing and distribution infrastructure to support the sales and marketing of any product candidates for which we may obtain marketing approvals; and
- add operational, financial and management information systems and personnel, including personnel to support our product development and planned future commercialization efforts, as well as to support our transition to a public company.

To become and remain profitable, we must succeed in developing, and eventually commercializing, a product or products that generate significant revenue. The ability to achieve this success will require us to be effective in a range of challenging activities, including completing preclinical testing and clinical trials of our product candidates, discovering additional product candidates, obtaining regulatory approval for these product candidates and manufacturing, marketing and selling any products for which we may obtain regulatory approval. We are only in the preliminary stages of most of these activities and have not yet demonstrated our ability to successfully develop any product candidate, obtain regulatory approvals, manufacture a commercial scale product or arrange for a third party to do so on our behalf, or conduct sales and marketing activities necessary for successful product commercialization. We may never be able to develop, manufacture or commercialize a marketable product.

Even if we are able to succeed in these activities, we may never generate revenues that are significant enough to achieve profitability. Because of the numerous risks and uncertainties associated with pharmaceutical product development, we are unable to accurately predict the timing or amount of increased expenses or when, or if, we will be able to achieve profitability. Our expenses will increase if, among other things:

- there are any delays in completing our clinical trials or the development of any of our product candidates;
- we are required by the U.S. Food and Drug Administration, or the FDA, the European Medicines Agency, or the EMA, or other regulatory authorities to perform trials or studies in addition to, or different than, those expected; or
- there are any third-party challenges to our intellectual property or we need to defend against any intellectual property-related claim.

Because of the numerous risks and uncertainties associated with pharmaceutical product development, we are unable to accurately predict the timing or amount of increased expenses we will incur or when, if ever, we will be able to achieve profitability. Even if we succeed in commercializing one or more of our product candidates, we will continue to incur substantial research and development and other expenditures to develop, seek regulatory approval for and market additional product candidates. We may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business. The size of our future net losses will depend, in part, on the rate of future growth of our expenses and our ability to generate revenue. Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital.

We have a limited operating history, which may make it difficult for you to evaluate the success of our business to date and to assess our future viability, and we may face significant challenges and expense as we test our product candidates and build our capabilities.

We are early in our development efforts and we have not initiated clinical trials for any of our product candidates. We were incorporated in 2017 and initially acquired rights to license certain patent rights from the University of Pennsylvania, or Penn, in August 2018. We have a limited operating history and are subject to the risks inherent to any newly-formed organization, including, among others, risks that we may not be able to hire sufficient qualified personnel and establish operating controls and procedures.

We currently do not have in-house resources sufficient to enable our chimeric autoantibody receptor, or CAAR, T cell platform. We are reliant on several manufacturing and support services from Penn through a Master Translational Research Services Agreement, or the Services Agreement, as well as certain research and development and general and administrative services through two sponsored research agreements. We also rely on Penn for access to key technologies for current manufacturing of our product candidates. As we build our own capabilities, we expect to encounter risks and uncertainties frequently experienced by growing companies in new and rapidly evolving fields, including the risks and uncertainties described herein. Our ability to rely on services

from Penn is limited to a specified period of time, to specific capabilities, and is subject to Penn's right to terminate these services with or without cause. If we are unable to establish necessary relationships with third party partners and build our own capabilities, our operating and financial results could differ materially from our expectations, and our business could suffer.

All of our programs require additional preclinical research and development, clinical development, regulatory approval in multiple jurisdictions, obtaining manufacturing supply, capacity and expertise, building of a commercial organization, substantial investment and significant marketing efforts before we generate any revenue from product sales. Other programs of ours require additional discovery research and then preclinical and clinical development. In addition, our product candidates must be licensed for marketing by the FDA or certain other health regulatory agencies, including the EMA, before we may commercialize any product.

Our limited operating history, particularly in light of the rapidly evolving cell therapy field, may make it difficult to evaluate our technology and industry and predict our future performance. Our short history as an operating company makes any assessment of our future success or viability subject to significant uncertainty. We will encounter risks and difficulties frequently experienced by early-stage companies in rapidly evolving fields. If we do not address these risks successfully, our business will suffer. Similarly, we expect that our financial condition and operating results will fluctuate significantly from quarter to quarter and year to year due to a variety of factors, many of which are beyond our control. As a result, our shareholders should not rely upon the results of any quarterly or annual period as an indicator of future operating performance.

In addition, as an early-stage company, we have encountered and may continue to encounter unforeseen expenses, difficulties, complications, delays and other known and unknown circumstances. As we advance our product candidates, we will need to transition from a company with a research focus to a company capable of supporting clinical development and if successful, commercial activities. We may not be successful in such a transition.

We have not generated any revenue from our product candidates and may never be profitable.

To become and remain profitable, we or any potential future collaborator must develop and eventually commercialize products with significant market potential at an adequate profit margin after cost of goods sold and other expenses. All of our product candidates are in the early stages of development and we will require additional preclinical studies, clinical development, regulatory review and approval, substantial investment, access to sufficient commercial manufacturing capacity and significant marketing efforts before we can generate any revenue from product sales. DSG3-CAART, our most advanced product candidate, targeting pathogenic B cells in patients with mucosal pemphigus vulgaris, or mPV, has not yet been evaluated in clinical trials. Our other product candidates, which include DSG3/1-CAART, targeting pathogenic B cells in patients with mucocutaneous pemphigus vulgaris, or mcPV, MuSK-CAART, targeting pathogenic B cells in a subset of patients with myasthenia gravis, or MG, and FVIII-CAART, for potential use as an adjunctive therapy targeting a subset of patients with Hemophilia A who develop alloantibody resistance to Factor VIII, or FVIII, replacement therapy, have yet to complete IND-enabling studies. We have not yet administered any of our product candidates in humans and, as such, we face significant translational risk as our product candidates advance to the clinical stage. Our ability to generate revenue depends on a number of factors, including, but not limited to:

- timely completion of our preclinical studies and clinical trials, which may be significantly slower or cost more than we currently anticipate and will depend substantially upon the performance of third-party academic and commercial contractors;
- our ability to complete IND-enabling studies and successfully submit INDs or comparable applications;
- whether we are required by the FDA or similar foreign regulatory authorities to conduct additional clinical trials or other studies beyond those planned to support the licensure and commercialization of our product candidates or any future product candidates;

- our ability to demonstrate to the satisfaction of the FDA and similar foreign regulatory authorities the safety, potency, purity and acceptable risk to benefit profile of our product candidates or any future product candidates;
- the prevalence, duration and severity of potential side effects or other safety issues experienced with our product candidates or future product candidates, if any;
- the cost of manufacturing and processing our product candidates being greater than we anticipate;
- the timely receipt of necessary marketing approvals from the FDA and similar foreign regulatory authorities;
- the willingness of physicians, operators of clinics and patients to utilize or adopt any of our product candidates or future product candidates to treat B cell-mediated autoimmune diseases;
- our ability and the ability of third parties with whom we contract to manufacture adequate clinical and commercial supplies of our product candidates or any future product candidates, remain in good standing with regulatory authorities and develop, validate and maintain commercially viable manufacturing processes that are compliant with current Good Manufacturing Practices, or cGMP;
- our ability to successfully develop a commercial and competitive strategy and thereafter commercialize our product candidates or any future product candidates in the United States and internationally, if licensed for marketing, reimbursement, sale and distribution in such countries and territories, whether alone or in collaboration with others;
- patient demand for our product candidates and any future product candidates, if licensed; and
- our ability to establish and enforce intellectual property rights in and to our product candidates or any future product candidates.

Many of the factors listed above are beyond our control and could cause us to experience significant delays or prevent us from obtaining regulatory approvals or commercialize our product candidates. Even if we are able to commercialize our product candidates, we may not achieve profitability soon after generating product sales, if ever. If we are unable to generate sufficient revenue through the sale of our product candidates or any future product candidates, we may be unable to continue operations without continued funding.

If we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Additionally, even if we succeed in commercializing one or more of our product candidates, we will continue to incur substantial research and development and other expenditures to research, develop and market additional product candidates. Our failure to become and remain profitable would decrease the value of our company and could impair our ability to raise capital, maintain our research and development efforts, expand our business or continue our operations. A decline in the value of our company also could cause you to lose all or part of your investment.

We may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business. The size of our future net losses will depend, in part, on the rate of future growth of our expenses and our ability to generate revenue. Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital.

We will require substantial additional financing to develop and commercialize our product candidates and implement our operating plans. If we fail to obtain additional financing or cannot obtain financing at the levels we require, we may be delayed in our plans or unable to complete the development and commercialization of our product candidates.

Our operations have consumed substantial amounts of cash since inception. We expect to continue to spend substantial amounts to continue the preclinical and clinical development of our product candidates, including our

planned Phase 1 clinical trial of DSG3-CAART, our initial *in vitro* studies and expected *in vivo* studies of MuSK-CAART, and our planned studies for DSG3/1-CAART as well as research and development, preclinical studies and clinical trials for FVIII-CAART and any future product candidates, to seek regulatory approvals for our product candidates, to enable commercial production of our products, if licensed, and to initiate and complete registration trials for multiple products. Further, if licensed, we will require significant additional amounts of cash to launch and commercialize our product candidates.

As of June 30, 2019, we had approximately $75.3 million of cash and cash equivalents. We estimate that our net proceeds from this offering will be approximately $ million, based on an assumed initial public offering price of $ per share, which is the midpoint of the price range set forth on the cover page of this prospectus, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

Based on our current operating plan, we believe that the net proceeds from this offering together with our existing cash, cash equivalents and marketable securities will be sufficient to fund our operations for at least . However, we have based this estimate on assumptions that may prove to be wrong. Additionally, changing circumstances may cause us to consume capital significantly faster than we currently anticipate, and we may need to spend more money than currently expected because of circumstances beyond our control. We may require substantial additional capital for the further development and commercialization of our product candidates, including funding our internal manufacturing capabilities, and may need to raise additional funds sooner if we choose to expand more rapidly than we presently anticipate. Because the length of time and activities associated with development of our product candidates is highly uncertain, we are unable to estimate the actual funds we will require for development and any approved marketing and commercialization activities. Our future funding requirements, both near- and long-term, will depend on many factors, including, but not limited to:

- the initiation, progress, timing, costs and results of preclinical studies and clinical trials for our product candidates;
- the clinical development plans we establish for these product candidates;
- the number and characteristics of product candidates that we may develop orin-license;
- the terms of any collaboration agreements we may choose to conclude;
- the outcome, timing and cost of meeting regulatory requirements established by the FDA, the EMA, and other comparable foreign regulatory authorities;
- the cost of filing, prosecuting, defending and enforcing our patent claims and other intellectual property rights;
- the cost of defending intellectual property disputes, including patent infringement actions brought by third parties against us or our product candidates;
- the effect of competing technological and market developments;
- the costs of establishing and maintaining a supply chain for the development and manufacture of our product candidates;
- the cost and timing of establishing, expanding and scaling manufacturing capabilities;
- the cost of maintaining the amount patient data for which we would be responsible following commercialization of one or more of our product candidates; and
- the cost of establishing sales, marketing and distribution capabilities for any product candidates for which we may receive regulatory approval in regions where we choose to commercialize our products on our own.

We cannot be certain that additional funding will be available on acceptable terms, or at all. Until we are able to generate sufficient revenue to finance our cash requirements, we will need to finance our future cash needs through a combination of public or private equity offerings, debt financings, collaborations, strategic alliances, licensing arrangements and other marketing or distribution arrangements. If we are unable to raise additional capital in sufficient amounts or on terms acceptable to us, we may have to significantly delay, scale back or discontinue our research and development initiatives. We could be required to seek collaborators for our product candidates at an earlier stage than otherwise would be desirable or on terms that are less favorable than might otherwise be available or relinquish or license on unfavorable terms our rights to our product candidates in markets where we otherwise would seek to pursue development or commercialization ourselves.

Any of the above events could significantly harm our business, prospects, financial condition and results of operations and cause the price of our common stock to decline.

Risks Related to Our Business, Technology and Industry

We are very early in our development efforts. All of our product candidates are still in preclinical development. If we are unable to advance our product candidates through clinical development, obtain regulatory approval and ultimately commercialize our product candidates, or experience significant delays in doing so, our business will be materially harmed.

We are very early in our development efforts. None of our product candidates have entered clinical development. Our ability to generate product revenues, which we do not expect will occur for many years, if ever, will depend heavily on the successful development and eventual commercialization of one or more of our product candidates. Even if we are able to develop and commercialize a marketable product, we may face challenges generating revenue from product sales. The success of our product candidates will depend on several factors, including the following:

- successful completion of preclinical studies resulting in data that is supportive of advancing to an IND submission;
- successful submission of INDs or comparable applications;
- successful initiation of clinical trials;
- demonstration of adequate safety to progress to a therapeutic dose level;
- successful patient enrollment in and completion of clinical trials;
- receipt and related terms of regulatory and marketing approvals and licensures from applicable regulatory authorities;
- establishing commercial manufacturing capabilities or making arrangements with third-party manufacturers for clinical supply and commercial manufacturing;
- making arrangements with various medical divisions across hospitals for administration of our product candidates, including with cancer treatment centers to conduct leukapheresis and with the relevant hospital divisions to perform infusion;
- obtaining and maintaining patent and trade secret protection and regulatory exclusivity for our product candidates;
- making arrangements with third-party manufacturers, or establishing manufacturing capabilities, for both clinical and commercial supplies of our product candidates;
- establishing sales, marketing and distribution and patient administration capabilities and launching commercial sales of our products, if and when licensed, whether alone or in collaboration with others;

- acceptance of our products, if and when licensed, by patients, the medical community and third-party payors;
- effectively competing with other therapies targeting the same indications as our product candidates;
- obtaining and maintaining third-party coverage and adequate reimbursement; and
- maintaining a continued acceptable safety profile of our products following licensure.

If we do not achieve one or more of these factors in a timely manner or at all, we could experience significant delays or be unable to successfully commercialize our product candidates, which would materially harm our business. If we do not receive regulatory approvals for our product candidates, we may not be able to continue our operations.

Our engineered CAAR T product candidates represent a novel approach to the treatment of B cell-mediated autoimmune diseases, which creates significant challenges for us.

We are developing a pipeline of CAAR T product candidates that are intended for use in treating individuals with B cell-mediated autoimmune disease. Advancing these novel product candidates creates significant challenges for us, including:

- manufacturing our product candidates to our specifications and in a timely manner to support our clinical trials, and, if licensed, commercialization;
- sourcing clinical and, if licensed, commercial supplies for the materials used to manufacture our product candidates;
- understanding and addressing variability in the quality and quantity of a subject's T cells, which could ultimately affect our ability to manufacture clinical supply and, if licensed, commercial supply of our product candidates in a reliable and consistent manner;
- educating medical personnel regarding the potential side effect profile of our product candidates, if licensed, such as the potential adverse side effects related to pemphigus flare from infusion of activated T cells or medication taper, cytokine release syndrome, or CRS, or other unexpected adverse effects of therapy with our product candidates;
- facilitating patient access to the limited number of facilities able to administer our product candidates, if licensed;
- using medicines to manage adverse side effects of our product candidates that may not adequately control the side effects and/or may have a detrimental impact on the efficacy of the treatment;
- potentially utilizing preconditioning agents in patients to enhance engraftment in advance of administering our product candidates, which may increase the risk of adverse side effects;
- obtaining and maintaining regulatory approval for our product candidates, as the FDA and other regulatory authorities have limited or no experience with development of engineered T cell therapies for the treatment of B cell-mediated autoimmune diseases;
- establishing sales and marketing capabilities upon obtaining any regulatory approval to gain market acceptance of a novel therapy; and
- managing costs of inputs and other supplies while scaling production.

In addition, preclinical murine and other animal models may not exist or be adequate for some or all of the B cell-mediated autoimmune diseases we choose to pursue in our programs, and because we have not commenced clinical trials of any of our product candidates, we are unable to predict whether there may be short-term or long-term effects from treatment with any product candidates that we develop. In developing our product

candidates, we have not exhaustively explored different options in the method for manufacturing CAAR T cells. We may find our existing manufacturing process may be substantially improved with future design or process changes, necessitating further clinical testing, delaying commercial launch of our first products, and causing us to incur additional expenses. For example, while we have used a lentiviral vector in our manufacturing process, we may in the future find that another viral vector or non-viral vector-based process offers advantages. Switching from one lentiviral vector to another or switching from lentiviral to another delivery system would necessitate additional process development and clinical testing, and this may delay the development of existing product candidates.

In addition, we do not know the doses to be evaluated in pivotal trials or, if licensed, commercially. Finding a suitable dose may delay our anticipated clinical development timelines. Our expectations with regard to our scalability and costs of manufacturing may vary significantly as we develop our product candidates and understand these critical factors. We may experience delays in developing a sustainable, reproducible and scalable manufacturing process or transferring that process to commercial partners, which may prevent us from completing our clinical studies or commercializing our product candidates on a timely or profitable basis, if at all.

Moreover, our product candidates may not perform successfully in clinical trials or may be associated with adverse events that distinguish them from the chimeric antigen receptor T, or CAR T, therapies that have previously been licensed. For instance, subjects in our clinical trials will be infused with our proposed therapies, and may possess strongly activating soluble antibodies, which, when they interact with our infused product candidates, could result in potential adverse side effects, such as CRS, which are not experienced with CAR T cell products for cancer. Unexpected side effects or clinical outcomes would significantly impact our business. Adverse side effects caused by even one of our product candidates could negatively affect our ability to develop future product candidates based on our CABA platform.

Two of our current product candidates, DSG3/1-CAART and FVIII-CAART, will and certain of our future product candidates may require introducing large transgenes into T cells, and lentiviral vectors may have too limited a genome capacity to accomplish this process.

We currently use lentiviral vector transduction for transgene delivery. However, lentiviral vectors have a limited genome capacity that restricts the size of the transgene that can be delivered using this vector system. For example, designing a lentiviral vector that will have sufficient capacity to introduce DSG3 CAAR and DSG1 CAAR together into T cells may not be possible. In addition to reducing lentiviral vector titers that may substantially increase the cost of gene transfer, it may be entirely unsuccessful, thus necessitating use of alternative strategies for transfer of these larger transgenes into T cells.

Our product candidates may have serious and potentially fatal targeting of cells within the body due to unexpected protein interactions with the CAAR.

Although we have completed multiple preclinical studies designed to screen for toxicity caused by unintendedoff-target recognition by the cell binding domain of the DSG3 CAAR, our product candidates may still recognize and react with one or more proteins unrelated to the intended surface immunoglobin target protein to which it is designed to link. If unexpected binding occurs in normal tissue, our product candidates may target and kill the normal tissue in a patient, leading to serious and potentially fatal adverse events, undesirable side effects, toxicities or unexpected characteristics. Detection of any unexpected targeting may halt or delay any ongoing clinical trials for our product candidates and prevent or delay regulatory approval. While we have developed a preclinical screening process to identify cross-reactivity of our product candidates, we cannot be certain that this process will identify all potential tissue that our product candidates may target. For example, a membrane protein array with DSG3-CAART yielded one weak signal against a protein that is designed to bind to glycoproteins and which was detected in both the test and control conditions. Further analysis of this protein in confirmatory cell-based assays repeatedly demonstrated that DSG3-CAART does not recognize nor activate

against this protein. However, this further analysis may prove to be inaccurate. Any unexpected targeting that impacts patient safety could materially impact our ability to advance our product candidates into clinical trials or to proceed to marketing approval and commercialization.

Patients receiving T cell-based immunotherapies, such as our product candidates, may experience serious adverse events, including neurotoxicity, CRS and killing of cells other than the intended B cells that express the autoantibodies. If our product candidates are revealed to have high and unacceptable severity and/or prevalence of side effects or unexpected characteristics, their clinical development, regulatory approval, and commercial potential will be negatively impacted, which will significantly harm our business, financial condition and prospects.

Our product candidates are CAAR T cell-based immunotherapies. There is a possibility that our product candidates could have adverse side effects, such as neurotoxicity and CRS. In other similarly designed cellular immunotherapies to treat cancer, there have been life threatening events related to severe neurotoxicity and CRS requiring intense medical intervention, such as intubation or medications to support blood pressure, and in several cases, resulted in death. Severe neurotoxicity is a condition that is currently defined clinically by cerebral edema, confusion, drowsiness, speech impairment, tremors, seizures or other central nervous system side effects, when such side effects are serious enough to lead to intensive care. CRS is a condition that is currently defined clinically by certain symptoms related to the release of cytokines, which can include fever, chills and low blood pressure, when such side effects are serious enough to lead to intensive care with mechanical ventilation or significant medications to support blood pressure.

Results of our studies could reveal a high and unacceptable severity and prevalence of side effects or unexpected characteristics. Undesirable side effects caused by our product candidates could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or other comparable foreign regulatory authorities. In some cases, side effects such as neurotoxicity or CRS have resulted in clinical holds of ongoing clinical trials and/or discontinuation of the development of the product candidate. Given that the autoimmune and alloimmune diseases we are seeking to treat are, in some cases, less serious than the later stage cancers being treated with other immunotherapy products, we believe the FDA and other regulatory authorities likely will apply a different benefit-risk assessment thresholds such that even if our product candidate demonstrated a similar safety profile as current CAR T therapies, the FDA may ultimately determine that the harmful side effects outweigh the benefits and require us to cease clinical trials or deny approval of our product candidates. We believe tolerance for adverse events in the patient population being pursued with CAAR T cell therapies will be lower than it is in oncology, and the risks of negative impact from these toxicities may therefore be higher for us than for CAR T programs in oncology.

Furthermore, treatment-related side effects could also affect patient recruitment or the ability of enrolled patients to complete the studies or result in potential product liability claims. In addition, these side effects may not be appropriately recognized or managed by the treating medical staff, as toxicities resulting from T cell-based immunotherapies are not normally encountered in routine medical care. Medical personnel may need additional training regarding T cell-based immunotherapy product candidates to understand their side effects. Inadequate training in recognizing or failure to effectively manage the potential side effects of T cell-based immunotherapy product candidates could result in patient deaths. Any of these occurrences may harm our business, financial condition and prospects significantly.

In addition to side effects caused by our product candidates, the preconditioning, administration process or related procedures, which we evaluate from time to time as part of our process improvement and optimization efforts, may also cause adverse side effects. For example, severe neurotoxicity has been noted to be associated with the use of certain lymphodepleting regimens. While we believe there are sufficient data from other CAR T programs to suggest that it is reasonable for us to initiate our first clinical trial of DSG3-CAART without a preconditioning regimen, we cannot be certain that a preconditioning regimen, with or without lymphodepleting agents, will not be required.

Although we plan to infuse DSG3-CAART without pre-infusion preconditioning initially in our planned Phase 1 clinical trial, we may in the future use a preconditioning regimen for our CAAR T cell product candidates, which may increase the risk of adverse side effects and impact our ability to accurately assess the efficacy of our product candidates.

The majority of clinical trials for CAR T cell-based therapies have been used in oncology indications and incorporate a lymphodepleting chemotherapeutic regimen to condition the patient prior to infusion in order to promote the expansion and activity of the CAR T cells in the patient. In the case of certain CAR T cell-based therapies, severe neurotoxicity and other serious side effects have been thought to be associated with the use of certain lymphodepleting regimens prior to the administration of CAR T cell products. These regimens often include cyclophosphamide and fludarabine and are usually administered within the week prior to infusion of CAR T cells.

Our CAARs differ from CARs used in oncology and are being designed to treat patients with autoimmune diseases. The level of certain cytokines that promote CAR T expansion in oncology patients may differ from autoimmune patients for many reasons, including the presence of circulating autoantibodies. We initially plan to infuse DSG3-CAART without preconditioning. Based on evidence from other CAR T cell clinical trials demonstrating clinical activity without prior conditioning and the levels of certain cytokines that promote T cell expansion in the patients we are treating relative to cancer patients, as well as data from engineered T cell therapy in the setting of HIV without conditioning, we believe that CAAR T cell therapy may be functional in our autoimmune target patient populations without preconditioning regimens. Based on preclinical studies where DSG3-CAART is combined with stimulatory DSG3 antibodies, we observed these antibodies generate a modest level of cytokine activity that is an order of magnitude less than what was observed when DSG3-CAART engaged with target B cells. We believe this data indicates the presence of soluble DSG3 antibodies could stimulate DSG3-CAART expansion and potentially facilitate engraftment. This information coupled with the risks associated with certain lymphodepleting regimens used for preconditioning, we believe exposing autoimmune patients to these regimens without data to support the benefit is difficult to justify.

Typical lymphodepleting regimens include medications that could kill the pathogenic B cells targeted by our CAAR T cell product candidates. As a result, if we do use a lymphodepleting regimen for preconditioning, it may adversely affect our ability to assess the safety and early efficacy of DSG3-CAART by using DSG3 autoantibody titers. Depending upon the preconditioning regimen used, this may make it difficult to demonstrate the ability of our CAAR T cell product candidates to specifically ablate such pathogenic B cells in the short term because certain preconditioning regimens may have indiscriminately and temporarily ablated these and other B cells. Despite these risks and the increased risk of potential adverse effects resulting from the lymphodepleting regimens, we may elect to use a preconditioning regimen if our clinical data indicates that, in the autoimmune setting, it could potentially permit or enhance the engraftment and expansion of the CAAR T cells to sufficient levels to improve clinical outcomes for patients.

If we ultimately use a preconditioning regimen, with or without lymphodepleting agents, prior to infusing patients with our CAAR T cell product candidates, our patients may experience adverse effects specifically related to the preconditioning regimen, some of which may result in death. These undesirable side effects could cause delays in patient enrollment in our clinical trials, could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in a change to our clinical trial design, a more restrictive label or the delay or denial of regulatory approval by the FDA or other comparable foreign regulatory authorities. Any of the foregoing may increase the duration and expense of the clinical development of our product candidates or limit market acceptance of such product candidates, if approved, any of which could have a material adverse effect on our business and financial condition.

Cellular therapies are a novel approach and negative perception or increased regulatory scrutiny of any product candidates that we develop could adversely affect our ability to conduct our business or obtain regulatory approvals for such product candidates.

Cellular therapies in general, and CAAR T cell therapies in particular, remain novel therapies, with no immunotherapies licensed to date in the United States or the European Union to treat autoimmune diseases or alloimmune responses. CAAR T cell therapies may not gain the acceptance of the public or the medical community. For example, CAR Ts and other cellular therapies have in some cases caused severe side effects, including death, and their broader use may therefore be limited. Even if CAR Ts and other cellular therapies are accepted by the public and medical community in the short term, long-term adverse events observed in these therapies may increase negative perception and regulatory scrutiny. Although our CAAR Ts are different from CAR Ts and other cellular therapies, they may be viewed in the same vein, limiting their market acceptance. Public perception may be influenced by claims that gene therapy, including the insertion of a transgene, is unsafe, and products incorporating gene therapy may not gain the acceptance of the public or the medical community. The patient populations targeted by our product candidates are also typically not at risk of near-term death, even if they may suffer life-threatening symptoms, so patients will need to deem the benefits of cell therapy to be worth the risk of unknown potential adverse side effects. Our success will depend upon physicians who specialize in the treatment of B cell-mediated autoimmune diseases targeted by our product candidates prescribing treatments that involve the use of our product candidates in lieu of, or in addition to, existing treatments with which they are more familiar and for which greater clinical data may be available. Adverse events in clinical trials of our product candidates or in clinical trials of others developing similar products and the resulting publicity, as well as any other adverse events in the field of cellular therapies, could result in a decrease in demand for any product that we may develop.

In addition, responses by the U.S., state or foreign governments to negative public perception or ethical concerns may result in new legislation or regulations that could limit our ability to develop or commercialize any product candidates, obtain or maintain regulatory approval or otherwise achieve profitability. The FDA, the EMA and regulatory authorities in other countries have each expressed interest in further regulating biotechnology products, such as cellular therapies. Agencies at both the federal and state level in the United States, as well as the U.S. Congressional committees and other government entities or governing agencies have also expressed interest in further regulating the biotechnology industry. Such action may delay or prevent commercialization of some or all of our product candidates. Adverse developments in clinical trials of cellular therapy products conducted by others may cause the FDA or other oversight bodies to change the requirements for approval of any of our product candidates. Similarly, the EMA governs the development of cellular therapies in the European Union and may issue new guidelines concerning the development and marketing authorization for cellular therapy products and require that we comply with these new guidelines. These regulatory review agencies and committees and the new requirements or guidelines they promulgate may lengthen the regulatory review process, require us to perform additional studies or trials, increase our development costs, lead to changes in regulatory positions and interpretations, delay or prevent approval and commercialization of our product candidates or lead to significant post-approval limitations or restrictions.

Further, the clinical study requirements of the FDA, the EMA and other regulatory agencies and the criteria they use to determine the safety, potency and purity of a product candidate are determined according to the type, complexity, novelty and intended use and market of the potential products. The regulatory approval process for novel product candidates such as ours is less clear, and can be more complex and consequently have higher development risk, be more expensive and take longer than for other, better known or extensively studied pharmaceutical or other product candidates. Approvals by the EMA and the FDA for existing cell therapies treating B cell-mediated diseases, such as Kymriah (Novartis Pharmaceuticals Corporation) and Yescarta (Gilead Sciences, Inc.), may not be indicative of what these regulators may require for approval of our therapies. Approvals by any regulatory agency may not be indicative of what any other regulatory agency may require for approval or what such regulatory agencies may require for approval in connection with new product candidates. As we advance our product candidates, we will be required to consult with these regulatory agencies and comply

with applicable requirements and guidelines. If we fail to do so, we may be required to delay or discontinue development of such product candidates. These additional processes may result in a review and approval process that is longer than we otherwise would have expected. More restrictive statutory regimes, government regulations or negative public opinion would have an adverse effect on our business, financial condition, results of operations and prospects and may delay or impair the development and commercialization of our product candidates or demand for any products we may develop.

Our business is highly dependent on the success of our initial product candidates targeting B cell-mediated autoimmune diseases, particularly DSG3-CAART. All of our product candidates will require significant additional preclinical and clinical development before we can seek regulatory approval for and launch a product commercially.

Our business and future success depend on our ability to obtain regulatory approval of, and then successfully launch and commercialize our initial product candidates targeting B cell-mediated autoimmune diseases, including DSG3-CAART, MuSK-CAART, DSG3/1-CAART and others that may be selected from preclinical programs. Our product candidates are in the early stages of development and will require additional preclinical studies, clinical trials, regulatory review and licensure, substantial investment, access to sufficient commercial manufacturing capacity and significant marketing efforts before we can generate any revenue from product sales. There is no guarantee that we will be able to advance our product candidates through clinical development or obtain marketing approval for any of our product candidates. The process for obtaining marketing approval for any product candidate is very long and risky and there will be significant challenges for us to address in order to obtain marketing approval as planned, if at all.

We plan to initiate a Phase 1 clinical trial for DSG3-CAART in 2020, if our planned IND is accepted by the FDA. DSG3-CAART has only been administered in murine models to date, and such results may not be predictive of the results of our planned clinical trial or any future clinical trials. Because DSG3-CAART is the first product candidate that we plan to test in the clinic, we may experience preliminary complications surrounding regulatory acceptance of our planned IND, trial design, protocol establishment and execution, establishing trial protocols, patient recruitment and enrollment, quality and supply of clinical doses, or safety issues. For example, while the majority of oncology CAR T clinical trials have been conducted with a lymphodepleting or other preconditioning regimen prior to infusion, we do not intend to use pre-infusion lymphodepletion or other preconditioning regimen initially in our planned Phase 1 trial. However, we may determine that use of a lymphodepleting or other preconditioning regimen is necessary for our product candidates to be successful, which could result in delays in clinical development and will expose patients to the associated risks.

Additionally, a failure of our planned clinical trial of DSG3-CAART could influence physicians' and regulators' opinions with regard to the viability of our CABA platform more broadly, particularly if treatment-related side effects are observed. The occurrence of any of these risks could significantly harm our development plans and business prospects. If treatment-related side effects are observed with the administration of DSG3-CAART, or if it is viewed as less safe, potent or pure than other therapies, our ability to develop other CAAR T cell therapies may be significantly harmed.

Our product candidates may cause undesirable side effects or have other properties that could halt their clinical development, prevent their regulatory approval, limit their commercial potential or result in significant negative consequences.

Undesirable or unacceptable side effects caused by our product candidates could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or other comparable foreign regulatory authorities. Further, clinical trials by their nature utilize a sample of the potential patient population. With a limited number of subjects and limited duration of exposure, rare and severe side effects of our product candidates may only be uncovered with a

significantly larger number of patients exposed to the drug. Undesirable side effects could also result in an expansion in the size of our clinical trials, increasing the expected costs and timeline of our clinical trials. Additionally, results of our clinical trials could reveal a high and unacceptable severity and prevalence of side effects or unexpected characteristics.

Licensed CAR T cell therapies and those under development have shown frequent rates of CRS and neurotoxicity, and adverse events have resulted in the death of patients. Similar adverse events could occur during treatment with our CAAR T cell product candidates. For example, activation of CAAR T cells by patient autoantibodies or alloantibodies could stimulate CRS. When CAAR T cells are infused and the CAAR binds to soluble antibodies in the blood or tissues of treated patients, these soluble antibodies may trigger the CAAR, resulting in an activation of the immune system that is too high, leading to CRS. Further, it is possible that patients will exhibit acute rejection of the CAAR T cells because of preexisting immunity to the antigen within the CAAR. This could render our product candidates ineffective.

If unacceptable toxicities or health risks, including risks inferred from other unrelated immunotherapy trials, arise in the development of our product candidates, we could suspend or terminate our trials or the FDA, comparable foreign regulatory authorities, the Data Safety Monitoring Board, or DSMB, or local regulatory authorities such as institutional review board, or IRBs, could order us to cease clinical trials. Competent national health authorities, such as the FDA, could also deny approval of our product candidates for any or all targeted indications. Treatment-related side effects could also affect patient recruitment or the ability of enrolled subjects to complete the trial or result in potential product liability claims. In addition, these side effects may not be appropriately recognized or managed by the treating medical staff, as toxicities resulting from T cell therapy are not normally encountered in the general patient population and by medical personnel. We expect to have to train medical personnel using CAAR T cell product candidates to understand the side effect profile of our product candidates for both our preclinical studies and clinical trials and upon any commercialization of any of our product candidates, if licensed. Inadequate training in recognizing or managing the potential side effects of our product candidates could result in patient deaths. Any of these occurrences may harm our business, financial condition and prospects significantly.

Our planned preclinical studies and clinical trials may fail to demonstrate the safety, potency and purity of any of our product candidates, which would prevent or delay regulatory approval and commercialization.

Before obtaining regulatory approvals for the commercial sale of any of our product candidates, we must demonstrate through lengthy, complex and expensive preclinical testing and clinical trials that our product candidates are safe, potent and pure for use in each target indication. Clinical trials are expensive and can take many years to complete, and their outcomes are inherently uncertain. Failure can occur at any time during the clinical trial process. The results of preclinical studies and early clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials, including in any post-approval studies of our product candidates. In addition, initial success in any clinical trials may not be indicative of results obtained when such trials are completed. There is typically an extremely high rate of attrition from the failure of product candidates proceeding through clinical trials. Product candidates in later stages of clinical trials may fail to show the desired safety, potency and purity profile despite having progressed through preclinical studies and initial clinical trials.

A number of companies in the biopharmaceutical industry have suffered significant setbacks in advanced clinical trials due to lack of potency or efficacy, insufficient durability of potency or efficacy or unacceptable safety issues, notwithstanding promising results in earlier trials, and we cannot be certain that we will not face similar setbacks. These setbacks have been caused by, among other things, preclinical and other nonclinical findings made while clinical trials were underway, or safety or efficacy observations made in preclinical studies and clinical trials, including previously unreported adverse events. Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses and many companies that believed their product candidates performed satisfactorily in preclinical studies and clinical trials nonetheless failed to obtain FDA or EMA approval. Most product candidates that commence clinical trials are never approved as products.

Any preclinical studies or clinical trials that we may conduct may not demonstrate the safety, potency and purity necessary to obtain regulatory approval to market our product candidates. If the results of our ongoing or future preclinical studies and clinical trials are inconclusive with respect to the safety, potency and purity of our product candidates, if we do not meet the clinical endpoints with statistical and clinically meaningful significance, or if there are safety concerns associated with our product candidates, we may be prevented or delayed in obtaining marketing approval for such product candidates. In some instances, there can be significant variability in safety, potency or purity results between different preclinical studies and clinical trials of the same product candidate due to numerous factors, including changes in trial procedures set forth in protocols, differences in the size and type of the patient populations, changes in and adherence to the clinical trial protocols and the rate of dropout among clinical trial participants. For example, because our CAAR T cell product candidates only target approximately 0.01% to 1% of the B cells in a patient, they may not engage enough of the target to achieve adequate engraftment necessary for elimination of all pathogenic B cells. Insufficient safety or potency in clinical trials may delay product development to enable time to modify the product candidate for next generation approaches or make manufacturing changes or may lead us to discontinue development of the product candidate.

In addition, for DSG3-CAART, MuSK-CAART and any future trials that may be completed, we cannot guarantee that the FDA or comparable foreign regulatory authorities will interpret the results as we do, and more trials could be required before we submit our product candidates for approval. To the extent that the results of the trials are not satisfactory to the FDA or comparable foreign regulatory authorities to support a marketing application, approval of our product candidates may be significantly delayed, or we may be required to expend significant additional resources, which may not be available to us, to conduct additional trials in support of potential approval of our product candidates.

Interim, topline or preliminary data from any preclinical studies or clinical trials that we conduct may change as more data become available and are subject to audit and verification procedures that could result in material changes in the final data.

Based on a pre-IND interaction with the FDA, we expect our initial clinical trial for our lead product candidate will be open-label. From time to time, we may publicly disclose preliminary or topline or data from our preclinical studies and clinical trials, which will be based on a preliminary analysis of then-available data, and the results and related findings and conclusions are subject to change following a more comprehensive review of the data related to the particular study or trial. We also make assumptions, estimations, calculations and conclusions as part of our analyses of data, and we may not have received or had the opportunity to fully and carefully evaluate all data. Additionally, we expect that in our planned Phase 1 clinical trial of DSG3-CAART, the product candidate will be administered by intravenous infusion, using a fractionated-dose infusion scheme of escalating numbers of DSG3-CAART cells. Because of the fractionated-dose infusion scheme, if we release topline results from our planned Phase 1 clinical trial, they may differ from the final data we observe once all dose levels have been administered within the initial cohort.

As a result, the topline results that we report may differ from future results of the same studies, or different conclusions or considerations may qualify such results, once additional data have been received and fully evaluated. Topline data also remain subject to audit and verification procedures that may result in the final data being materially different from the preliminary data we previously published. As a result, topline data should be viewed with caution until the final data are available. From time to time, we may also disclose interim data from planned interim analyses in our clinical trials. Interim data from clinical trials that we may complete are subject to the risk that one or more of the clinical outcomes may materially change as patient enrollment continues and more patient data become available. Adverse differences between preliminary or interim data and final data could significantly harm our business prospects. Further, disclosure of interim data by us or by our competitors could result in volatility in the price of our common stock after this offering.

Regulatory agencies, including the FDA and comparable foreign authorities, may not accept or agree with our assumptions, estimates, calculations, conclusions or analyses or may interpret or weigh the importance of

data differently, which could impact the value of the particular program, the approvability or commercialization of the particular product candidate or product and our company in general.

If the interim, topline or preliminary data that we report differ from actual results, or if others, including regulatory authorities, disagree with the conclusions reached, our ability to obtain approval for, and commercialize, our product candidates may be harmed, which could harm our business, operating results, prospects or financial condition.

We have no experience as a company in conducting clinical trials.

Although our key employees have significant experience in leading clinical development programs, we have no experience as a company in conducting clinical trials. In part because of this lack of experience, we cannot be certain that our ongoing preclinical studies will be completed on time or that our planned preclinical studies and clinical trials will begin or be completed on time, if at all. Any clinical trial that we conduct, including our planned Phase 1 clinical trial of DSG3-CAART, will require significant financial and management resources and reliance on third-party clinical investigators, contract research organizations, or CROs, and consultants. For example, the coordination of the clinical trial sites for our Phase 1 clinical trial of DSG3-CAART will be conducted by a CRO. Relying on third-party clinical investigators, CROs and consultants may force us to encounter delays and expenses that are outside of our control.

We may not be able to file INDs to commence clinical trials on the timelines we expect, and even if we are able to, the FDA may not permit us to proceed.

We intend to submit an IND to the FDA to initiate a clinical trial of DSG3-CAART targeting mPV in the second half of 2019. The timing of submissions on future product candidates will be dependent on further preclinical and manufacturing success. We cannot be sure that submission of an IND or IND amendment will result in the FDA allowing testing and clinical trials to begin, or that, once begun, issues will not arise that would cause us or the FDA to suspend or terminate such clinical trials. Additionally, even if such regulatory authorities agree with the design and implementation of the clinical trials set forth in an IND or clinical trial application, we cannot guarantee that such regulatory authorities will not change their requirements in the future.

We may encounter substantial delays in our clinical trials or may not be able to conduct our trials on the timelines we expect or at all.

Clinical testing is expensive, time consuming and subject to uncertainty. We cannot guarantee that any clinical trials will be conducted as planned or completed on schedule, if at all. Even if these trials begin as planned, issues may arise that could suspend or terminate such clinical trials. A failure of one or more clinical trials can occur at any stage of testing, and our future clinical trials may not be successful. Events that may prevent successful or timely completion of clinical development include:

- inability to generate sufficient preclinical, toxicology or other *in vivo* or *in vitro* data to support the initiation of clinical trials;
- delays in sufficiently developing, characterizing or controlling a manufacturing process suitable for clinical trials;
- delays in developing suitable assays for screening patients for eligibility for clinical trials with respect to certain product candidates;
- delays in reaching a consensus with the FDA and other regulatory agencies on trial design;
- delays in reaching agreement on acceptable terms with prospective CROs and clinical study sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and clinical trial sites;

- delays in obtaining required institutional review board, or IRB, approval at each clinical trial site;
- imposition of a temporary or permanent clinical hold by regulatory agencies for a number of reasons, including after review of an IND submission or amendment, or equivalent application or amendment; as a result of a new safety finding that presents unreasonable risk to clinical trial participants; a negative finding from an inspection of our clinical study operations or study sites; developments on trials conducted by competitors for related technology that raises FDA concerns about risk to patients of the technology broadly; or if FDA finds that the investigational protocol or plan is clearly deficient to meet its stated objectives;
- delays in recruiting suitable patients to participate in our clinical trials;
- delays in treating one or more patients, once enrolled, due to their inability to accommodate parts of the complex study procedures schedule;
- difficulty collaborating with patient groups and investigators;
- failure by our CROs, other third parties or us to adhere to clinical trial requirements;
- limitations on our recourse in our CRO relationship with Penn as compared to a CRO that is not an academic institution;
- failure to perform in accordance with the FDA's good clinical practice, or GCP, requirements or applicable regulatory guidelines in other countries;
- transfer of manufacturing processes to any new CMO or our own manufacturing facilities or any other development or commercialization partner for the manufacture of product candidates;
- delays in having patients complete participation in a trial or return for post-treatmentfollow-up;
- patients dropping out of a trial;
- occurrence of adverse events associated with the product candidate that are viewed to outweigh its potential benefits;
- changes in regulatory requirements and guidance that require amending or submitting new clinical protocols;
- changes in the standard of care on which a clinical development plan was based, which may require new or additional trials;
- the cost of clinical trials of our product candidates being greater than we anticipate;
- clinical trials of our product candidates producing negative or inconclusive results, which may result in our deciding, or regulators requiring us, to conduct additional clinical trials or abandon product development programs;
- delays or failure to secure supply agreements with suitable raw material suppliers, or any failures by suppliers to meet our quantity or quality requirements for necessary raw materials; and
- delays in manufacturing, testing, releasing, validating or importing/exporting sufficient stable quantities of our product candidates for use in clinical trials or the inability to do any of the foregoing.

Any inability to successfully complete preclinical and clinical development could result in additional costs to us or impair our ability to generate revenue. In addition, if we make manufacturing or formulation changes to our product candidates, we may be required to, or we may elect to, conduct additional trials to bridge our modified product candidates to earlier versions. Clinical trial delays could also shorten any periods during which our product candidates and products, if licensed, have patent protection and may allow our competitors to bring products to market before we do, which could impair our ability to successfully commercialize our product candidates and may harm our business and results of operations.

We could also encounter delays if a clinical trial is suspended or terminated by us, by the DSMB for such trial or by the FDA or other regulatory authority, or if the IRBs of the institutions in which such trials are being conducted suspend or terminate the participation of their clinical investigators and sites subject to their review. Such authorities may suspend or terminate a clinical trial due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a product candidate, changes in governmental regulations or administrative actions or lack of adequate funding to continue the clinical trial.

Delays in the initiation, conduct or completion of any clinical trial of our product candidates will increase our costs, slow down our product candidate development and approval process and delay or potentially jeopardize our ability to commence product sales and generate revenue. In addition, many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may also ultimately lead to the denial of regulatory approval of our product candidates. In the event we identify any additional product candidates to pursue, we cannot be sure that submission of an IND will result in the FDA allowing clinical trials to begin in a timely manner, if at all. Any of these occurrences may significantly harm our business, financial condition and prospects.

Monitoring safety of patients receiving our product candidates will be challenging, which could adversely affect our ability to obtain regulatory approval and commercialize our product candidates.

For our planned clinical trials of DSG3-CAART and our other product candidates, we expect to continue to contract with Penn and other academic medical centers and hospitals experienced in the assessment and management of toxicities arising during clinical trials. In the future, we may also contract with non-academic medical centers and hospitals with similar capabilities. Nonetheless, these centers and hospitals may have difficulty observing patients, including due to failure by patients to comply with post-clinical trial follow-up programs, and treating toxicities, which may be more challenging due to personnel changes, inexperience, shift changes, house staff coverage or related issues. This could lead to more severe or prolonged toxicities or even patient deaths, which could result in us or the FDA delaying, suspending or terminating one or more of our clinical trials, and which could jeopardize regulatory approval. We also expect the centers using DSG3-CAART and our other product candidates, if licensed, on a commercial basis could have similar difficulty in managing adverse events. Medicines used at centers to help manage adverse side effects of DSG3-CAART and our other product candidates may not adequately control the side effects and/or may have a detrimental impact on the efficacy of the treatment.

If we encounter difficulties enrolling patients in our clinical trials, our clinical development activities could be delayed or otherwise adversely affected.

We may experience difficulties in patient enrollment in our clinical trials for a variety of reasons. The timely completion of clinical trials in accordance with their protocols depends, among other things, on our ability to enroll a sufficient number of patients who remain in the trial until its conclusion. The enrollment of patients depends on many factors, including:

- the size and nature of the patient population;
- the patient eligibility criteria defined in the protocol;
- the size of the patient population required for analysis of the trial's primary endpoints;
- recruiting an adequate number of suitable patients to participate in a clinical trial;
- reaching agreement on acceptable terms with prospective CROs and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and clinical trial sites;

- obtaining IRB approval at each clinical trial site;
- the proximity of patients to trial sites;
- the design of the trial and whether the FDA or comparable foreign regulatory authorities agree to the design and implementation of the trial;
- our ability to recruit clinical trial investigators with the appropriate competencies and experience;
- clinicians' and patients' perceptions as to the potential advantages and risks of the product candidate being studied in relation to other available therapies, including any new drugs that may be approved for the indications we are investigating;
- the occurrence of dose-limiting toxicity in the clinical trial;
- the efforts to facilitate timely enrollment in clinical trials;
- the patient referral practices of physicians;
- the ability to monitor patients adequately during and after treatment;
- our ability to obtain and maintain patient consents;
- the risk that patients enrolled in clinical trials will drop out of the trials before the infusion of our product candidates or trial completion; and
- the ability of patients to meet the complex follow-up requirements of the clinical trial.

In addition, our clinical trials will compete with other clinical trials for product candidates that are in the same therapeutic areas as our product candidates, and this competition will reduce the number and types of patients available to us because some patients who might have opted to enroll in our trials may instead opt to enroll in a trial being conducted by one of our competitors. Since the number of qualified clinical investigators is limited, some of our clinical trial sites may also be used by some of our competitors, which may reduce the number of patients who are available for our clinical trials in that clinical trial site.

Moreover, because our product candidates represent a departure from more commonly used methods for B cell-mediated autoimmune disease treatment, potential patients and their doctors may be inclined to use conventional therapies, such as corticosteroids or systemic immunosuppressive medications, rather than enroll patients in our clinical trial.

Delays in patient enrollment may result in increased costs or may affect the timing or outcome of our planned clinical trials, which could prevent completion of these trials and adversely affect our ability to advance the development of our product candidates.

Clinical trials are expensive, time-consuming and difficult to design and implement.

Human clinical trials are expensive and difficult to design and implement, in part because they are subject to rigorous regulatory requirements. Failure or delay can occur at any time during the clinical trial process. Because our CAAR T cell product candidates are based on new technologies, we expect that they will require extensive research and development and have substantial manufacturing and processing costs. In addition, costs to treat patients with PV and other B cell-mediated autoimmune diseases and to treat potential side effects that may result from our product candidates can be significant. Accordingly, our clinical trial costs are likely to be significantly higher than for more conventional therapeutic technologies or drug products.

Our planned initial Phase 1 clinical trials for each of our product candidates will be pilot dose escalation studies with a limited number of patients. The safety and efficacy data from these clinical trials of our product candidates may differ from future results of Phase 2 and/or Phase 3 clinical trials that enroll a larger number of patients.

Since the number of patients that we plan to dose in our planned Phase 1 clinical trial of DSG3-CAART is small, the results from such clinical trial, once completed, may be less reliable than results achieved in larger clinical trials, which may hinder our efforts to obtain regulatory approval for our product candidates. In our planned Phase 1 clinical trial of DSG3-CAART, we plan to evaluate the safety profile of DSG3-CAART and establish the recommended dose for the next clinical trial. The preliminary results of clinical trials with smaller sample sizes, such as our planned Phase 1 clinical trial of DSG3-CAART, can be disproportionately influenced by various biases associated with the conduct of small clinical trials, such as the potential failure of the smaller sample size to accurately depict the features of the broader patient population, which limits the ability to generalize the results across a broader community, thus making the clinical trial results less reliable than clinical trials with a larger number of patients. As a result, there may be less certainty that such product candidates would achieve a statistically significant effect in any future clinical trials. If we conduct any future clinical trials of DSG3-CAART, we may not achieve a statistically significant result or the same level of statistical significance, if any, that we might have anticipated based on the results observed in our initial Phase 1 clinical trial.

The market opportunities for our product candidates may be limited to those patients who are ineligible for or have failed prior treatments and may be small.

Our projections of both the number of people who have the B cell-mediated autoimmune diseases we are targeting, as well as the subset of people with these diseases in a position to receive second or later lines of therapy and who have the potential to benefit from treatment with our product candidates, are based on our beliefs and estimates. These estimates have been derived from a variety of sources, including scientific literature, surveys of clinics, patient foundations, or market research and may prove to be incorrect. Further, new studies may change the estimated incidence or prevalence of these B cell-mediated autoimmune diseases. The number of patients may turn out to be lower than expected. Additionally, the potentially addressable patient population for our product candidates may be limited or may not be amenable to treatment with our product candidates. For instance, we expect our lead product candidate, DSG3-CAART, to initially target a small patient population that suffers from mPV. Even if we obtain significant market share for our product candidates, because the potential target populations are small, we may never achieve profitability without obtaining regulatory approval for additional indications.

We may not be successful in our efforts to identify additional product candidates. Due to our limited resources and access to capital, we must prioritize development of certain product candidates, which may prove to be wrong and may adversely affect our business.

Although we intend to explore other therapeutic opportunities, in addition to the product candidates that we are currently developing, we may fail to identify viable new product candidates for clinical development for a number of reasons. If we fail to identify additional potential product candidates, our business could be materially harmed.

Research programs to pursue the development of our existing and planned product candidates for additional indications and to identify new product candidates and disease targets require substantial technical, financial and human resources whether or not they are ultimately successful. Our research programs may initially show promise in identifying potential indications and/or product candidates, yet fail to yield results for clinical development for a number of reasons, including:

- the research methodology used may not be successful in identifying potential indications and/or product candidates;

- potential product candidates may, after further study, be shown to have harmful adverse effects or other characteristics that indicate they are unlikely to be effective drugs; or
- it may take greater human and financial resources than we will possess to identify additional therapeutic opportunities for our product candidates or to develop suitable potential product candidates through internal research programs, thereby limiting our ability to develop, diversify and expand our product portfolio.

Because we have limited financial and human resources, we intend to initially focus on research programs and product candidates for a limited set of indications. As a result, we may forego or delay pursuit of opportunities with other product candidates or for other indications that later prove to have greater commercial potential or a greater likelihood of success. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities.

Accordingly, there can be no assurance that we will ever be able to identify additional therapeutic opportunities for our product candidates or to develop suitable potential product candidates through internal research programs, which could materially adversely affect our future growth and prospects. We may focus our efforts and resources on potential product candidates or other potential programs that ultimately prove to be unsuccessful.

If we fail to develop additional product candidates, our commercial opportunity will be limited.

One of our core strategies is to pursue clinical development of additional product candidates beyond DSG3-CAART, MuSK-CAART, DSG3/1-CAART and FVIII-CAART. Developing, obtaining regulatory approval and commercializing additional CAAR T cell product candidates will require substantial additional funding beyond the net proceeds of this offering and is prone to the risks of failure inherent in medical product development. We cannot provide you any assurance that we will be able to successfully advance any of these additional product candidates through the development process.

Even if we receive FDA approval to market additional product candidates for the treatment of B cell-mediated autoimmune diseases, we cannot assure you that any such product candidates will be successfully commercialized, widely accepted in the marketplace or more effective than other commercially available alternatives. If we are unable to successfully develop and commercialize additional product candidates, our commercial opportunity will be limited. Moreover, a failure in obtaining regulatory approval of additional product candidates may have a negative effect on the approval process of any other, or result in losing approval of any approved, product candidate.

The product candidates we plan to develop and commercialize are premised on offering a potential cure for B cell-mediated autoimmune diseases, which may result in a high degree of uncertainty related to pricing and long-term demand for our product.

Our target patient populations are relatively small. Because of this pricing and demand for our product candidates, if licensed, may not be adequate to support an extended period of commercial viability, which could adversely affect our continued ability to successfully produce and market our product or any follow-on products.

We currently rely upon Penn for our manufacturing needs, and we intend to rely on other third parties for our future manufacturing needs prior to establishing our own manufacturing facility.

We are currently reliant upon Penn for our cell product manufacturing for our lead product candidate, DSG3-CAART. In parallel with initiating our first clinical trial, we plan to establish a relationship with a CMO to help secure the manufacturing supply chain for future product candidates. We will need to develop relationships with suppliers, increase the scale of production and demonstrate comparability of the material

produced at these facilities to the material that was previously produced. Transferring manufacturing processes and know-how is complex and involves review and incorporation of both documented and undocumented processes that may have evolved over time.

In addition, transferring production to different facilities may require utilization of new or different processes to meet the specific requirements of a given facility. We would expect additional comparability work will also need to be conducted to support the transfer of certain manufacturing processes and process improvements. We cannot be certain that all relevant know-how and data has been adequately incorporated into the manufacturing process until the completion of studies (and the related evaluations) intended to demonstrate the comparability of material previously produced with that generated by any CMO that we engage for our manufacturing needs. If we are not able to successfully transfer and produce comparable product candidates, our ability to further develop and manufacture our product candidates may be negatively impacted.

We plan to eventually establish our own manufacturing facility. While the addition of our own manufacturing facility would provide us with future flexibility within our manufacturing network, we still may need to identify additional CMOs for continued production of supply for some or all of our product candidates. Given the nature of our manufacturing processes, the number of CMOs who possess the requisite skill and capability to manufacture our CAAR T cell immunotherapy product candidates is limited.

Further, we may not be able to achieve clinical manufacturing and cell processing through Penn on a timely basis, on our own or at any future CMO. While our current manufacturing process is based off the validated process developed at Penn for CD19 CAR T, or CART19, we have limited experience as an organization in managing the CAAR T engineering process. Finally, because clinical manufacturing and cell processing is highly complex, we cannot be sure that the manufacturing processes employed by Penn, any CMO that we engage in the future, or by us at a manufacturing facility that we establish will consistently result in T cells that will be safe and effective.

If we are to operate our own manufacturing facility, significant resources will be required and we may fail to successfully operate our facility, which could adversely affect our clinical trials and the commercial viability of our product candidates.

If we establish our own manufacturing facility, our operations will be subject to review and oversight by the FDA and the FDA could object to our use of our manufacturing facility. We must first receive approval from the FDA prior to licensure to manufacture our product candidates, which we may never obtain. Even if licensed, we would be subject to ongoing periodic unannounced inspection by the FDA and corresponding state agencies to ensure strict compliance with cGMPs and other government regulations. Our license to manufacture product candidates will be subject to continued regulatory review.

Our cost of goods development is at an early stage. The actual cost to manufacture and process our product candidates could be greater than we expect and could materially and adversely affect the commercial viability of our product candidates.

The manufacture of biopharmaceutical products is complex and requires significant expertise, and can be impacted by resource constraints, labor disputes and workforce limitations.

The manufacture of biopharmaceutical products is complex and requires significant expertise, including the development of advanced manufacturing techniques and process controls. Manufacturers of cell therapy products often encounter difficulties in production, particularly in scaling out and validating initial production and ensuring the absence of contamination. These problems include difficulties with production costs and yields, quality control, including stability of the product, quality assurance testing, operator error, shortages of qualified personnel, as well as compliance with strictly enforced federal, state and foreign regulations. Furthermore, if contaminants are discovered in our supply of product candidates or in the manufacturing facilities upon which we

currently or will rely, such manufacturing facilities may need to be closed for an extended period of time to investigate and remedy the contamination. We cannot assure you that any stability or other issues relating to the manufacture of our product candidates, whether by Penn, by a third-party CMO, or at any manufacturing facility that we may establish, will not occur in the future.

Penn, third-party CMOs that we engage or we may fail to manage the logistics of storing and shipping our product candidates. Storage failures and shipment delays and problems caused by us, our vendors or other factors not in our control, such as weather, could result in loss of usable product or prevent or delay the delivery of product candidates to patients.

Penn, third-party CMOs that we engage, or we may also experience manufacturing difficulties due to resource constraints, labor disputes or workforce limitations arising from the expanding need for manufacturing in the cell therapy field and the limited number of training programs for technical staff. If we were to encounter any of these difficulties, our ability to provide our product candidates to patients would be jeopardized.

We currently have no marketing and sales organization and as a company have no experience in marketing products. If we are unable to establish marketing and sales capabilities or enter into agreements with third parties to market and sell our product candidates, we may not be able to generate product revenue.

We currently have no sales, marketing or distribution capabilities and as a company have no experience in marketing pharmaceutical products. We intend to develop an in-house marketing organization and sales force, which will require significant capital expenditures, management resources and time. We will have to compete with other pharmaceutical and biotechnology companies to recruit, hire, train and retain marketing and sales personnel. Additionally, there are risks involved with establishing our own sales, marketing and distribution capabilities. For example, recruiting and training a sales force is expensive and time-consuming and could delay any product launch. If the commercial launch of a product candidate for which we recruit a sales force and establish marketing capabilities is delayed or does not occur for any reason, we would have prematurely or unnecessarily incurred these commercialization expenses. These efforts may be costly, and our investment would be lost if we cannot retain or reposition our sales and marketing personnel.

If we are unable or decide not to establish internal sales, marketing and distribution capabilities, we will need to pursue collaborative arrangements regarding the sales and marketing of our products, if licensed. However, there can be no assurance that we will be able to establish or maintain such collaborative arrangements, or if we are able to do so, that they will have effective sales forces. Any revenue we receive will depend upon the efforts of such third parties, which may not be successful. Our product revenues and profitability, if any, are likely to be lower than if we were to market, sell and distribute any products that we develop ourselves. In addition, we may have little or no control over the marketing and sales efforts of such third parties and our revenue from product sales may be lower than if we had commercialized our product candidates ourselves. We also face competition in our search for third parties to assist us with the sales and marketing efforts of our product candidates.

There can be no assurance that we will be able to develop in-house sales and distribution capabilities or establish or maintain relationships with third-party collaborators to commercialize any product in the United States or overseas.

A variety of risks associated with marketing our product candidates internationally could materially adversely affect our business.

We plan to seek regulatory approval of our product candidates outside of the United States and, accordingly, we expect that we will be subject to additional potential risks related to operating in foreign countries if we obtain the necessary approvals, including:

- differing regulatory requirements in foreign countries for marketing approval and manufacturing;

- unexpected changes in tariffs, trade barriers, price and exchange controls and other regulatory requirements;
- risks associated with establishing manufacturing capabilities in ex-U.S. jurisdictions, if we choose to conduct a global study;
- risks associated with establishing relationships with one or more CMOs in the European Union, whether to perform the entire manufacturing process or to handle receipt and release of product imported from the United States;
- increased difficulties in managing the logistics and transportation of storing and shipping product candidates produced in the United States and shipping the product candidate to the patient abroad;
- import and export requirements and restrictions;
- economic weakness, including inflation, or political instability in particular foreign economies and markets;
- compliance with tax, employment, immigration and labor laws for employees living or traveling abroad;
- foreign taxes, including withholding of payroll taxes;
- foreign currency fluctuations, which could result in increased operating expenses and reduced revenue, and other obligations incident to doing business in another country;
- difficulties staffing and managing foreign operations;
- workforce uncertainty in countries where labor unrest is more common than in the United States;
- differing payor reimbursement regimes, governmental payors or patient self-pay systems, and price controls;
- potential liability under the Foreign Corrupt Practices Act of 1977 or comparable foreign regulations;
- challenges enforcing our contractual and intellectual property rights, especially in those foreign countries that do not respect and protect intellectual property rights to the same extent as the United States;
- production shortages resulting from any events affecting raw material supply or manufacturing capabilities abroad; and
- business interruptions resulting from geo-political actions, including war and terrorism.

These and other risks associated with our international operations may materially adversely affect our ability to attain or maintain profitable operations.

We face significant competition from other biotechnology and pharmaceutical companies, and our operating results will suffer if we fail to compete effectively.

The biopharmaceutical and pharmaceutical industries are characterized by rapidly advancing technologies, intense competition and a strong focus on intellectual property. We face competition from many different players, including large and specialty pharmaceutical and biotechnology companies, academic research organizations and governmental agencies. Any therapeutic candidates we successfully develop and commercialize will compete with the existing standard of care as well as novel therapies that may gain regulatory approval in the future. Many of our competitors have substantially greater financial, technical and other resources, such as larger research and development staff and experienced marketing and manufacturing organizations and well-established sales forces. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large, established companies. Mergers and acquisitions in the biotechnology and pharmaceutical industries may result in even more resources

being concentrated in our competitors. We believe we are the first and only company developing CAAR T drug candidates for the treatment of B cell-mediated autoimmune diseases. However, despite the significant differences in discovery, development and target populations between oncology and autoimmune targets, we recognize that companies with an investment and expertise in CAR T cell development for oncology indications could attempt to leverage their expertise into B cell-mediated autoimmune disease affected populations. Competition may increase further as a result of advances in the commercial applicability of technologies and greater availability of capital for investment in these industries. Our competitors, either alone or with collaborative partners, may succeed in developing, acquiring or licensing on an exclusive basis drug or biologic products that are more effective, safer, more easily commercialized or less costly than our product candidates or may develop proprietary technologies or secure patent protection that we may need for the development of our technologies and products.

Specifically, while rituximab is the first drug for the treatment of PV, the target indication of our lead product candidate, DSG3-CAART, to have received regulatory approval in the United States in over 60 years, we are aware that multiple biopharmaceutical companies have therapies in clinical development. We are aware that Affibody AB, Alexion Pharmaceuticals, Inc., argenx SE, Immunovant, Inc., Momenta Pharmaceuticals, Inc., Novartis AG, Ono Pharmaceutical Co., Ltd., Principia Biopharma Inc. and Rubius Therapeutics, Inc., among others, are developing treatments for PV. We are also aware of other biopharmaceutical companies developing therapies for muscle-specific kinase myasthenia gravis, or MuSK MG, and Hemophilia A patients who develop alloantibodies against FVIII. While we do not expect these product candidates to be directly competitive to our product candidates, even if we obtain regulatory approval of our product candidates, the availability and price of these other products could limit the demand and the price we are able to charge for our product candidates. We may not be able to implement our business plan if the acceptance of our product candidates is inhibited by price competition or the reluctance of physicians to switch from existing methods of treatment to our product candidates, or if physicians switch to other new drug or biologic products or choose to reserve our product candidates for use in limited circumstances. For additional information regarding our competition, see “Business—Competition”.

Risks Related to Employee Matters and Managing Growth

We are highly dependent on our key personnel, and if we are not successful in attracting and retaining highly qualified personnel, we may not be able to successfully implement our business strategy.

Our ability to compete in the highly competitive biotechnology and pharmaceutical industries depends upon our ability to attract and retain highly qualified managerial, scientific and medical personnel. We are highly dependent on our management, scientific, and medical personnel, including our Chief Executive Officer and President, our Scientific Advisory Board members, our Chief Medical Officer, our Executive Vice President, Science and Technology, and our Chief Financial Officer. The loss of the services of any of our executive officers, other key employees, and other scientific and medical advisors, and our inability to find suitable replacements could result in delays in product development and harm our business.

Competition for skilled personnel in our market is intense and may limit our ability to hire and retain highly qualified personnel on acceptable terms or at all. To induce valuable employees to remain at our company, in addition to salary and cash incentives, we have provided stock options that vest over time. The value to employees of stock options that vest over time may be significantly affected by movements in our stock price that are beyond our control and may at any time be insufficient to counteract more lucrative offers from other companies. Despite our efforts to retain valuable employees, members of our management, scientific and development teams may terminate their employment with us on short notice. Although we have employment agreements with our key employees, these employment agreements provide for at-will employment, which means that any of our employees could leave our employment at any time, with or without notice. We do not maintain “key person” insurance policies on the lives of these individuals or the lives of any of our other employees. Our success also depends on our ability to continue to attract, retain and motivate highly skilled junior, mid-level and senior managers as well as junior, mid-level and senior scientific and medical personnel.

We expect to grow the size of our organization, and we may experience difficulties in managing this growth.

As of June 30, 2019, we had 12 full-time employees and no part-time employees and were reliant on services provided to us by Penn and certain Penn-affiliated entities under the Services Agreement. As our development and commercialization plans and strategies develop, and as we continue to transition into operating as a public company, we expect to rapidly expand our employee base and continue to add managerial, operational, sales, research and development, marketing, financial and other personnel. Current and future growth imposes significant added responsibilities on members of management, including:

- identifying, recruiting, integrating, maintaining and motivating additional employees;
- managing our internal development efforts effectively, including the clinical and FDA review process for our product candidates, while complying with our contractual obligations to contractors and other third parties; and
- improving our operational, financial and management controls, reporting systems and procedures.

Our future financial performance and our ability to commercialize our product candidates will depend, in part, on our ability to effectively manage our growth, and our management may also have to divert a disproportionate amount of its attention away from day-to-day activities in order to devote a substantial amount of time to managing these growth activities.

We currently rely, and for the foreseeable future will continue to rely, in substantial part on certain independent organizations, advisors and consultants to provide certain services, including certain research and development as well as general and administrative support, pursuant to agreements which expire after a certain period of time. There can be no assurance that the services of independent organizations, advisors and consultants will continue to be available to us on a timely basis when needed, or that we can find qualified replacements. In addition, if we are unable to effectively manage our outsourced activities or if the quality or accuracy of the services provided by consultants is compromised for any reason, our clinical trials may be extended, delayed or terminated, and we may not be able to obtain regulatory approval of our product candidates or otherwise advance our business. There can be no assurance that we will be able to manage our existing consultants or find other competent outside contractors and consultants on economically reasonable terms, or at all.

If we are not able to effectively expand our organization by hiring new employees and expanding our groups of consultants and contractors, we may not be able to successfully implement the tasks necessary to further develop and commercialize our product candidates and, accordingly, may not achieve our research, development and commercialization goals.

We may not realize the benefits of acquired assets or other strategic transactions, including any transactions whereby we acquire or license manufacturing and other advanced technologies.

In August 2018, we entered into a License Agreement with Penn and the Children's Hospital of Pennsylvania, or CHOP, which was amended and restated in July 2019, or the License Agreement, pursuant to which we were granted licenses to certain patent rights for the research and development of products, as well as an exclusive license under those same patent rights to make, use, sell and import such products, in the autoimmune disease and alloimmune response subfields, in each case, for the treatment of humans.

We actively evaluate various strategic transactions on an ongoing basis. We may acquire other businesses, products or technologies as well as pursue joint ventures or investments in complementary businesses. The success of our strategic transactions, including the License Agreement, and any future strategic transactions depends on the risks and uncertainties involved including:

- unanticipated liabilities related to acquired companies or joint ventures;

- difficulties integrating acquired personnel, technologies and operations into our existing business;
- retention of key employees;
- diversion of management time and focus from operating our business to management of strategic alliances or joint ventures or acquisition integration challenges;
- increases in our expenses and reductions in our cash available for operations and other uses;
- disruption in our relationships with collaborators or suppliers as a result of such a transaction; and
- possible write-offs or impairment charges relating to acquired businesses or joint ventures.

If any of these risks or uncertainties occur, we may not realize the anticipated benefit of any acquisition or strategic transaction. Additionally, foreign acquisitions and joint ventures are subject to additional risks, including those related to integration of operations across different cultures and languages, currency risks, potentially adverse tax consequences of overseas operations and the particular economic, political and regulatory risks associated with specific countries.

Future acquisitions or dispositions could result in potentially dilutive issuances of our equity securities, the incurrence of debt, contingent liabilities or amortization expenses or write-offs of goodwill, any of which could harm our financial condition.

Business disruptions could seriously harm our future revenue and financial condition and increase our costs and expenses.

Our operations, Penn's operations and those of any CMOs, CROs and other contractors and consultants that we may engage could be subject to earthquakes, power shortages, telecommunications failures, water shortages, floods, hurricanes, typhoons, fires, extreme weather conditions, medical epidemics and other natural or man-made disasters or business interruptions, for which we are predominantly self-insured. The occurrence of any of these business disruptions could seriously harm our operations and financial condition and increase our costs and expenses. We currently rely on Penn to produce and process our first product candidate and anticipate that in the future we will rely on a third-party CMO for the same. Our ability to obtain clinical supplies of our product candidates could be disrupted if the operations of these suppliers are affected by a man-made or natural disaster or other business interruption.

Even if we obtain regulatory approval of our product candidates, the products may not gain the market acceptance among physicians, patients, hospitals, treatment centers and others in the medical community necessary for commercial success.

The use of engineered T cells as a potential treatment for B cell-mediated autoimmune diseases is a recent development and may not become broadly accepted by physicians, patients, hospitals, treatment centers and others in the medical community. We expect physicians to be particularly influential and we may not be able to convince them to use our product candidates for many reasons. Additional factors will influence whether our product candidates are accepted in the market, including:

- the clinical indications for which our product candidates are licensed;
- physicians, hospitals, treatment centers and patients considering our product candidates as a safe and effective treatment;
- the potential and perceived advantages of our product candidates over alternative treatments;
- the prevalence and severity of any side effects;
- product labeling or product insert requirements of the FDA or other regulatory authorities;
- limitations or warnings contained in the labeling approved by the FDA;

- the timing of market introduction of our product candidates as well as competitive products;
- the cost of treatment in relation to alternative treatments;
- the availability of coverage and adequate reimbursement and pricing by third-party payors and government authorities;
- the willingness of patients to pay out-of-pocket in the absence of coverage and adequate reimbursement by third-party payors and government authorities;
- relative convenience and ease of administration, including as compared to alternative treatments and competitive therapies; and
- the effectiveness of our sales and marketing efforts.

If our product candidates are licensed but fail to achieve market acceptance among physicians, patients, hospitals, treatment centers or others in the medical community, we will not be able to generate significant revenue. Even if our products achieve market acceptance, we may not be able to maintain that market acceptance over time if new products or technologies are introduced that are more favorably received than our products, are more cost effective or render our products obsolete.

If product liability lawsuits are brought against us, we may incur substantial liabilities and may be required to limit commercialization of our product candidates.

We face an inherent risk of product liability as a result of the clinical testing of our product candidates and will face an even greater risk if we commercialize any products. For example, we may be sued if our product candidates cause or are perceived to cause injury or are found to be otherwise unsuitable during clinical testing, manufacturing, marketing or sale. Any such product liability claims may include allegations of defects in manufacturing, defects in design, a failure to warn of dangers inherent in the product, negligence, strict liability or a breach of warranties. Claims could also be asserted under state consumer protection acts. If we cannot successfully defend ourselves against product liability claims, we may incur substantial liabilities or be required to limit commercialization of our product candidates. Even successful defense would require significant financial and management resources. Regardless of the merits or eventual outcome, liability claims may result in:

- inability to bring our product candidates to the market;
- decreased demand for our product candidates;
- injury to our reputation;
- withdrawal of clinical trial participants;
- initiation of investigations by regulators;
- costs to defend the related litigation;
- a diversion of management's time and our resources;
- substantial monetary awards to trial participants or patients;
- product recalls, withdrawals or labeling, marketing or promotional restrictions;
- loss of revenue;
- exhaustion of any available insurance and our capital resources;
- the inability to commercialize any product candidate; and
- a decline in our share price.

Since we have not yet commenced marketing of any products, we do not yet hold product liability insurance for commercialization of our product candidates. Our inability to obtain sufficient product liability insurance at

an acceptable cost to protect against potential product liability claims could prevent or inhibit the commercialization of products we develop, alone or with corporate collaborators. Our insurance policies may also have various exclusions, and we may be subject to a product liability claim for which we have no coverage. Assuming we obtained clinical trial insurance for our clinical trials, we may have to pay amounts awarded by a court or negotiated in a settlement that exceed our coverage limitations or that are not covered by our insurance, and we may not have, or be able to obtain, sufficient capital to pay such amounts. Even if our agreements with any future corporate collaborators entitle us to indemnification against losses, such indemnification may not be available or adequate should any claim arise.

Unstable market and economic conditions may have serious adverse consequences on our business, financial condition and stock price.

As widely reported, global credit and financial markets have experienced extreme volatility and disruptions in the past several years, including severely diminished liquidity and credit availability, declines in consumer confidence, declines in economic growth, increases in unemployment rates and uncertainty about economic stability. There can be no assurance that further deterioration in credit and financial markets and confidence in economic conditions will not occur. Our general business strategy may be adversely affected by any such economic downturn, volatile business environment or continued unpredictable and unstable market conditions. If the current equity and credit markets deteriorate, it may make any necessary debt or equity financing more difficult, more costly and more dilutive. Failure to secure any necessary financing in a timely manner and on favorable terms could have a material adverse effect on our growth strategy, financial performance and stock price and could require us to delay or abandon clinical development plans. In addition, there is a risk that one or more of our current service providers, manufacturers and other partners may not survive an economic downturn, which could directly affect our ability to attain our operating goals on schedule and on budget.

Comprehensive tax reform legislation could adversely affect our business and financial condition.

In 2017, the Tax Cuts and Jobs Act, or the TCJA, significantly revised the Internal Revenue Code of 1986, as amended, or the Code. The TCJA includes, among other things, a reduction of the corporate tax rate from a top marginal tax rate of 35% to a flat rate of 21%, a limitation of the tax deduction for net interest expense to 30% of adjusted earnings (except for certain small businesses), a limitation of the deduction for net operating losses to 80% of annual taxable income for losses arising in taxable years beginning after December 31, 2017 and an elimination of net operating loss carrybacks for losses arising in taxable years ending after December 31, 2017 (though any such net operating losses may be carried forward indefinitely) and the modification and repeal of many business deductions and credits, including the reduction of the business tax credit for certain clinical testing expenses incurred in the testing of certain drugs for rare diseases or conditions generally referred to as “orphan drugs.” We continue to examine the impact this tax reform legislation may have on our business. Prospective investors in our common stock should consult with their legal and tax advisors with respect to the TCJA and potential tax consequences of investing in or holding our common stock.

Our ability to utilize our net operating losses and certain other tax attributes to offset future taxable income may be subject to certain limitations.

As of December 31, 2018, we had U.S. federal and state net operating loss carryforwards of $4.0 million, which begin to expire in 2038. Approximately $3.8 million of the federal net operating losses can be carried forward indefinitely. These net operating loss carryforwards could expire unused and be unavailable to offset future taxable income or tax liabilities, respectively. In addition, in general, under Sections 382 and 383 of the Code and corresponding provisions of state law, a corporation that undergoes an “ownership change” is subject to limitations on its ability to utilize its pre-change net operating loss carryforwards or tax credits, or NOLs or credits, to offset future taxable income or taxes. For these purposes, an ownership change generally occurs where the aggregate stock ownership of one or more stockholders or groups of stockholders who owns at least 5% of a corporation’s stock increases its ownership by more than 50 percentage points over its lowest ownership

percentage within a specified testing period. Our existing NOLs or credits may be subject to limitations arising from previous ownership changes, and if we undergo an ownership change in connection with or after this offering, our ability to utilize NOLs or credits could be further limited by Sections 382 and 383 of the Code. In addition, future changes in our stock ownership, many of which are outside of our control, could result in an ownership change under Sections 382 and 383 of the Code. Our NOLs or credits may also be impaired under state law. Accordingly, we may not be able to utilize a material portion of our NOLs or credits. Furthermore, our ability to utilize our NOLs or credits is conditioned upon our attaining profitability and generating U.S. federal and state taxable income. As described above under "—Risks Related to Our Financial Condition and Capital Requirements", we have incurred significant net losses since our inception and anticipate that we will continue to incur significant losses for the foreseeable future; and therefore, we do not know whether or when we will generate the U.S. federal or state taxable income necessary to utilize our NOLs or credits that are subject to limitation by Sections 382 and 383 of the Code. Under the TCJA, net operating loss carryforwards generated after December 31, 2017 will not be subject to expiration. However, any NOLs generated after December 31, 2017 may only offset 80% of our annual taxable income.

Risks Related to Our Reliance on Third Parties

We are reliant on a research services agreement with Penn for our nonclinical research and development activities and current manufacturing activities.

As of June 30, 2019, we had 12 employees, and we have limited clinical research and development, regulatory support and validation and manufacturing capabilities. We are reliant on the Services Agreement with Penn and certain Penn-affiliated entities, pursuant to which Penn and these affiliated entities provide us with these services. For more information, see "Business—Our Material Agreements". While we intend to eventually build out these functions internally, we are currently significantly reliant on Penn for these critical business functions.

We are also dependent on Penn to enroll patients and conduct the DSG3-CAART Phase 1 clinical trial at the first clinical trial site, to be located at Penn, in a timely and appropriate manner. If Penn does not conduct the trial on the timeline we expect or otherwise fails to support the trial, our clinical trial results could be significantly delayed, thereby adversely impacting our leadership position in the CAAR T industry and our ability to progress additional product candidates. Further, although we intend to transition our manufacturing needs to a CMO and eventually secure our own clinical manufacturing facility, we must currently rely on Penn to manufacture supplies and process our product candidates.

If Penn and its affiliated entities were to fail to perform their obligations in accordance with the terms of the Services Agreement or terminate the Services Agreement with little notice, we may have difficulty continuing our normal business operations and our business prospects, financial condition and results of operations could be harmed. In addition, the termination of our relationship with Penn and the Services Agreement and any delay in appointing or finding a suitable replacement provider, if one exists, could make it difficult for us to operate our business for that period. Moreover, we will be reliant on Penn to assist us with any necessary technology transfer. Any delays or inadequacies in such technology transfer, or disputes regarding the scope of such technology transfer, could delay our operations, including our clinical trials, require us to expend additional resources and otherwise have an adverse effect on our business.

Additionally, over time we will need to transition from receiving the services that Penn currently provides to performing such services internally. The Services Agreement is scheduled to expire on the later of October 19, 2021 or completion of all research and development projects, and unless the Services Agreement is amended, Penn will not be obligated to provide any further services under the Services Agreement after that time. In addition, Penn has the right to terminate the Services Agreement in whole at any time with 90 days' notice and to terminate any research and development project being performed under the Services Agreement if the Penn service provider appointed to lead such project is unavailable and Penn is unavailable to find a replacement

within 60 days for such service provider. Penn also has the right to terminate certain manufacturing services being performed under the Services Agreement with 180 days' written notice. From time to time, we may enter into further addenda to the Services Agreement that provide Penn with the right to terminate such addenda with limited notice periods. If we do not have adequate personnel and capabilities at the time that we assume responsibilities for such services, we may not be successful in effectively or efficiently transitioning these services from Penn, which could disrupt our business and have a material adverse effect on our financial condition and results of operations. Further, we will incur costs relating to establishing our own financial, administrative, information technology and other support functions as well as running and maintaining such functions on a going-forward basis. In addition, the process of establishing such functions may distract our management from focusing on business and strategic opportunities and could result in disruptions to our business. Even if we are able to successfully transition these services, they may be more expensive or less efficient than the services we are receiving from Penn during the transition period.

We will rely on third parties, including Penn, to conduct our clinical trials. If these third parties do not successfully carry out their contractual duties or meet expected deadlines, we may not be able to obtain regulatory approval of or commercialize our product candidates.

We depend and will continue to depend upon third parties, including independent investigators and collaborators, such as universities, medical institutions, CROs and strategic partners, to conduct our preclinical studies and clinical trials under agreements with us. Specifically, we depend on our collaborator, Penn, pursuant to the terms of the Services Agreement, to operate the first trial site for our planned Phase 1 clinical trial of DSG3-CAART. As we open additional clinical trial sites, we expect to have to negotiate budgets and contracts with CROs and study sites, which may result in delays to our development timelines and increased costs.

We will rely heavily on these third parties, including Penn, to conduct our preclinical studies and clinical trials, and as a result, will have limited control over the clinical investigators and limited visibility into their day-to-day activities, including with respect to their compliance with the approved clinical protocol. Nevertheless, we are responsible for ensuring that each of our trials is conducted in accordance with applicable protocol, legal, regulatory and scientific standards, and our reliance on third parties does not relieve us of our regulatory responsibilities. We and these third parties are required to comply with Good Clinical Practices, or GCPs, which are regulations and guidelines enforced by the FDA and comparable foreign regulatory authorities for product candidates in clinical development. Regulatory authorities enforce these GCPs through periodic inspections of trial sponsors, principal investigators and trial sites. If we or any of these third parties fail to comply with applicable GCP requirements, the clinical data generated in our clinical trials may be deemed unreliable and the FDA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. We cannot provide assurance that, upon inspection, such regulatory authorities will not determine that some or all of our clinical trials do not fully comply with the GCP requirements. For any violations of laws and regulations during the conduct of our clinical trials, we could be subject to untitled and warning letters or enforcement action that may include civil penalties up to and including criminal prosecution. In addition, our clinical trials must be conducted with biologic product produced under cGMPs and will require a large number of test patients. We also are required to register ongoing clinical trials and post the results of completed clinical trials on a government-sponsored database within certain timeframes. Failure to do so can result in fines, adverse publicity and civil and criminal sanctions.

If we or these third parties do not successfully carry out their contractual duties, meet expected deadlines, or conduct our clinical trials in accordance with regulatory requirements or our stated protocols, we will not be able to obtain, or may be delayed in obtaining, marketing approvals for any product candidates we may develop and will not be able to, or may be delayed in our efforts to, successfully commercialize our medicines. Our failure or the failure of these third parties to comply with applicable regulatory requirements or our stated protocols could also subject us to enforcement action. Moreover, our business may be implicated if any of these third parties violates federal or state fraud and abuse or false claims laws and regulations or healthcare privacy and security laws.

Any third parties conducting our clinical trials will not be our employees and, except for remedies available to us under our agreements with such third parties, we cannot control whether or not they devote sufficient time and resources to our ongoing preclinical and clinical programs. These third parties may also have relationships with other commercial entities, including our competitors, for whom they may also be conducting clinical studies or other drug development activities, which could affect their performance on our behalf. If these third parties do not successfully carry out their contractual duties or obligations or meet expected deadlines, if they need to be replaced or if the quality or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our clinical protocols or regulatory requirements or for other reasons, our clinical trials may be extended, delayed or terminated and we may not be able to complete development of, obtain regulatory approval of or successfully commercialize our product candidates. As a result, our financial results and the commercial prospects for our product candidates would be harmed, our costs could increase and our ability to generate revenue could be delayed.

If any of our relationships with trial sites, or any CRO that we may use in the future, terminates, we may not be able to enter into arrangements with alternative trial sites or CROs or do so on commercially reasonable terms. Switching or adding third parties to conduct our clinical trials involves substantial cost and requires extensive management time and focus. In addition, there is often a natural transition period when a new third party commences work. As a result, delays may occur, which can materially impact our ability to meet our desired clinical development timelines. Though we carefully manage our relationships with our CROs, there can be no assurance that we will not encounter similar challenges or delays in the future or that these delays or challenges will not have a material adverse impact on our business, financial condition and prospects.

We also expect to rely on other third parties to store and distribute drug supplies for our clinical trials. Any performance failure on the part of our distributors could delay clinical development or marketing approval of any product candidates we may develop or commercialization of our medicines, producing additional losses and depriving us of potential product revenue.

We intend to rely on third parties to manufacture our clinical product supplies, and we may have to rely on third parties to produce and process our product candidates, if licensed.

Although we may eventually secure our own clinical manufacturing facility for any late phase clinical development that we undertake, we currently rely on Penn to supply raw materials and other important components that are used to manufacture our product candidates and intend in the future to rely on CMOs. In the case of any manufacturing performed for us by Penn, the services performed for us risk being delayed because of the competing priorities that Penn has for utilization of its manufacturing resources and any capacity issues that thereby arise.

We do not yet have sufficient information to reliably estimate the cost of the manufacturing and processing of our product candidates in clinical quantity or commercial quantity, and the actual cost to manufacture and process our product candidates could ultimately materially and adversely affect the commercial viability of our product candidates. As a result, we may never be able to develop a commercially viable product.

In addition, our anticipated reliance on a limited number of third-party manufacturers exposes us to the following risks:

- We may be unable to identify manufacturers on acceptable terms or at all because the number of potential manufacturers is limited and the FDA may have questions regarding any replacement contractor. This may require new testing and regulatory interactions. In addition, a new manufacturer would have to be educated in, or develop substantially equivalent processes for, production of our products after receipt of FDA questions, if any.
- Our third-party manufacturers might be unable to timely formulate and manufacture our product or produce the quantity and quality required to meet our clinical and commercial needs, if any.

- Contract manufacturers may not be able to execute our manufacturing procedures appropriately.
- Any contract manufacturers that we engage may not perform as agreed or may not remain in the contract manufacturing business for the time required to supply our clinical trials or to successfully produce, store and distribute our product candidates.
- Manufacturers are subject to ongoing periodic unannounced inspection by the FDA and corresponding state agencies to ensure strict compliance with cGMP and other government regulations and corresponding foreign standards. We do not have control over third-party manufacturers' compliance with these regulations and standards.
- We may not own, or may have to share, the intellectual property rights to any improvements made by our third-party manufacturers in the manufacturing process for our product candidates.
- Our third-party manufacturers could breach or terminate their agreement with us.

Furthermore, all of our contract manufacturers are engaged with other companies to supply and/or manufacture materials or products for such companies, which exposes our manufacturers to regulatory risks related to the production of such materials and products. As a result, failure to meet the regulatory requirements for the production of those materials and products may affect the regulatory clearance of our contract manufacturers' facilities generally. If the FDA or a comparable foreign regulatory agency does not approve these facilities for the manufacture of our product candidates or if any agency withdraws its approval in the future, we may need to find alternative manufacturing facilities, which would negatively impact our ability to develop, obtain regulatory approval for or market our product candidates, if licensed.

Our contract manufacturers would also be subject to the same risks we face in developing our own manufacturing capabilities, as described above. Each of these risks could delay our clinical trials, the approval, if any of our product candidates by the FDA or the commercialization of our product candidates or result in higher costs or deprive us of potential product revenue. In addition, we will rely on third parties to perform release tests on our product candidates prior to delivery to patients. If these tests are not appropriately done and test data are not reliable, patients could be put at risk of serious harm.

For more information, see "Risk Factors—Risks Related to Manufacturing and Supply".

We may form or seek strategic alliances or enter into additional licensing arrangements in the future, and we may not realize the benefits of such alliances or licensing arrangements.

We may form or seek strategic alliances, create joint ventures or collaborations or enter into additional licensing arrangements with third parties that we believe will complement or augment our development and commercialization efforts with respect to our product candidates and any future product candidates that we may develop. Any of these relationships may require us to incur non-recurring and other charges, increase our near and long-term expenditures, issue securities that dilute our existing stockholders or disrupt our management and business. In addition, we face significant competition in seeking appropriate strategic partners and the negotiation process is time-consuming and complex. Moreover, we may not be successful in our efforts to establish a strategic partnership or other alternative arrangements for our product candidates because they may be deemed to be at too early of a stage of development for collaborative effort and third parties may not view our product candidates as having the requisite potential to demonstrate safety, potency and purity. Any delays in entering into new strategic partnership agreements related to our product candidates could delay the development and commercialization of our product candidates in certain geographies for certain indications, which would harm our business prospects, financial condition and results of operations.

If we license products or businesses, we may not be able to realize the benefit of such transactions if we are unable to successfully integrate them with our existing operations and company culture. For instance, our License Agreement with Penn and CHOP requires significant research and development commitments that may

not result in the development and commercialization of our product candidates, including DSG3-CAART and our other product candidates. We cannot be certain that, following a strategic transaction or license, we will achieve the results, revenue or specific net income that justifies such transaction.

Risks Related to Manufacturing and Supply

We are dependent upon the availability of specialty raw materials and the production capabilities of small manufacturers to source the components of our product candidates.

Our product candidates require many specialty raw materials, some of which are manufactured by small companies with limited resources and experience to support a commercial product, and the suppliers may not be able to deliver raw materials to our specifications. In addition, those suppliers generally do not have the capacity to support commercial products manufactured under cGMP by biopharmaceutical firms. The suppliers may be ill-equipped to support our needs, especially innon-routine circumstances like an FDA inspection or medical crisis, such as widespread contamination. We also do not have contracts with many of these suppliers, and we may not be able to contract with them on acceptable terms or at all. Accordingly, we may experience delays in receiving key raw materials to support clinical or commercial manufacturing.

In addition, some raw materials are currently available from a single supplier, or a small number of suppliers. We cannot be sure that these suppliers will remain in business or that they will not be purchased by one of our competitors or another company that is not interested in continuing to produce these materials for our intended purpose. In addition, the lead time needed to establish a relationship with a new supplier can be lengthy, and we may experience delays in meeting demand in the event we must switch to a new supplier. The time and effort to qualify a new supplier could result in additional costs, diversion of resources or reduced manufacturing yields, any of which would negatively impact our operating results. Further, we may be unable to enter into agreements with a new supplier on commercially reasonable terms, which could have a material adverse impact on our business.

Our product candidates are uniquely manufactured. If we, Penn or any of our third-party manufacturers encounter difficulties in manufacturing our product candidates, our ability to provide supply of our product candidates for clinical trials or, if licensed, for commercial sale, could be delayed or stopped, or we may be unable to maintain a commercially viable cost structure.

The manufacturing process used to produce our product candidates is complex and novel and it has not yet been validated for commercial production. Among the complex processes used in the manufacture of our product candidates is the manufacture of the lentiviral delivery vector used to deliver the applicable CAAR gene into the T cells. For example, the manufacture of our product candidates includes harvesting white blood cells from each patient, stimulating certain T cells from the white blood cells and thereby causing them to activate and proliferate, combining patient T cells with our lentiviral delivery vector through a process known as transduction, expanding the transduced T cells to obtain the desired dose, and ultimately infusing the modified T cells back into the patient's body. Notably, the manufacture of both DSG3/1-CAART and FVIII-CAART will likely involve particularly complex processes due to the need to deliver large transgenes in a vector delivery system with limited capacity. Because of these complexities, the cost to manufacture our product candidates is higher than traditional small molecule chemical compounds and monoclonal antibodies, and the manufacturing process is less reliable and is more difficult to reproduce. Furthermore, our manufacturing process development and scale-up is at an early stage. The actual cost to manufacture and process our product candidates could be greater than we expect and could materially and adversely affect the commercial viability of our product candidates.

Our manufacturing process may be susceptible to logistical issues associated with the collection of white blood cells from patients' blood, variability in the quality of white blood cells collected from patients' blood, procurement of lentiviral vectors and shipment to the product candidate manufacturing site as well as shipment of the final product to clinical centers, manufacturing issues associated with interruptions in the manufacturing

process, contamination, concentration and purity of batches of lentiviral vectors, equipment or reagent failure, improper installation or operation of equipment, vendor or operator error, inconsistency in cell growth, and variability in product characteristics due to patient-to-patient variability. Even minor deviations from normal manufacturing processes could result in reduced production yields, lot failures, product defects, product recalls, product liability claims and other supply disruptions. If microbial, viral, or other contaminations are discovered in our product candidates or in the manufacturing facilities in which our product candidates are made, production at such manufacturing facilities may be interrupted for an extended period of time to investigate and remedy the contamination. Further, as product candidates are developed through preclinical studies to late-stage clinical trials toward approval and commercialization, it is common that various aspects of the development program, such as manufacturing methods, are altered along the way in an effort to optimize processes and results. Penn has informed us that it will be unable provide clinical supply for any late-phase clinical trials of our product candidates that we may conduct. Therefore, we will need to enter into new agreements with CMOs to produce clinical supply of our product candidates for late-phase clinical trials. We cannot guarantee that we will be able to enter into such agreements on commercially acceptable terms, if at all. We will need to transfer the technology to manufacture our product candidates to these CMOs, and these CMOs may decide or be required to adopt different manufacturing protocols or processes, which may require us to amend any ongoing or proposed clinical trial protocols or perform additional preclinical studies to demonstrate the comparability of any such new manufacturing protocols or processes. We cannot provide any assurance that Penn will provide adequate support to efficiently and effectively transfer the technology or that disputes will not arise between us and Penn regarding the necessary scope of technology transfer, that the technology transfer will be successful, or that any CMO will be successful in producing our product candidates in sufficient quantities or of acceptable quality, if at all. Such changes carry the risk that they will not achieve these intended objectives, and any of these changes could cause our product candidates to perform differently and affect the results of planned clinical trials or other future clinical trials.

Although we continue to optimize our manufacturing process for our product candidates, doing so is a difficult and uncertain task, and there are risks associated with scaling to the level required for advanced clinical trials or commercialization, including, among others, cost overruns, potential problems with process scale-up, process reproducibility, stability issues, lot consistency and timely availability of reagents and/or raw materials. We ultimately may not be successful in transferring our production system from our contract manufacturer to any manufacturing facilities we may establish ourselves, or our contract manufacturer may not have the necessary capabilities to complete the implementation and development process. If we are unable to adequately validate or scale-up the manufacturing process for our product candidates with our current manufacturer, we will need to transfer to another manufacturer and complete the manufacturing validation process, which can be lengthy. If we are able to adequately validate and scale-up the manufacturing process for our product candidates with a contract manufacturer, we will still need to negotiate with such contract manufacturer an agreement for commercial supply and it is not certain we will be able to come to agreement on terms acceptable to us. As a result, we may ultimately be unable to reduce the cost of goods for our product candidates to levels that will allow for an attractive return on investment if and when those product candidates are commercialized.

The manufacturing process for any products that we may develop is subject to the FDA and foreign regulatory authority approval process, and we will need to contract with manufacturers who can meet all applicable FDA and foreign regulatory authority requirements on an ongoing basis.

The manufacturing process for any products that we may develop is subject to the FDA and foreign regulatory authority approval process, and we will need to contract with manufacturers who can meet all applicable FDA and foreign regulatory authority requirements on an ongoing basis. If we or our CMOs are unable to reliably produce products to specifications acceptable to the FDA or other regulatory authorities, we may not obtain or maintain the approvals we need to commercialize such products. Even if we obtain regulatory approval for any of our product candidates, there is no assurance that either we or our CMOs will be able to manufacture the approved product in accordance with requirements from the FDA or other regulatory authorities, to produce it in sufficient quantities to meet the requirements for the potential launch of the product, or to meet

potential future demand. Any of these challenges could delay completion of clinical trials, require bridging clinical trials or the repetition of one or more clinical trials, increase clinical trial costs, result in sanctions being imposed on us, including clinical holds, fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, suspension of production or recalls of the product candidates or marketed biologics, operating restriction and criminal prosecutions, delay approval of our product candidates, impair commercialization efforts, increase our cost of goods, and have an adverse effect on our business, financial condition, results of operations and growth prospects. Our future success depends on our ability to manufacture our products, if licensed, on a timely basis with acceptable manufacturing costs, while at the same time maintaining good quality control and complying with applicable regulatory requirements, and an inability to do so could have a material adverse effect on our business, financial condition, and results of operations. In addition, we could incur higher manufacturing costs if manufacturing processes or standards change, and we could need to replace, modify, design, or build and install equipment, all of which would require additional capital expenditures. Specifically, because our product candidates may have a higher cost of goods than conventional therapies, the risk that coverage and reimbursement rates may be inadequate for us to achieve profitability may be greater.

The manufacture of viral vectors is complex and variable, and there are a limited number of manufacturers able to supply us with viral vectors.

Our DSG3-CAART and MuSK-CAART product candidates utilize a lentiviral delivery vector and some or all of our other product candidates may require a lentiviral delivery vector, a key drug substance that delivers the CAAR to the target T cells. We do not have the capability to manufacture lentiviral vector and plan to obtain the vector we require from third parties. The manufacturing process for lentiviral vector is variable and still evolving. It is not uncommon for manufacturing runs to fail, whether due to contamination, supplier error, or equipment failure, or to be delayed. To the extent our product candidates use a lentiviral delivery vector, a lack of vector supply will cause us to be unable to manufacture our CAAR T cells as well as a delay in patient enrollment, which may have a negative impact on our ability to successfully develop our product candidates.

Further, there are a limited number of manufacturers capable of producing lentiviral vectors. It can be challenging to secure a relationship with any of these manufacturers, and the manufacturing and release process can take a significant amount of time. We have secured a supply of lentiviral vector from CHOP sufficient for a portion of the patients we plan to enroll in our Phase 1 clinical trial of our DSG3-CAART product candidate. We have also reserved additional vector manufacturing capacity at Penn and we are in discussions with other CMOs for additional supply. There is no assurance that we will be able to secure adequate and timely supply of lentiviral vector. Moreover, we cannot be certain that our CAAR T cell product candidates produced with lentiviral vector from different manufacturers will be comparable or that results of clinical trials will be consistent if conducted with lentiviral vector from different manufacturers.

Vector production also requires the production of high-quality DNA plasmids, for which there is also a limited number of suppliers. Although we have established relationships with multiple suppliers for lentiviral vector and plasmids, we do not yet have our own clinical-scale manufacturing facility established, and are therefore highly dependent on the ability of these suppliers to manufacture necessary materials and to deliver these materials to us on a timely and reliable basis.

We may encounter difficulties in production, particularly with respect to process development or scaling up of our manufacturing capabilities. If we encounter such difficulties, our ability to provide supply of our CAAR T cells for clinical trials or for commercial purposes could be delayed or stopped.

Establishing clinical and commercial manufacturing and supply is a difficult and uncertain task, and there are risks associated with scaling to the level required for advanced clinical trials or commercialization, including, among others, increased costs, potential problems with process scale-out, process reproducibility, stability issues, lot consistency, and timely availability of reagents or raw materials. For example, we may find it difficult to

establish a manufacturing process that is consistent. If this occurs, we may need to complete more than one manufacturing run for each treated patient, which would impact the availability of adequate coverage and reimbursement from third-party payors. Competitors that have developed CAR T cell therapies have had difficulty reliably producing engineered T cell therapies in the commercial setting. If we experience similar challenges manufacturing product candidates to approved specifications, this may limit our product candidates' utilization and our ability to receive payment for these product candidates once licensed. Alternatively, these challenges may require changes to our manufacturing processes, which could require us to perform additional clinical studies, incurring significant expense. We may ultimately be unable to reduce the expenses associated with our product candidates to levels that will allow us to achieve a profitable return on investment.

If we or our third-party suppliers use hazardous,non-hazardous, biological or other materials in a manner that causes injury or violates applicable law, we may be liable for damages.

Our research and development activities involve the controlled use of potentially hazardous substances, including chemical and biological materials. We and our suppliers are subject to federal, state and local laws and regulations in the United States governing the use, manufacture, storage, handling and disposal of medical and hazardous materials. Although we believe that we and our suppliers' procedures for using, handling, storing and disposing of these materials comply with legally prescribed standards, we and our suppliers cannot completely eliminate the risk of contamination or injury resulting from medical or hazardous materials. As a result of any such contamination or injury, we may incur liability or local, city, state or federal authorities may curtail the use of these materials and interrupt our business operations. In the event of an accident, we could be held liable for damages or penalized with fines, and the liability could exceed our resources. We do not have any insurance for liabilities arising from medical or hazardous materials. Compliance with applicable environmental laws and regulations is expensive, and current or future environmental regulations may impair our research, development and production efforts, which could harm our business, prospects, financial condition or results of operations.

Changes in product candidate manufacturing or formulation may result in additional costs or delay, which could adversely affect our business, results of operations and financial condition.

As product candidates are developed through preclinical studies to later-stage clinical trials towards approval and commercialization, it is common that various aspects of the development program, such as manufacturing methods or formulation, are altered along the way in an effort to optimize processes and results. Any of these changes could cause our product candidates to perform differently and affect the results of planned clinical trials or other future clinical trials conducted with the altered materials or with materials made with the altered methods. Such changes may also require additional testing, or notification to, or approval by the FDA or other regulatory authorities. This could delay completion of clinical trials, require the conduct of bridging clinical trials or studies, require the repetition of one or more clinical trials, increase clinical trial costs, delay approval of our product candidates and/or jeopardize our ability to commence product sales and generate revenue.

Risks Related to Government Regulation

The FDA regulatory approval process is lengthy and time-consuming, and we may experience significant delays in the clinical development and regulatory approval of our product candidates.

The research, testing, manufacturing, labeling, approval, selling, import, export, marketing and distribution of drug products, including biologics, are subject to extensive regulation by the FDA and other regulatory authorities in the United States. We are not permitted to market any biological drug product in the United States until we receive approval of a Biologics License Application, or BLA, from the FDA. We have not previously submitted a BLA to the FDA, or similar licensure filings to comparable foreign authorities. A BLA must include extensive preclinical and clinical data and supporting information to establish the product candidate's safety, potency and purity for each desired indication. The BLA must also include significant information regarding the chemistry, manufacturing and controls for the product, including with respect to chain of identity and chain of custody of the product.

We expect the novel nature of our product candidates to create further challenges in obtaining regulatory approval. For example, the FDA has not previously reviewed regulatory applications for the commercial development of CAAR T cells for treatment of pemphigus, and there is no therapy currently approved by the FDA for the treatment of mPV. Because of this, we have little guidance as to which endpoints will be accepted, how many clinical trials we may expect to conduct, and whether open-label clinical trials will be deemed acceptable, among other things. We may also request regulatory approval of future CAAR T cell-based product candidates by target, regardless of disease type or origin, which the FDA may have difficulty accepting if our clinical trials only involved diseases of certain origins. The FDA may also require a panel of experts, referred to as an Advisory Committee, to deliberate on the adequacy of the safety, potency and purity data to support licensure. The opinion of the Advisory Committee, although not binding, may have a significant impact on our ability to obtain licensure of the product candidates based on the completed clinical trials, as the FDA often adheres to the Advisory Committee's recommendations. Further, given the rapidly evolving landscape of cell therapy, we could encounter a significant change in the regulatory environment for our product candidates once we have already begun one or more lengthy and expensive clinical trials for our product candidates. Accordingly, the regulatory approval pathway for our product candidates may be uncertain, complex, expensive and lengthy, and approval may not be obtained.

We may also experience delays in completing planned clinical trials for a variety of reasons, including delays related to:

- obtaining regulatory authorization to begin a trial, if applicable;
- the availability of financial resources to commence and complete the planned trials;
- reaching agreement on acceptable terms with prospective CROs and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- obtaining approval at each clinical trial site by an independent IRB;
- recruiting suitable patients to participate in a trial;
- having patients complete a trial, including having patients enrolled in clinical trials dropping out of the trial before the product candidate is manufactured and returned to the site, or return for post-treatment follow-up;
- clinical trial sites deviating from trial protocol or dropping out of a trial;
- addressing any patient safety concerns that arise during a trial;
- adding new clinical trial sites; or
- manufacturing sufficient quantities of qualified materials under cGMPs and applying them on a patient by patient basis for use in clinical trials.

We could also encounter delays if physicians encounter unresolved ethical issues associated with enrolling patients in clinical trials of our product candidates in lieu of prescribing existing treatments that have established safety and efficacy profiles. Further, a clinical trial may be suspended or terminated by us, the IRBs for the institutions in which such trials are being conducted or by the FDA or other regulatory authorities due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a product candidate, changes in governmental regulations or administrative actions, lack of adequate funding to continue the clinical trial, or based on a recommendation by the DSMB. If we experience termination of, or delays in the completion of, any future clinical trial of our product candidates, the commercial prospects for our product candidates will be harmed, and our ability to generate product revenue will be delayed. In addition, any delays in completing our clinical trials will increase our costs, slow down our

product development and approval process and jeopardize our ability to commence product sales and generate revenue. Many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may ultimately lead to the denial of regulatory approval of our product candidates.

We expect the product candidates we develop will be regulated as biological products, or biologics, and therefore they may be subject to competition.

The Biologics Price Competition and Innovation Act of 2009, or BPCIA, was enacted as part of the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, or collectively the ACA, to establish an abbreviated pathway for the approval of biosimilar and interchangeable biological products. The regulatory pathway establishes legal authority for the FDA to review and approve biosimilar biologics, including the possible designation of a biosimilar as "interchangeable" based on its similarity to a licensed biologic. Under the BPCIA, an application for a biosimilar product cannot be licensed by the FDA until 12 years after the reference product was licensed under a BLA. The law is complex and is still being interpreted and implemented by the FDA. In addition, as discussed more fully below, since the BPCIA was enacted as part of the ACA, if the ACA is invalidated in its entirety as unconstitutional, then the BPCIA could be considered invalid as well. While it is uncertain when such processes intended to implement the BPCIA may be fully adopted by the FDA, any such processes could have a material adverse effect on the future commercial prospects for our biological product candidates.

We believe that any of the product candidates we develop that is licensed in the United States as a biological product under a BLA should qualify for the 12-year period of exclusivity. However, there is a risk that this exclusivity could be shortened due to congressional action or otherwise, or that the FDA will not consider the subject product candidates to be reference products for competing products, potentially creating the opportunity for generic competition sooner than anticipated. Moreover, the extent to which a biosimilar, once licensed, will be substituted for any one of the reference products in a way that is similar to traditional generic substitution for non-biological products is not yet clear, and will depend on a number of marketplace and regulatory factors that are still developing.

The regulatory landscape that will govern our product candidates is uncertain; regulations relating to more established cell therapies and other therapies for B cell-mediated autoimmune diseases are still developing, and changes in regulatory requirements could result in delays or discontinuation of development of our product candidates or unexpected costs in obtaining regulatory approval.

Because we are developing novel CAAR T cell product candidates that are unique biological entities, the regulatory requirements that we will be subject to are not entirely clear. Even with respect to more established products that fit into the categories of gene therapies or cell therapies, the regulatory landscape is still developing. For example, regulatory requirements governing gene therapy products and cell therapy products have changed frequently and may continue to change in the future. Moreover, there is substantial, and sometimes uncoordinated, overlap in those responsible for regulation of existing gene therapy products and cell therapy products. For example, in the United States, the FDA has established the Office of Tissues and Advanced Therapies, formerly known as the Office of Cellular, Tissue and Gene Therapies, within its Center for Biologics Evaluation and Research, or CBER, to consolidate the review of gene therapy and related products, and the Cellular, Tissue and Gene Therapies Advisory Committee to advise CBER on its review. Gene therapy clinical trials are also subject to review and oversight by an institutional biosafety committee, a local institutional committee that reviews and oversees basic and clinical research conducted at the institution participating in the clinical trial. Although the FDA decides whether individual gene therapy protocols may proceed, review process and determinations of other reviewing bodies can impede or delay the initiation of a clinical study, even if the FDA has reviewed the study and approved its initiation. Conversely, the FDA can place an IND application on clinical hold even if such other entities have provided a favorable review. Furthermore, each clinical trial must be reviewed and approved by an independent IRB at or servicing each institution at which a clinical trial will be conducted. In addition, adverse developments in clinical trials of gene therapy products conducted by others may

cause the FDA or other regulatory bodies to change the requirements for approval of any of our product candidates.

Complex regulatory environments exist in other jurisdictions in which we might consider seeking regulatory approvals for our product candidates, further complicating the regulatory landscape. For example, in the European Union, a special committee called the Committee for Advanced Therapies was established within the EMA in accordance with Regulation (EC) No 1394/2007 on advanced-therapy medicinal products, or ATMPs, to assess the quality, safety and efficacy of ATMPs, and to follow scientific developments in the field. ATMPs include gene therapy products as well as somatic cell therapy products and tissue engineered products. These various regulatory review committees and advisory groups and new or revised guidelines that they promulgate from time to time may lengthen the regulatory review process, require us to perform additional studies, increase our development costs, lead to changes in regulatory positions and interpretations, delay or prevent approval and commercialization of our product candidates or lead to significant post-approval limitations or restrictions. Because the regulatory landscape for our CAAR T cell product candidates is new, we may face even more cumbersome and complex regulations than those emerging for gene therapy products and cell therapy products. Furthermore, even if our product candidates obtain required regulatory approvals, such approvals may later be withdrawn because of changes in regulations or the interpretation of regulations by applicable regulatory agencies. Delay or failure to obtain, or unexpected costs in obtaining, the regulatory approval necessary to bring a potential product to market could decrease our ability to generate sufficient product revenue to maintain our business.

If we are not able to obtain, or if there are delays in obtaining, required regulatory approvals for our product candidates, we will not be able to commercialize, or will be delayed in commercializing, our product candidates, and our ability to generate revenue will be materially impaired.

Our product candidates and the activities associated with their development and commercialization, including their design, testing, manufacture, safety, efficacy, recordkeeping, labeling, storage, approval, advertising, promotion, sale, distribution, import and export are subject to comprehensive regulation by the FDA and other regulatory agencies in the United States and by comparable authorities in other countries. Before we can commercialize any of our product candidates, we must obtain marketing approval. We have not received approval to market any of our product candidates from regulatory authorities in any jurisdiction and it is possible that none of our product candidates or any product candidates we may seek to develop in the future will ever obtain regulatory approval. We, as a company, have no experience in filing and supporting the applications necessary to gain regulatory approvals and expect to rely on third-party CROs and/or regulatory consultants to assist us in this process. Securing regulatory approval requires the submission of extensive preclinical and clinical data and supporting information to the various regulatory authorities for each therapeutic indication to establish the drug candidate’s safety, potency and purity.

Securing regulatory approval also requires the submission of information about the drug manufacturing process to, and inspection of manufacturing facilities by, the relevant regulatory authority. Our product candidates may not be effective, may be only moderately effective or may prove to have undesirable or unintended side effects, toxicities or other characteristics that may preclude our obtaining marketing approval or prevent or limit commercial use.

The process of obtaining regulatory approvals, both in the United States and abroad, is expensive, may take many years if additional clinical trials are required, if approval is obtained at all, and can vary substantially based upon a variety of factors, including the type, complexity and novelty of the product candidates involved. Changes in marketing approval policies during the development period, changes in or the enactment of additional statutes or regulations, or changes in regulatory review for each submitted IND, BLA or equivalent application types, may cause delays in the approval or rejection of an application. The FDA and comparable authorities in other countries have substantial discretion in the approval process and may refuse to accept any application or may decide that our data are insufficient for approval and require additional preclinical, clinical or other studies. Our

product candidates could be delayed in receiving, or fail to receive, regulatory approval for many reasons, including the following:

- the FDA or comparable foreign regulatory authorities may disagree with the design or implementation of our clinical trials;
- we may be unable to demonstrate to the satisfaction of the FDA or comparable foreign regulatory authorities that a drug candidate is safe, potent and pure for its proposed indication or a related companion diagnostic is suitable to identify appropriate patient populations;
- the results of clinical trials may not meet the level of statistical significance required by the FDA or comparable foreign regulatory authorities for approval;
- we may be unable to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;
- the FDA or comparable foreign regulatory authorities may disagree with our interpretation of data from preclinical studies or clinical trials;
- the data collected from clinical trials of our product candidates may not be sufficient to support the submission of an BLA or other submission or to obtain regulatory approval in the United States or elsewhere;
- the FDA or comparable foreign regulatory authorities may fail to approve the manufacturing processes, test procedures and specifications, or facilities that we may establish or of third-party manufacturers with which we may contract for clinical and commercial supplies; and
- the approval policies or regulations of the FDA or comparable foreign regulatory authorities may significantly change in a manner rendering our clinical data insufficient for approval.

Of the large number of drugs in development, only a small percentage successfully complete the FDA or foreign regulatory approval processes and are commercialized. The lengthy approval process as well as the unpredictability of future clinical trial results may result in our failing to obtain regulatory approval to market our product candidates, which would significantly harm our business, results of operations and prospects.

We expect the novel nature of our product candidates to create further challenges in obtaining regulatory approval. As a result, our ability to develop product candidates and obtain regulatory approval may be significantly impacted. For example, the general approach for FDA approval of a new biologic or drug is for sponsors to seek licensure or approval based on dispositive data from well-controlled, Phase 3 clinical trials of the relevant product candidate in the relevant patient population. Phase 3 clinical trials typically involve hundreds of patients, have significant costs and take years to complete. We believe that we may be able to utilize the FDA's Regenerative Medicine Advanced Therapy designation for our product candidates given the limited alternatives for treatments for certain rare diseases and B cell-mediated autoimmune diseases, but the FDA may not agree with our plans.

Moreover, approval of genetic or biomarker diagnostic tests may be necessary to advance some of our product candidates to clinical trials or potential commercialization. In the future, regulatory agencies may require the development and approval of such tests. Accordingly, the regulatory approval pathway for such product candidates may be uncertain, complex, expensive and lengthy, and approval may not be obtained.

In addition, even if we were to obtain approval, regulatory authorities may approve any of our product candidates for fewer or more limited indications than we request, may not approve the price we intend to charge for our products, if licensed, may grant approval contingent on the performance of costly post-marketing clinical trials, or may approve a product candidate with a label that does not include the labeling claims necessary or desirable for the successful commercialization of that product candidate. Any of the foregoing scenarios could materially harm the commercial prospects for our product candidates.

If we experience delays in obtaining approval or if we fail to obtain approval of our product candidates, the commercial prospects for our product candidates may be harmed and our ability to generate revenues will be materially impaired.

We may seek orphan drug designation for DSG3-CAART,MuSK-CAART and some or all of our future product candidates across various indications, but we may be unable to obtain such designations or to maintain the benefits associated with orphan drug designation, including market exclusivity, which may cause our revenue, if any, to be reduced.

Under the Orphan Drug Act, the FDA may grant orphan designation to a drug or biologic intended to treat a rare disease or condition, defined as a disease or condition with a patient population of fewer than 200,000 in the United States, or a patient population of 200,000 or more in the United States when there is no reasonable expectation that the cost of developing and making available the drug or biologic in the United States will be recovered from sales in the United States for that drug or biologic. In order to obtain orphan drug designation, the request must be made before submitting a BLA. In the United States, orphan drug designation entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages, and user-fee waivers. After the FDA grants orphan drug designation, the generic identity of the drug and its potential orphan use are disclosed publicly by the FDA. Orphan drug designation does not convey any advantage in, or shorten the duration of, the regulatory review and approval process.

If a product that has orphan drug designation subsequently receives the first FDA approval of that particular product for the disease for which it has such designation, the product is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications, including a BLA, to market the same biologic (meaning, a product with the same principal molecular structural features) for the same indication for seven years, except in limited circumstances such as a showing of clinical superiority to the product with orphan drug exclusivity or if FDA finds that the holder of the orphan drug exclusivity has not shown that it can assure the availability of sufficient quantities of the orphan drug to meet the needs of patients with the disease or condition for which the drug was designated. As a result, even if one of our product candidates receives orphan exclusivity, the FDA can still approve other biologics that do not have the same principal molecular structural features for use in treating the same indication or disease or the same biologic for a different indication or disease during the exclusivity period. Furthermore, the FDA can waive orphan exclusivity if we are unable to manufacture sufficient supply of our product or if a subsequent applicant demonstrates clinical superiority over our product.

We may seek orphan drug designation for some or all of our product candidates in specific orphan indications in which there is a medically plausible basis for the use of these products. Even if we obtain orphan drug designation, exclusive marketing rights in the United States may be limited if we seek approval for an indication broader than the orphan designated indication and may be lost if the FDA later determines that the request for designation was materially defective or if we are unable to assure sufficient quantities of the product to meet the needs of patients with the rare disease or condition, or if a subsequent applicant demonstrates clinical superiority over our products, if licensed. In addition, although we may seek orphan drug designation for other product candidates, we may never receive such designations.

Although we may pursue expedited regulatory approval pathways for a product candidate, it may not qualify for expedited development or, if it does qualify for expedited development, it may not actually lead to a faster development or regulatory review or approval process.

Although we believe there may be an opportunity to accelerate the development of certain of our product candidates through one or more of the FDA's expedited programs, such as fast track, breakthrough therapy, accelerated approval or priority review, we cannot be assured that any of our product candidates will qualify for such programs.

For example, a drug may be eligible for designation as a breakthrough therapy if the drug is intended, alone or in combination with one or more other drugs, to treat a serious or life-threatening condition and preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints. Although breakthrough designation or access to any other expedited program may expedite the development or approval process, it does not change the standards for approval. If we apply for breakthrough therapy designation or any other expedited program for our product candidates, the FDA may determine that our proposed target indication or other aspects of our clinical development plans do not qualify for such expedited program. Even if we are successful in obtaining a breakthrough therapy designation or access to any other expedited program, we may not experience faster development timelines or achieve faster review or approval compared to conventional FDA procedures. Access to an expedited program may also be withdrawn by the FDA if it believes that the designation is no longer supported by data from our clinical development program. Additionally, qualification for any expedited review procedure does not ensure that we will ultimately obtain regulatory approval for such product candidate.

Obtaining and maintaining regulatory approval of our product candidates in one jurisdiction does not mean that we will be successful in obtaining regulatory approval of our product candidates in other jurisdictions.

Obtaining and maintaining regulatory approval of our product candidates in one jurisdiction does not guarantee that we will be able to obtain or maintain regulatory approval in any other jurisdiction, while a failure or delay in obtaining regulatory approval in one jurisdiction may have a negative effect on the regulatory approval process in others. For example, even if the FDA grants marketing approval of a product candidate, comparable regulatory authorities in foreign jurisdictions must also approve the manufacturing, marketing and promotion of the product candidate in those countries. Approval procedures vary among jurisdictions and can involve requirements and administrative review periods different from, and greater than, those in the United States, including additional preclinical studies or clinical trials as clinical trials conducted in one jurisdiction may not be accepted by regulatory authorities in other jurisdictions. The foreign regulatory approval process may include all of the risk associated with obtaining FDA approval or licensure. In many jurisdictions outside the United States, a product candidate must be approved for reimbursement before it can be approved for sale in that jurisdiction. In some cases, the price that we intend to charge for our products, if licensed, is also subject to approval.

We may also submit marketing applications in other countries. Regulatory authorities in jurisdictions outside of the United States have requirements for approval of product candidates with which we must comply prior to marketing in those jurisdictions. Obtaining foreign regulatory approvals and compliance with foreign regulatory requirements could result in significant delays, difficulties and costs for us and could delay or prevent the introduction of our products, if licensed, in certain countries. If we fail to comply with the regulatory requirements in international markets and/or receive applicable marketing approvals, our target market will be reduced and our ability to realize the full market potential of our product candidates will be harmed.

Even if we receive regulatory approval of our product candidates, we will be subject to ongoing regulatory obligations and continued regulatory review, which may result in significant additional expense and we may be subject to penalties if we fail to comply with regulatory requirements or experience unanticipated problems with our product candidates.

Any regulatory approvals that we receive for our product candidates will require surveillance to monitor the safety, potency and purity of the product candidate. We believe it is likely that the FDA will require a Risk Evaluation and Mitigation Strategy, or REMS, in order to approve our product candidates, which could entail requirements for a medication guide, physician communication plans or additional elements to assure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. In addition, if the FDA or a comparable foreign regulatory authority approves our product candidates, the manufacturing processes, labeling, packaging, distribution, adverse event reporting, storage, advertising, promotion, import, export and

recordkeeping for our product candidates will be subject to extensive and ongoing regulatory requirements. These requirements include submissions of safety and other post-marketing information and reports, registration, as well as continued compliance with cGMPs and cGCPs for any clinical trials that we conduct post-approval. As such, we and our contract manufacturers will be subject to continual review and inspections to assess compliance with cGMP and adherence to commitments made in any BLA, other marketing application and previous responses to inspectional observations. Accordingly, we and others with whom we work must continue to expend time, money and effort in all areas of regulatory compliance, including manufacturing, production and quality control. In addition, the FDA could require us to conduct another study to obtain additional safety or biomarker information.

Further, we will be required to comply with FDA promotion and advertising rules, which include, among others, standards fordirect-to-consumer advertising, restrictions on promoting products for uses or in patient populations that are not described in the product's approved uses (known as "off-label use"), limitations on industry-sponsored scientific and educational activities and requirements for promotional activities involving the internet and social media. Later discovery of previously unknown problems with our product candidates through follow-up programs with our clinical trial patients, including adverse events of unanticipated severity or frequency, or with our third-party suppliers or manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the approved labeling to add new safety information, imposition of post-market studies or clinical studies to assess new safety risks, or imposition of distribution restrictions or other restrictions under a REMS program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of our product candidates, withdrawal of the product from the market or voluntary or mandatory product recalls;
- fines, warning letters or holds on clinical trials;
- refusal by the FDA to approve pending applications or supplements to approved applications filed by us or suspension or revocation of license approvals;
- product seizure or detention, or refusal to permit the import or export of our product candidates; and
- injunctions or the imposition of civil or criminal penalties.

The FDA's and other regulatory authorities' policies may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our product candidates. We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative or executive action, either in the United States or abroad. For example, certain policies of the current U.S. President's administration may impact our business and industry. Namely, the current U.S. President's administration has taken several executive actions, including the issuance of a number of Executive Orders, that could impose significant burdens on, or otherwise materially delay, FDA's ability to engage in routine oversight activities such as implementing statutes through rulemaking, issuance of guidance, and review and approval of marketing applications. It is difficult to predict how these orders will be implemented, and the extent to which they will impact the FDA's ability to exercise its regulatory authority. If these executive actions impose restrictions on FDA's ability to engage in oversight and implementation activities in the normal course, our business may be negatively impacted. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained, and we may not achieve or sustain profitability.

Coverage and reimbursement may be limited or unavailable in certain market segments for our product candidates, which could make it difficult for us to sell our product candidates, if licensed, profitably.

Successful commercialization of our product candidates, if licensed, will depend in part on the extent to which reimbursement for those drug products will be available from government health administration authorities, private health insurers, and other organizations. Government authorities and third-party payors, such

as private health insurers and health maintenance organizations, decide which drug products they will pay for and establish reimbursement levels. The availability and extent of reimbursement by governmental and private payors is essential for most patients to be able to afford a drug product. Sales of drug products depend substantially, both domestically and abroad, on the extent to which the costs of drugs products are paid for by health maintenance, managed care, pharmacy benefit and similar healthcare management organizations, or reimbursed by government health administration authorities, private health coverage insurers and other third-party payors. Significant uncertainty exists as to the coverage and reimbursement status of any product candidates for which we obtain regulatory approval. Any product candidate for which we seek regulatory approval and reimbursement will need to meet or surpass our target product profile, or TPP, to be deemed a viable alternative to currently approved therapies. In addition, because our product candidates represent new approaches to the treatment of B cell-mediated autoimmune diseases, we cannot accurately estimate the potential revenue from our product candidates.

Third-party payors decide which drugs and treatments they will cover and the amount of reimbursement. Reimbursement by a third-party payor may depend upon a number of factors, including, but not limited to, the third-party payor's determination that use of a product is:

- a covered benefit under its health plan;
- safe, effective and medically necessary;
- appropriate for the specific patient;
- cost-effective; and
- neither experimental nor investigational.

Obtaining coverage and reimbursement of a product from a government or other third-party payor is a time-consuming and costly process that could require us to provide the payor with supporting scientific, clinical and cost-effectiveness data for the use of our products, if licensed. In the United States, the principal decisions about reimbursement for new drug products are typically made by the Centers for Medicare and Medicaid Services, or CMS, an agency within the U.S. Department of Health and Human Services, or HHS. CMS decides whether and to what extent a new drug product will be covered and reimbursed under Medicare, and private payors tend to follow CMS to a substantial degree. However, no uniform policy of coverage and reimbursement for drug products exists among third-party payors and coverage and reimbursement levels for drug products can differ significantly from payor to payor. Further, one payor's determination to provide coverage for a product does not assure that other payors will also provide coverage for the product. Adequate third-party reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in product development.

Even if we obtain coverage for a given product, if the resulting reimbursement rates are insufficient, hospitals may not approve our product for use in their facility or third-party payors may require co-payments that patients find unacceptably high. Patients are unlikely to use our product candidates unless coverage is provided and reimbursement is adequate to cover a significant portion of the cost of our product candidates. Separate reimbursement for the product itself may or may not be available. Instead, the hospital or administering physician may be reimbursed only for providing the treatment or procedure in which our product is used. Further, from time to time, CMS revises the reimbursement systems used to reimburse health care providers, including the Medicare Physician Fee Schedule and Outpatient Prospective Payment System, which may result in reduced Medicare payments. In some cases, private third-party payers rely on all or portions of Medicare payment systems to determine payment rates. Changes to government healthcare programs that reduce payments under these programs may negatively impact payments from private third-party payers, and reduce the willingness of physicians to use our product candidates.

We intend to seek approval to market our product candidates in both the United States and in selected foreign jurisdictions. Outside of the United States, the pricing of pharmaceutical products and medical devices is

subject to governmental control in many countries. For example, in the European Union, pricing and reimbursement schemes vary widely from country to country. Some countries provide that products may be marketed only after a reimbursement price has been agreed. Some countries may require the completion of additional studies that compare the cost effectiveness of a particular therapy to currently available therapies or so-called health technology assessments, in order to obtain reimbursement or pricing approval. Other countries may allow companies to fix their own prices for products but monitor and control product volumes and issue guidance to physicians to limit prescriptions. Efforts to control prices and utilization of pharmaceutical products and medical devices will likely continue as countries attempt to manage healthcare expenditures. If we obtain approval in one or more foreign jurisdictions for our product candidates, we will be subject to rules and regulations in those jurisdictions. The downward pressure on health care costs has become very intense. As a result, increasingly high barriers are being erected to the entry of new products. In addition, in some countries, cross-border imports from low-priced markets exert a commercial pressure on pricing within a country.

The marketability of any product candidates for which we receive regulatory approval for commercial sale may suffer if government and other third-party payors fail to provide coverage and adequate reimbursement. We expect downward pressure on pharmaceutical pricing to continue. Further, coverage policies and third-party reimbursement rates may change at any time. Even if favorable coverage and reimbursement status is attained for one or more products for which we receive regulatory approval, less favorable coverage policies and reimbursement rates may be implemented in the future.

Healthcare legislative measures aimed at reducing healthcare costs may have a material adverse effect on our business and results of operations.

In the United States and foreign jurisdictions, there have been a number of legislative and regulatory changes and proposed changes regarding the healthcare system that could prevent or delay regulatory approval of our product candidates, restrict or regulate post-approval activities and affect our ability to profitably sell any product candidates for which we obtain regulatory approval. We expect that current laws, as well as other healthcare reform measures that may be adopted in the future, may result in additional reductions in Medicare and other healthcare funding, more rigorous coverage criteria, new payment methodologies and in additional downward pressure on the price that we, or any collaborators, may receive for any approved products.

In March 2010, President Obama signed into law the ACA. Among the provisions of the ACA of potential importance to our business and our product candidates are the following:

- an annual, non-deductible fee on any entity that manufactures or imports specified branded prescription products and biologic products;
- an increase in the statutory minimum rebates a manufacturer must pay under the Medicaid Drug Rebate Program;
- a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for products that are inhaled, infused, instilled, implanted or injected;
- expansion of healthcare fraud and abuse laws, including the civil False Claims Act and the federal Anti-Kickback Statute, new government investigative powers and enhanced penalties for noncompliance;
- a new Medicare Part D coverage gap discount program, in which manufacturers must agree to offer 50% (increased to 70% as of January 1, 2019) point-of-sale discounts off negotiated prices of applicable brand products to eligible beneficiaries during their coverage gap period, as a condition for the manufacturer's outpatient products to be covered under Medicare Part D;
- extension of manufacturers' Medicaid rebate liability to individuals enrolled in Medicaid managed care organizations;

- expansion of the entities eligible for discounts under the Public Health Service pharmaceutical pricing program;
- new requirements to report certain financial arrangements with physicians and teaching hospitals;
- a new requirement to annually report product samples that manufacturers and distributors provide to physicians;
- a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research;
- a new Independent Payment Advisory Board, or IPAB, which has authority to recommend certain changes to the Medicare program to reduce expenditures by the program that could result in reduced payments for prescription products; and
- established the Center for Medicare and Medicaid Innovation within CMS to test innovative payment and service delivery models.

There have been a number of significant changes to the ACA and its implementation. The Tax Cuts and Jobs Act of 2017, or Tax Act, includes a provision that repealed, effective January 1, 2019, the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the "individual mandate." On December 14, 2018, a U.S. District Court Judge in the Northern District of Texas, or the Texas District Court Judge, ruled that the individual mandate is a critical and inseverable feature of the ACA, and therefore, because it was repealed as part of the Tax Act, the remaining provisions of the ACA, including the BPCIA, are invalid as well. The U.S. President Administration and CMS have both stated that the ruling will have no immediate effect, and on December 30, 2018 the Texas District Court Judge issued an order staying the judgment pending appeal. On July 9, 2019, a Fifth Circuit U.S. Court of Appeals held a hearing to determine whether certain states and the House of Representatives have standing to appeal the lower court decision, but it is unclear when the Court will render its decision on this hearing, and what effect it will have on the status of the ACA. Litigation and legislation over the ACA are likely to continue, with unpredictable and uncertain results. We will continue to evaluate the effect that the ACA and its possible repeal and replacement has on our business.

On January 20, 2017, the U.S. President signed an Executive Order directing federal agencies with authorities and responsibilities under the ACA to waive, defer, grant exemptions from, or delay the implementation of any provision of the ACA that would impose a fiscal burden on states or a cost, fee, tax, penalty or regulatory burden on individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices. On October 13, 2017, the U.S. President signed an Executive Order terminating the cost-sharing subsidies that reimburse insurers under the ACA. The U.S. President administration has concluded that cost-sharing reduction, or CSR, payments to insurance companies required under the ACA have not received necessary appropriations from Congress and announced that it will discontinue these payments immediately until those appropriations are made. The loss of the CSR payments is expected to increase premiums on certain policies issued by qualified health plans under the ACA. Several state Attorneys General filed suit to stop the administration from terminating the subsidies, but their request for a restraining order was denied by a federal judge in California on October 25, 2017. On June 14, 2018, U.S. Court of Appeals for the Federal Circuit ruled that the federal government was not required to pay more than $12 billion in ACA risk corridor payments to third-party payors who argued were owed to them. The effects of this gap in reimbursement on third-party payors, the viability of the ACA marketplace, providers, and potentially our business, are not yet known.

Further, on January 22, 2018, the U.S. President signed a continuing resolution on appropriations for fiscal year 2018 that delayed the implementation of certain Affordable Care Act-mandated fees, including the so-called "Cadillac" tax on certain high cost employer-sponsored insurance plans, the annual fee imposed on certain health insurance providers based on market share, and the medical device excise tax on non-exempt medical devices.

Moreover, the Bipartisan Budget Act of 2018, among other things, amended the Affordable Care Act, effective January 1, 2019, to increase the point-of-sale discount (from 50% under the ACA to 70%) that is owed by pharmaceutical manufacturers who participate in Medicare Part D and closed the coverage gap in most Medicare drug plans, commonly referred to as the "donut hole". More recently, in July 2018, CMS announced that it is suspending further collections and payments to and from certain Affordable Care Act qualified health plans and health insurance issuers under the Affordable Care Act risk adjustment program pending the outcome of federal district court litigation regarding the method CMS uses to determine this risk adjustment. In addition, CMS has recently published a final rule that would give states greater flexibility, starting in 2020, in setting benchmarks for insurers in the individual and small group marketplaces, which may have the effect of relaxing the essential health benefits required under the ACA for plans sold through such marketplaces. Congress is continuing to consider legislation that would alter other aspects of the Affordable Care Act. The ultimate content, timing or effect of any healthcare reform legislation on the U.S. healthcare industry is unclear.

Further legislation or regulation could be passed that could harm our business, financial condition and results of operations. Other legislative changes have been proposed and adopted since the Affordable Care Act was enacted. For example, in August 2011, President Obama signed into law the Budget Control Act of 2011, which, among other things included aggregate reductions to Medicare payments to providers of 2% per fiscal year, which went into effect in April 2013 and will remain in effect through 2027 unless additional Congressional action is taken. In January 2013, the American Taxpayer Relief Act of 2012 was signed into law, which, among other things, further reduced Medicare payments to several types of providers, including hospitals, imaging centers and treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. These new laws and regulations may result in additional reductions in Medicare and other healthcare funding and otherwise affect the prices we may obtain for any of our product candidates for which we may obtain regulatory approval or the frequency with which any such product candidate is prescribed or used.

There have been, and likely will continue to be, legislative and regulatory proposals at the foreign, federal and state levels directed at broadening the availability of healthcare and containing or lowering the cost of healthcare. The implementation of cost containment measures or other healthcare reforms may prevent us from being able to generate revenue, attain profitability, or commercialize our product candidates. Such reforms could have an adverse effect on anticipated revenue from product candidates that we may successfully develop and for which we may obtain regulatory approval and may affect our overall financial condition and ability to develop product candidates.

In addition, there has been increasing legislative and enforcement interest in the United States with respect to specialty drug pricing practices. Specifically, there have been several recent U.S. Congressional inquiries and proposed and enacted federal and state legislation designed to, among other things, bring more transparency to drug pricing, review the relationship between pricing and manufacturer patient assistance programs, and reform government program reimbursement methodologies for drugs. At the federal level, the U.S. President's administration's budget for fiscal year 2019 contains further drug price control measures that could be enacted during the 2019 legislative session or in other future legislation, including, for example, measures to permit Medicare Part D plans to negotiate the price of certain drugs under Medicare Part B, to allow some states to negotiate drug prices under Medicaid, and to eliminate cost sharing for generic drugs for low-income patients. Further, the current U.S. President's administration released a "Blueprint", or plan, to lower drug prices and reduce out of pocket costs of drugs that contains additional proposals to increase drug manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products, and reduce the out of pocket costs of drug products paid by consumers. HHS has already started the process of soliciting feedback on some of these measures and, at the same, is immediately implementing others under its existing authority. For example, in September 2018, CMS announced that it will allow Medicare Advantage Plans the option to use step therapy for Part B drugs beginning January 1, 2019. Additionally, on May 10, 2019, CMS announced a new pricing transparency rule, which was set to go into effect on July 9, 2019, but on July 8, 2019, a federal judge struck down the rule concluding that HHS did not have the

statutory authority to implement such regulations on drug companies. This final rule would have required direct-to-consumer television advertisements for prescription drugs and biological products for which reimbursement is available, directly or indirectly, through or under Medicare or Medicaid to include the list price of that product, except for a prescription drug or biological product that has a list price of less than $35 per month for a 30-day supply or typical course of treatment. If it goes into effect, the pricing transparency rule could have had a negative effect on our business. Although a number of these, and other proposed measures will require authorization through additional legislation to become effective, Congress and the current U.S. President's administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. While some proposed measures will require authorization through additional legislation to become effective, Congress and the current U.S. President's administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. Individual states in the United States have also become increasingly active in passing legislation and implementing regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing.

The pricing of prescription pharmaceuticals is also subject to governmental control outside the United States. In these countries, pricing negotiations with governmental authorities can take considerable time after the receipt of regulatory approval for a product. To obtain reimbursement or pricing approval in some countries, we may be required to conduct a clinical trial that compares the cost-effectiveness of our product candidates to other available therapies. If reimbursement of our products is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our ability to generate revenues and become profitable could be impaired.

There have been, and likely will continue to be, legislative and regulatory proposals at the foreign, federal and state levels directed at containing or lowering the cost of healthcare. The implementation of cost containment measures or other healthcare reforms may prevent us from being able to generate revenue, attain profitability, or commercialize our product. Such reforms could have an adverse effect on anticipated revenue from product candidates that we may successfully develop and for which we may obtain regulatory approval and may affect our overall financial condition and ability to develop product candidates.

We cannot predict the initiatives that may be adopted in the future. The continuing efforts of the government, insurance companies, managed care organizations and other payors of healthcare services to contain or reduce costs of healthcare and/or impose price controls may adversely affect:

- the demand for our product candidates, if we obtain regulatory approval;
- our ability to set a price that we believe is fair for our products, if licensed;
- our ability to generate revenue and achieve or maintain profitability;
- the level of taxes that we are required to pay; and
- the availability of capital.

Any reduction in reimbursement from Medicare or other government programs may result in a similar reduction in payments from private payors, which may adversely affect our future profitability.

If we fail to comply with environmental, health and safety laws and regulations, we could become subject to fines or penalties or incur costs that could have a material adverse effect on the success of our business.

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our research and development activities involve the use of biological and hazardous materials and

produce hazardous waste products. We generally contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials, which could cause an interruption of our commercialization efforts, research and development efforts and business operations, environmental damage resulting in costly clean-up and liabilities under applicable laws and regulations governing the use, storage, handling and disposal of these materials and specified waste products. Although we believe that the safety procedures utilized by our third-party manufacturers for handling and disposing of these materials generally comply with the standards prescribed by these laws and regulations, we cannot guarantee that this is the case or eliminate the risk of accidental contamination or injury from these materials. In such an event, we may be held liable for any resulting damages and such liability could exceed our resources and state or federal or other applicable authorities may curtail our use of certain materials and/or interrupt our business operations. Furthermore, environmental laws and regulations are complex, change frequently and have tended to become more stringent. We cannot predict the impact of such changes and cannot be certain of our future compliance. Breach of certain environmental, health and safety laws and regulations could also in certain circumstances constitute a breach of our License Agreement with Penn. In addition, we may incur substantial costs in order to comply with current or future environmental, health and safety laws and regulations. These current or future laws and regulations may impair our research, development or production efforts. Failure to comply with these laws and regulations also may result in substantial fines, penalties or other sanctions.

Although we maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees resulting from the use of hazardous materials or other work-related injuries, this insurance may not provide adequate coverage against potential liabilities. We do not carry specific biological waste or hazardous waste insurance coverage, workers compensation or property and casualty and general liability insurance policies that include coverage for damages and fines arising from biological or hazardous waste exposure or contamination.

Our employees, independent contractors, consultants, commercial partners and vendors may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements.

We are exposed to the risk of employee fraud or other illegal activity by our employees, independent contractors, consultants, commercial partners and vendors. Misconduct by these parties could include intentional, reckless and/or negligent conduct that fails to comply with the laws of the FDA and other similar foreign regulatory bodies, provide true, complete and accurate information to the FDA and other similar foreign regulatory bodies, comply with manufacturing standards we have established, comply with healthcare fraud and abuse laws in the United States and similar foreign fraudulent misconduct laws, or report financial information or data accurately or to disclose unauthorized activities to us. If we obtain FDA approval of any of our product candidates and begin commercializing those products in the United States, our potential exposure under such laws will increase significantly, and our costs associated with compliance with such laws are also likely to increase. These laws may impact, among other things, our current activities with principal investigators and research patients, as well as proposed and future sales, marketing and education programs.

Our relationships with customers, healthcare providers, physicians, and third-party payors will be subject, directly or indirectly, to federal and state healthcare fraud and abuse laws, false claims laws, health information privacy and security laws, and other healthcare laws and regulations. If we or our employees, independent contractors, consultants, commercial partners and vendors violate these laws, we could face substantial penalties.

These laws may impact, among other things, our clinical research program, as well as our proposed and future sales, marketing and education programs. In particular, the promotion, sales and marketing of healthcare items and services is subject to extensive laws and regulations designed to prevent fraud, kickbacks, self-dealing and other abusive practices, including, without limitation, the federal Anti-Kickback Statute and the federal False Claims Act, which may constrain the business or financial arrangements and relationships through which such

companies sell, market and distribute pharmaceutical products. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive and other business arrangements. We may also be subject to federal, state and foreign laws governing the privacy and security of individual identifiable health information and other personally identifiable information. The U.S. healthcare laws and regulations that may affect our ability to operate include, but are not limited to:

- the federal Anti-Kickback Statute, which prohibits, among other things, knowingly and willfully soliciting, receiving, offering or paying any remuneration (including any kickback, bribe or rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce, or in return for, either the referral of an individual, or the purchase, lease, order or recommendation of any good, facility, item or service for which payment may be made, in whole or in part, under a federal healthcare program, such as the Medicare and Medicaid programs. A person or entity can be found guilty of violating the statute without actual knowledge of the statute or specific intent to violate it. In addition, a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the False Claims Act, or FCA. The Anti-Kickback Statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand and prescribers, purchasers, and formulary managers on the other. There are a number of statutory exceptions and regulatory safe harbors protecting some common activities from prosecution;

- federal civil and criminal false claims laws and civil monetary penalty laws, including the FCA, which prohibit, among other things, individuals or entities from knowingly presenting, or causing to be presented, false or fraudulent claims for payment to, or approval by Medicare, Medicaid, or other federal healthcare programs, knowingly making, using or causing to be made or used a false record or statement material to a false or fraudulent claim or an obligation to pay or transmit money to the federal government, or knowingly concealing or knowingly and improperly avoiding or decreasing or concealing an obligation to pay money to the federal government. Manufacturers can be held liable under the FCA even when they do not submit claims directly to government payors if they are deemed to "cause" the submission of false or fraudulent claims. The FCA also permits a private individual acting as a "whistleblower" to bring actions on behalf of the federal government alleging violations of the FCA and to share in any monetary recovery;

- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which created new federal criminal statutes that prohibit knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program or obtain, by means of false or fraudulent pretenses, representations, or promises, any of the money or property owned by, or under the custody or control of, any healthcare benefit program, regardless of the payor (*e.g.*, public or private) and knowingly and willfully falsifying, concealing or covering up by any trick or device a material fact or making any materially false statements in connection with the delivery of, or payment for, healthcare benefits, items or services relating to healthcare matters. Similar to the federal Anti-Kickback Statute, a person or entity can be found guilty of violating HIPAA without actual knowledge of the statute or specific intent to violate it;

- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, which impose, among other things, requirements on certain covered healthcare providers, health plans, and healthcare clearinghouses as well as their respective business associates that perform services for them that involve the use, or disclosure of, individually identifiable health information, relating to the privacy, security and transmission of individually identifiable health information without appropriate authorization. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions;

- the federal Physician Payment Sunshine Act, created under the Patient Protection and Affordable Care Act, and its implementing regulations, which require manufacturers of drugs, devices, biologicals and

medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program (with certain exceptions) to report annually to the HHS information related to payments or other transfers of value made to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors) and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members;

- federal consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers; and
- analogous state and foreign laws and regulations, such as state anti-kickback and false claims laws, which may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers, and may be broader in scope than their federal equivalents; state and foreign laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government or otherwise restrict payments that may be made to healthcare providers; state and foreign laws that require drug manufacturers to report information related to payments and other transfers of value to physicians and other healthcare providers or marketing expenditures; and state and foreign laws governing the privacy and security of individually identifiable health information and other personally identifiable information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

The distribution of pharmaceutical products is subject to additional requirements and regulations, including extensive record-keeping, licensing, storage and security requirements intended to prevent the unauthorized sale of pharmaceutical products.

The scope and enforcement of each of these laws is uncertain and subject to rapid change in the current environment of healthcare reform, especially in light of the lack of applicable precedent and regulations. Federal and state enforcement bodies have recently increased their scrutiny of interactions between healthcare companies and healthcare providers, which has led to a number of investigations, prosecutions, convictions and settlements in the healthcare industry. Ensuring business arrangements comply with applicable healthcare laws, as well as responding to possible investigations by government authorities, can be time- and resource-consuming and can divert a company's attention from the business.

The failure to comply with any of these laws or regulatory requirements subjects entities to possible legal or regulatory action. Depending on the circumstances, failure to meet applicable regulatory requirements can result in civil, criminal and administrative penalties, damages, fines, disgorgement, individual imprisonment, possible exclusion from participation in federal and state funded healthcare programs, contractual damages and the curtailment or restructuring of our operations, as well as additional reporting obligations and oversight if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with these laws. Any action for violation of these laws, even if successfully defended, could cause a pharmaceutical manufacturer to incur significant legal expenses and divert management's attention from the operation of the business. Prohibitions or restrictions on sales or withdrawal of future marketed products could materially affect business in an adverse way.

Because of the breadth of these laws and the narrowness of the statutory exceptions and regulatory safe harbors available, it is possible that some of our business activities, or our arrangements with physicians, some of who receive stock options as compensation, could be subject to challenge under one or more of such laws. If we or our employees, independent contractors, consultants, commercial partners and vendors violate these laws, we may be subject to investigations, enforcement actions and/or significant penalties. Effective upon the completion of this offering, we will adopt a code of business conduct and ethics, but it is not always possible to identify and deter employee misconduct or business noncompliance, and the precautions we take to detect and prevent inappropriate conduct may not be effective in controlling unknown or unmanaged risks or losses or in protecting

us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. Efforts to ensure that our business arrangements will comply with applicable healthcare laws may involve substantial costs. It is possible that governmental and enforcement authorities will conclude that our business practices may not comply with current or future statutes, regulations or case law interpreting applicable fraud and abuse or other healthcare laws and regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, including the imposition of civil, criminal and administrative penalties, damages, disgorgement, monetary fines, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, contractual damages, reputational harm, diminished profits and future earnings, additional reporting requirements and/or oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, and curtailment of our operations, any of which could adversely affect our ability to operate our business and our results of operations. In addition, the approval and commercialization of any of our product candidates outside the United States will also likely subject us to foreign equivalents of the healthcare laws mentioned above, among other foreign laws.

European data collection is governed by restrictive regulations governing the use, processing, and cross-border transfer of personal information.

The collection and processing of personal data – including health data – is governed by the European Union-wide General Data Protection Regulation, or GDPR, which became applicable on May 25, 2018. The GDPR applies to any business, regardless of its location, that provides goods or services to residents in the EU or monitors the behavior of individuals within the European Union. The GDPR imposes more stringent operational requirements for processors and controllers of personal data, including, for example, special protections for "sensitive information" which includes health and genetic information of data subjects residing in the European Union, expanded disclosures about how personal information is to be used, limitations on retention of information, increased requirements pertaining to health data and pseudonymized (*i.e.*, key-coded) data, mandatory data breach notification requirements and higher standards for controllers to demonstrate that they have obtained valid consent for certain data processing activities. GDPR grants individuals the opportunity to object to the processing of their personal information, allows them to request deletion of personal information in certain circumstances, and provides the individual with an express right to seek legal remedies in the event the individual believes his or her rights have been violated. Further, the GDPR imposes strict rules on the transfer of personal data out of the European Union to the United States and other jurisdictions that have not been deemed to offer "adequate" privacy protections. The GDPR provides that European Union Member States may make their own further laws and regulations in relation to the processing of genetic, biometric or health data, which could result in differences between Member States, limit our ability to use and share personal data or could cause our costs to increase, and harm our business and financial condition. Our clinical trial activity conducted within the member states of the European Union is regulated by the GDPR. In addition, we are subject to evolving and strict rules on the transfer of personal data out of the European Union to the United States. Furthermore, the current main data transfer mechanisms (Privacy Shield and Standard Contractual Clauses) are the subject of a legal challenge before the European Court of Justice, raising the possibility of future uncertainty about mechanisms that may be used to legitimize cross-border transfers of personal data. Failure to comply with European Union data protection laws may result in fines (for example, of up to €20,000,000 or up to 4% of the total worldwide annual turnover of the preceding financial year (whichever is higher) under the GDPR) and other administrative penalties, which may be onerous and adversely affect our business, financial condition, results of operations and prospects. As a result of the implementation of the GDPR, we may be required to put in place additional mechanisms ensuring compliance with the new data protection rules. There is significant uncertainty related to the manner in which data protection authorities will seek to enforce compliance with GDPR is not yet clear. Enforcement uncertainty and the costs associated with ensuring GDPR compliance be onerous and adversely affect our business, financial condition, results of operations and prospects.

If our security measures are breached or unauthorized access to individually identifiable health information or other personally identifiable information is otherwise obtained, our reputation may be harmed, and we may incur significant liabilities.

Unauthorized access to, or security breaches of, our systems and databases could result in unauthorized access to data and information and loss, compromise or corruption of such data and information. The systems of Penn, any CMOs that we may engage in the future, and present and future CROs, contractors and consultants also could experience breaches of security leading to the exposure of confidential and sensitive information. Such breaches of security could be caused by computer hacking, phishing attacks, ransomware, dissemination of computer viruses, worms and other destructive or disruptive software, denial of service attacks, and other malicious activity, which may be heretofore unknown. The number and complexity of these threats continue to increase over time.

In the event of a security breach, our company could suffer loss of business, severe reputational damage adversely affecting investor confidence, regulatory investigations and orders, litigation, indemnity obligations, damages for contract breach, penalties for violation of applicable laws or regulations, significant costs for remediation and other liabilities. For example, the loss of preclinical study or clinical trial data from completed or future preclinical studies or clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability and the further development and commercialization of our product candidates could be delayed.

We have incurred and expect to incur significant expenses to prevent security breaches, including costs related to deploying additional personnel and protection technologies, training employees, and engaging third-party solution providers and consultants. Although we expend significant resources to create security protections that shield our customer data against potential theft and security breaches, such measures cannot provide absolute security. Moreover, as we outsource more of our information systems to vendors and rely more on cloud-based information systems, the related security risks will increase, and we will need to expend additional resources to protect our technology and information systems.

We have in the past experienced breaches of our security measures. For example, in 2019, we believe a phishing incident led to certain employee email accounts being accessed by an unauthorized third party. We initiated an investigation to determine whether further action was required under applicable law. The incident did not have a material impact on our business or financial condition. While we believe we responded appropriately, including implementing remedial measures with the goal of preventing similar such events in the future, there can be no assurance that we will be successful in these remedial and preventative measures or in successfully mitigating the effects of potential future incidents or cyber-attacks. We thus remain at risk for future breaches, including, without limitation, breaches that may occur as a result of third-party action, or employee, vendor or contractor error or malfeasance and other causes. If, in the future, we experience a data breach or security incident, we would be likely to experience harm to our reputation, financial performance, and customer and vendor relationships, and the possibility of litigation or regulatory investigations or actions by state and federal governmental authorities and non-U.S. authorities.

Risks Related to Our Intellectual Property

We rely heavily on certain in-licensed patent and other intellectual property rights in connection with our development of our product candidates and, if we fail to comply with our obligations under our existing and any future intellectual property licenses with third parties, we could lose license rights that are important to our business.

Our ability to develop and commercialize our product candidates is heavily dependent onin-licenses to patent rights and other intellectual property granted to us by third parties. For example, we depend heavily on our

License Agreement with Penn and CHOP, pursuant to which we obtained (a) a non-exclusive, non-sublicensable, worldwide research license to make, have made and use products in two subfields of use, (b) effective as of October 2018, an exclusive, worldwide, royalty-bearing license, with the right to sublicense, under certain of the intellectual property to make, use, sell, offer for sale and import products in the same two subfields of use, and (c) effective as of October 2018, a non-exclusive, worldwide, royalty-bearing license, with limited rights to sublicense, under certain of Penn's know-how to make, have made, use, sell, offer for sale, import and have imported products in the same two subfields of use. We may enter into additional license agreements in the future. Our license agreement with Penn and CHOP imposes, and we expect that future license agreements will impose, various diligence, milestone payment, royalty, insurance and other obligations on us. If we fail to comply with our obligations under these licenses, our licensors, including Penn and CHOP, may have the right to terminate these license agreements, in which event we might not be able to market our product candidates. Termination of any of our license agreements or reduction or elimination of our licensed rights may also result in our having to negotiate new or reinstated licenses with less favorable terms.

We may need to obtain additional licenses from third parties to advance our research or allow commercialization of our product candidates, and we have done so from time to time. We may fail to obtain any of these licenses at a reasonable cost or on reasonable terms, if at all. In that event, we may be required to expend significant time and resources to develop or license replacement technology. If we are unable to do so, we may be unable to develop or commercialize the affected product candidates, which could harm our business significantly. We cannot provide any assurances that third-party patents do not exist which might be enforced against our current product candidates or future products, resulting in either an injunction prohibiting our sales, or, with respect to our sales, an obligation on our part to pay royalties and/or other forms of compensation to third parties.

Furthermore, in many cases, we may not have the right to control the preparation, filing and prosecution of patent applications, or to maintain the patents, covering technology that we in-license from third parties. For example, pursuant to our License Agreement with Penn and CHOP, Penn controls such activities for the patent rights licensed to us under such agreement. Therefore, although we provide input to Penn and CHOP on these activities, we cannot be certain that these patents will be prosecuted, maintained and enforced in a manner consistent with the best interests of our business. If our current or future licensors or collaboration partners fail to obtain, maintain or protect any patents or patent applications licensed to us, our rights to such patents and patent applications may be reduced or eliminated and our right to develop and commercialize any of our product candidates that are the subject of such licensed rights could be adversely affected.

Disputes may arise between us and our current and future licensors regarding intellectual property subject to a license agreement, including those related to:

- the scope of rights granted under the License Agreement and other interpretation-related issues;
- whether we have breached the License Agreement and whether any such breach is subject to a cure period;
- whether and the extent to which our technology and processes infringe on intellectual property of the licensor that is not subject to the licensing agreement;
- our right to sublicense patent and other rights to third parties under collaborative development relationships;
- our diligence obligations with respect to the use of the licensed technology in relation to our development and commercialization of our product candidates, and what activities satisfy those diligence obligations; and
- the ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and us and our partners.

Furthermore, disputes may arise between us and our current or future licensors regarding the ownership of intellectual property developed by us, such that we may be required to assign or otherwise transfer such intellectual property to such licensor. In the event that the assigned or transferred intellectual property is covered by an existing license agreement with such licensor we may be required to make additional royalty or milestone payments, or both, to such licensor. If the assigned or transferred intellectual property is not covered by an existing license agreement, then we may be required to enter into an additional license agreement to advance our research or allow commercialization of our product candidates, which may not be available on commercially reasonable terms or at all.

If disputes over intellectual property that we have licensed, or license in the future, prevent or impair our ability to maintain our current licensing arrangements on acceptable terms, we may be unable to successfully develop and commercialize the affected product candidates.

If our efforts to protect the proprietary nature of the intellectual property related to our current and any future product candidates are not adequate, we may not be able to compete effectively in our market.

Our success depends in large part on our ability to obtain and maintain intellectual property protection in the United States and other countries with respect to our product candidates. If we do not adequately protect or enforce our intellectual property rights, competitors may be able to erode or negate any competitive advantage we may have, which could harm our business and ability to achieve profitability. To protect our proprietary position, we have in-licensed patent rights in the United States and abroad relating to the product candidates that are important to our business. The patent application and approval process is expensive, complex and time-consuming. Our licensors may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner.

The patent position of biotechnology and pharmaceutical companies generally is highly uncertain. No consistent policy regarding the breadth of claims allowed in biotechnology and pharmaceutical patents has emerged to date in the United States or in many foreign jurisdictions. In addition, the determination of patent rights with respect to biological and pharmaceutical products commonly involves complex legal and factual questions, which has in recent years been the subject of much litigation. As a result, the issuance, scope, validity, enforceability and commercial value of our patent rights are highly uncertain. Pending patent applications cannot be enforced against third parties practicing the technology claimed in such applications unless and until a patent issues from such applications. Assuming the other requirements for patentability are met, currently, the first to file a patent application is generally entitled to the patent. However, prior to March 16, 2013, in the United States, the first to invent was entitled to the patent. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that our licensors were the first to make the inventions claimed in the patents or pending patent applications we in-license, or that our licensors were the first to file for patent protection of such inventions.

Moreover, because the issuance of a patent is not conclusive as to its inventorship, scope, validity or enforceability, the patents or pending patent applications we in-license may be challenged in the courts or patent offices in the United States and abroad. For example, we may be subject to a third party preissuance submission of prior art to the U.S. Patent and Trademark Office, or USPTO, or become involved in post-grant review procedures, derivation proceedings, reexaminations, or *inter partes* review in the United States, or oppositions and other comparable proceedings in foreign jurisdictions, challenging our patent rights or the patent rights of others. An adverse determination in any such challenges may result in loss of exclusivity or in patent claims being narrowed, invalidated or held unenforceable, in whole or in part, which could limit our ability to stop others from using or commercializing similar or identical technology and products, or limit the duration of the patent protection of our technology and product candidates. In addition, given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting such candidates might expire before or shortly after such candidates are commercialized.

Changes in either the patent laws or interpretation of the patent laws in the United States and other countries may diminish the value of the patents we in-license or narrow the scope of our patent protection. In addition, the laws of foreign countries may not protect our rights to the same extent or in the same manner as the laws of the United States. For example, European patent law is more restrictive than U.S. patent law in connection with the patentability of methods of treatment of the human body.

We cannot predict whether the patent applications we in-license currently being pursued will issue as patents, whether the claims of any patent that has or may issue will provide us with a competitive advantage or prevent competitors from designing around the claims to develop competing technologies in a non-infringing manner, or whether we or our licensors will be able to successfully pursue patent applications in the future relating to our current product candidates or future products and product candidates. Moreover, the patent application and approval process is expensive and time-consuming. We or our licensors may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. Furthermore, we, or any future partners, collaborators, or licensees, may fail to identify patentable aspects of inventions made in the course of development and commercialization activities before it is too late to obtain patent protection on them. Therefore, we may miss potential opportunities to seek additional patent protection.

It is possible that defects of form in the preparation or filing of patent applications may exist, or may arise in the future, for example with respect to proper priority claims, inventorship, claim scope, or requests for patent term adjustments. If we fail to establish, maintain or protect such patents and other intellectual property rights, such rights may be reduced or eliminated. If there are material defects in the form, preparation, prosecution or enforcement of the patents or patent applications we in-license, such patents may be invalid and/or unenforceable, and such applications may never result in valid, enforceable patents. Any of these outcomes could impair our ability to prevent competition from third parties, which may have an adverse impact on our business.

Even if the patent applications we in-license issue as patents, they may not issue in a form that will provide us with any meaningful protection, prevent competitors from competing with us or otherwise provide us with any competitive advantage. Our competitors may be able to circumvent our patent rights by developing similar or alternative technologies or products in a non-infringing manner. Our competitors may also seek approval to market their own products similar to or otherwise competitive with our product candidates. Alternatively, our competitors may seek to market generic versions of any approved products by submitting abbreviated BLAs to the FDA during which process they may claim that patents licensed by us are invalid, unenforceable or not infringed. In these circumstances, we may need to defend or assert our intellectual property rights, or both, including by filing lawsuits alleging patent infringement. In any of these types of proceedings, a court or other agency with jurisdiction may find the patents we in-license invalid or unenforceable, or that our competitors are competing in a non-infringing manner. Thus, even if we have in-licensed valid and enforceable patents, these patents still may not provide protection against competing products or processes sufficient to achieve our business objectives. Any of the foregoing could have a material adverse effect on our competitive position, business, financial conditions, results of operations, and prospects.

In the future, we likely will need to expand our patent portfolio to pursue patent coverage for new product candidates that we wish to develop. The patent prosecution process is competitive, and other companies, some which may have greater resources than we do in this area, may also be pursuing intellectual property rights that we may consider necessary or attractive in order to develop and commercialize future product candidates.

We may not be able to protect our intellectual property rights throughout the world.

Filing, prosecuting, maintaining, defending and enforcing patents on our product candidates in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States could be less extensive than those in the United States. The deadline to pursue protection in foreign jurisdictions for many of the patent families licensed under the License Agreement with Penn has not yet expired. Prior to applicable deadlines, we and Penn will need to decide where to pursue

protection, and we will not have the opportunity to pursue protection unless we do so in applicable jurisdictions prior to the deadlines. Although our License Agreement grants us worldwide rights, there can be no assurance that we will obtain or maintain patent rights in or outside the United States under any future license agreements. In addition, the laws of some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the United States even in jurisdictions where we and our licensors pursue patent protection. Consequently, we and our licensors may not be able to prevent third parties from practicing our inventions in all countries outside the United States, even in jurisdictions where we and our licensors pursue patent protection, or from selling or importing products made using our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we and our licensors have not pursued and obtained patent protection to develop their own products and, further, may export otherwise infringing products to territories where we and our licensors have patent protection, but enforcement is not as strong as that in the United States. These products may compete with our product candidates and the patents we in-license or other intellectual property rights may not be effective or sufficient to prevent them from competing.

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents, trade secrets and other intellectual property protection, particularly those relating to biotechnology products, which could make it difficult for us to stop the infringement of the patents we in-license or marketing of competing products in violation of our proprietary rights generally. Proceedings to enforce our patent rights, even if obtained, in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business, could put the patents we in-license at risk of being invalidated or interpreted narrowly and the patent applications we in-license at risk of not issuing and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate, and the damages or other remedies awarded, if any, may not be commercially meaningful. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

We or our licensors may be subject to claims challenging the inventorship or ownership of the patents and other intellectual property that we own or license.

We or our licensors may be subject to claims that former employees, collaborators or other third parties have an ownership interest in the patents and intellectual property that we in-license or that we may own orin-license in the future. While it is our policy to require our employees and contractors who may be involved in the development of intellectual property to execute agreements assigning such intellectual property to us, we may be unsuccessful in executing such an agreement with each party who in fact develops intellectual property that we regard as our own or such assignments may not be self-executing or may be breached. Our licensors may face similar obstacles. We or our licensors could be subject to ownership disputes arising, for example, from conflicting obligations of employees, consultants or others who are involved in developing our product candidates. For example, our scientific co-founders, Drs. Payne and Milone, are members of our scientific advisory board and are also employed by and subject to Penn's intellectual property policy. Litigation may be necessary to defend against any claims challenging inventorship or ownership. If we or our licensors fail in defending any such claims, we may have to pay monetary damages and may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, intellectual property, which could adversely impact our business, results of operations and financial condition.

Some intellectual property which we have in-licensed was discovered through government funded programs and thus is subject to federal regulations such as "march-in" rights, certain reporting requirements, and a preference for U.S. industry. Compliance with such regulations may limit our exclusive rights and limit our ability to contract with non-U.S. manufacturers.

Certain of the intellectual property rights we have licensed, including rights licensed to us by Penn relating to our DSG3-CAART and DSG3/1-CAART product candidates, was generated through the use of U.S.

government funding and may therefore be subject to certain federal laws and regulations. As a result, the U.S. government has certain rights to intellectual property embodied in our DSG3-CAART and DSG3/1-CAART product candidates and may have rights in future product candidates pursuant to the Bayh-Dole Act of 1980. These U.S. government rights in certain inventions developed under a government-funded program include a non-exclusive, non-transferable, irrevocable worldwide license to use inventions for any governmental purpose. In addition, the U.S. government has the right to require us to grant exclusive, partially exclusive, or non-exclusive licenses to any of these inventions to a third party if it determines that: (i) adequate steps have not been taken to commercialize the invention; (ii) government action is necessary to meet public health or safety needs; or (iii) government action is necessary to meet requirements for public use under federal regulations, also referred to as "march-in rights". The U.S. government also has the right to take title to these inventions if we, or the applicable licensor, such as Penn, fail to disclose the invention to the government and fail to file an application to register the intellectual property within specified time limits. Intellectual property generated under a government funded program is also subject to certain reporting requirements, compliance with which may require us or the applicable licensor to expend substantial resources. In addition, the U.S. government requires that products embodying the subject invention or produced through the use of the subject invention be manufactured substantially in the United States. The manufacturing preference requirement can be waived if the owner of the intellectual property can show that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible. This preference for U.S. manufacturers may limit our ability to contract with non-U.S. product manufacturers for product candidates covered by such intellectual property.

We may become involved in lawsuits to protect or enforce our patent rights or other intellectual property rights, which could be expensive, time consuming and unsuccessful.

Competitors may infringe, misappropriate or otherwise violate patents, trademarks, copyrights or other intellectual property that we own or in-license. To counter infringement, misappropriation or other unauthorized use, we may be required to file claims, which can be expensive and time consuming and divert the time and attention of our management and scientific personnel. Any claims we assert against perceived violators could provoke these parties to assert counterclaims against us alleging that we infringe, misappropriate or otherwise violate their intellectual property, in addition to counterclaims asserting that the patents we in-license are invalid or unenforceable, or both. In any patent infringement proceeding, there is a risk that a court will decide that a patent we in-license is invalid or unenforceable, in whole or in part, and that we do not have the right to stop the other party from using the invention at issue. There is also a risk that, even if the validity of such patents is upheld, the court will construe the patent's claims narrowly or decide that we do not have the right to stop the other party from using the invention at issue on the grounds that the patent claims do not cover the invention. An adverse outcome in a litigation or proceeding involving the patents we in-license could limit our ability to assert the patent we in-license against those parties or other competitors and may curtail or preclude our ability to exclude third parties from making and selling similar or competitive products. Any of these occurrences could adversely affect our competitive business position, business prospects and financial condition.

Even if we establish infringement, misappropriation or another violation of our intellectual property rights, the court may decide not to grant an injunction against the offender and instead award only monetary damages, which may or may not be an adequate remedy. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during litigation. There could also be public announcements of the results of hearings, motions or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a material adverse effect on the price of our shares. Moreover, there can be no assurance that we will have sufficient financial or other resources to file and pursue such claims, which typically last for years before they are concluded. Even if we ultimately prevail in such claims, the monetary cost of such litigation and the diversion of the attention of our management and scientific personnel

could outweigh any benefit we receive as a result of the proceedings. Any of the foregoing may have a material adverse effect on our business, financial condition, results of operations and prospects.

Changes in patent law in the United States and other jurisdictions could diminish the value of patents in general, thereby impairing our ability to protect our product candidates.

Changes in either the patent laws or the interpretation of the patent laws in the United States or other jurisdictions could increase the uncertainties and costs surrounding the prosecution of patent applications and the enforcement or defense of issued patents. On September 16, 2011, the Leahy-Smith America Invents Act, or the Leahy-Smith Act, was signed into law. When implemented, the Leahy-Smith Act included several significant changes to U.S. patent law that impacted how patent rights could be prosecuted, enforced and defended. In particular, the Leahy-Smith Act also included provisions that switched the United States from a "first-to-invent" system to a "first-to-file" system, allowed third-party submission of prior art to the USPTO during patent prosecution and set forth additional procedures to attack the validity of a patent by the USPTO administered post grant proceedings. Under a first-to-file system, assuming the other requirements for patentability are met, the first inventor to file a patent application generally will be entitled to the patent on an invention regardless of whether another inventor had made the invention earlier. The USPTO developed new regulations and procedures governing the administration of the Leahy-Smith Act, and many of the substantive changes to patent law associated with the Leahy-Smith Act, and in particular, the first to file provisions, only became effective on March 16, 2013. It remains unclear what impact, if any, the Leahy-Smith Act will have on the operation of our business. However, the Leahy-Smith Act and its implementation could increase the uncertainties and costs surrounding the prosecution of the patent applications we in-license and the enforcement or defense of the issued patents we in-license, all of which could have a material adverse effect on our business.

The patent positions of companies engaged in the development and commercialization of biologics are particularly uncertain. For example, the Supreme Court of the United States issued its decision in Association for Molecular Pathology v. Myriad Genetics, Inc., or Myriad, a case involving patent claims held by Myriad Genetics, Inc. relating to the breast cancer susceptibility genes BRCA1 and BRCA2. Myriad held that an isolated segment of naturally occurring DNA, such as the DNA constituting the BRCA1 and BRCA2 genes, is not patent-eligible subject matter, but that complementary DNA, which is an artificial construct that may be created from RNA transcripts of genes, may be patent-eligible. Thereafter, the USPTO issued a guidance memorandum instructing USPTO examiners on the ramifications of the Prometheus and Myriad rulings and apply the Myriad ruling to natural products and principles including all naturally occurring nucleic acids. Certain claims of our in-licensed patent applications contain, and any future patents we may obtain may contain, claims that relate to specific recombinant DNA sequences that are naturally occurring at least in part and, therefore, could be the subject of future challenges made by third parties.

We cannot assure you that our efforts to seek patent protection for one or more of our product candidates will not be negatively impacted by this Supreme Court decision, rulings in other cases or changes in guidance or procedures issued by the USPTO. We cannot fully predict what impact the Supreme Court's decisions in Myriad may have on the ability of life science companies to obtain or enforce patents relating to their products in the future. These decisions, the guidance issued by the USPTO and rulings in other cases or changes in USPTO guidance or procedures could have a material adverse effect on our existing patent rights and our ability to protect and enforce our intellectual property in the future.

If we are unable to protect the confidentiality of trade secrets, our business and competitive position would be harmed.

In addition to the protection afforded by patents, we rely on trade secret protection and confidentiality agreements to protect certain proprietary know-how that is not patentable or that we elect not to patent, processes for which patents are difficult to enforce, and any other elements of our product candidate discovery and development processes that involve proprietary know-how, information or technology that is not covered by

patents. However, trade secrets can be difficult to protect and some courts inside and outside the United States are less willing or unwilling to protect trade secrets. We seek to protect our proprietary technology and processes, in part, by entering into confidentiality agreements with our employees, consultants, scientific advisors, and contractors. We cannot guarantee that we have entered into such agreements with each party that may have or has had access to our trade secrets or proprietary technology and processes. We also seek to preserve the integrity and confidentiality of our data and trade secrets by maintaining physical security of our premises and physical and electronic security of our information technology systems. While we have confidence in these individuals, organizations and systems, agreements or security measures may be breached, and we may not have adequate remedies for any breach.

In addition, our trade secrets may otherwise become known or be independently discovered by competitors. Competitors and other third parties could infringe, misappropriate or otherwise violate our intellectual property rights, design around our protected technology or develop their own competitive technologies that fall outside of our intellectual property rights. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor or other third party, we would have no right to prevent them, or those to whom they communicate it, from using that technology or information to compete with us. If our trade secrets are not adequately protected or sufficient to provide an advantage over our competitors, our competitive position could be adversely affected, as could our business. Additionally, if the steps taken to maintain our trade secrets are deemed inadequate, we may have insufficient recourse against third parties for misappropriating our trade secrets.

We may become subject to claims that we are infringing certain third-party patents or other third party intellectual property rights, any of which may prevent or delay our development and commercialization efforts and have a material adverse effect on our business.

Our commercial success depends in part on avoiding infringing, misappropriating and otherwise violating the patents and other intellectual property and proprietary rights of third parties. There is a substantial amount of litigation, both within and outside the United States, involving patent and other intellectual property rights in the biotechnology and pharmaceutical industries, including patent infringement lawsuits, and administrative proceedings such as interferences, *inter partes* review and post grant review proceedings before the USPTO and opposition proceedings before foreign patent offices. Numerous U.S. and foreign issued patents and pending patent applications, which are owned or controlled by third parties, including our competitors, exist in the fields in which we are pursuing product candidates. As the biotechnology and pharmaceutical industries expand and more patents are issued, the risk increases that our product candidates may be subject to claims of infringement of the patent rights of third parties.

Third parties may assert that we or our licensors are employing their proprietary technology without authorization. There may be third-party patents or patent applications with claims to materials, methods of manufacture or methods for treatment relating to our product candidates and, because patent applications can take many years to issue, there may be currently pending third party patent applications which may later result in issued patents, in each case that our product candidates, their manufacture or use may infringe or be alleged to infringe. We may fail to identify potentially relevant patents or patent applications, incorrectly conclude that a patent is invalid or does not cover our activities, or incorrectly conclude that a patent application is unlikely to issue in a form of relevance to our activities.

Parties making patent infringement claims against us may obtain injunctive or other equitable relief, which could effectively block our ability to further develop and commercialize one or more of our product candidates. Defense of these claims, including demonstrating non-infringement, invalidity or unenforceability of the respective patent rights in question, regardless of their merit, is time-consuming, would involve substantial litigation expense and would be a substantial diversion of employee resources from our business. For example, in order to successfully challenge the validity of any U.S. patent in federal court, we would need to overcome a presumption of validity. This is a high burden requiring us to present clear and convincing evidence as to the

invalidity of any such U.S. patent claim, and we can provide no assurance that a court of competent jurisdiction would invalidate the claims of any such U.S. patent. We may not have sufficient resources to bring these actions to a successful conclusion. There could also be public announcements of the results of hearings, motions or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a material adverse effect on the price of our shares.

In the event that a holder of any such patents seeks to enforce its patent rights against us with respect to one or more of our product candidates, and our defenses against the infringement of such patent rights are unsuccessful, we may be precluded from commercializing our product candidates, even if approved, without first obtaining a license to some or all of these patents, which may not be available on commercially reasonable terms or at all. Moreover, we may be required to pay significant fees and royalties to secure a license to the applicable patents. Such a license may only be non-exclusive, in which case our ability to stop others from using or commercializing technology and products similar or identical to ours may be limited. Furthermore, we could be liable for damages to the holder of these patents, which may be significant and could include treble damages if we are found to have willfully infringed such patents. In the event that a challenge to these patents were to be unsuccessful or we were to become subject to litigation or unable to obtain a license on commercially reasonable terms with respect to these patents, it could harm our business, financial condition, results of operations and prospects.

We are aware of third-party issued U.S. patents relating to the lentiviral vectors which may be used in the manufacture or use of our product candidates. If these patent rights were enforced against us, we believe that we have defenses against any such action, including that these patents would not be infringed by our product candidates and/or that these patents are not valid. However, if these patents were enforced against us and defenses to such enforcement were unsuccessful, unless we obtain a license to these patents, which may not be available on commercially reasonable terms, or at all, we could be liable for damages and precluded from commercializing any product candidates that were ultimately held to infringe these patents, which could have a material adverse effect on our business, financial condition, results of operations and prospects.

Even in the absence of a finding of infringement, we may need or may choose to obtain licenses from third parties to advance our research or allow commercialization of our product candidates. We may fail to obtain any of these licenses at a reasonable cost or on reasonable terms, or at all. In that event, we would be unable to further develop and commercialize our product candidates. Claims that we have misappropriated the confidential information or trade secrets of third parties could have a similar negative impact on our business. Any of the foregoing could materially adversely affect our business, results of operations and financial condition.

Patent term may be inadequate to protect our competitive position on our product candidates for an adequate amount of time.

Given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting such candidates might expire before or shortly after such candidates are commercialized. In the United States, the Drug Price Competition and Patent Term Restoration Act of 1984 permits a patent term extension of up to five years beyond the normal expiration of the patent, which is limited to the approved indication (or any additional indications approved during the period of extension). However, a patent term extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of the product's approval by the FDA, only one patent applicable to an approved drug is eligible for the extension, and only those claims covering the approved drug, a method for using it or a method for manufacturing it may be extended. In the future, if and when our product candidates receive FDA approval, we plan to apply for patent term extensions on patents covering those product candidates in any jurisdiction where these are available. However, the applicable authorities, including the FDA and the USPTO in the United States, and any equivalent regulatory authority in other countries, may not agree with our assessment of whether such extensions are available, and may refuse to grant extensions to the patents we in-license, or may grant more limited extensions than we request. Moreover, we may not receive an extension because of, for example, failing to apply within

applicable deadlines, failing to apply prior to expiration of relevant patents or otherwise failing to satisfy applicable requirements. If this occurs, our competitors may be able to take advantage of our investment in development and clinical trials by referencing our clinical and preclinical data and launch their product earlier than might otherwise be the case.

We may be subject to claims asserting that our employees, consultants or advisors have wrongfully used or disclosed alleged trade secrets of their current or former employers or claims asserting ownership of what we regard as our own intellectual property.

Certain of our employees, consultants or advisors are currently, or were previously, employed at universities or other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that our employees, consultants and advisors do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that these individuals or we have used or disclosed intellectual property, including trade secrets or other proprietary information, of any such individual's current or former employer. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management. Our licensors may face similar risks, which could have an adverse impact on intellectual property that is licensed to us.

Intellectual property rights do not necessarily address all potential threats.

The degree of future protection afforded by our intellectual property rights is uncertain because intellectual property rights have limitations and may not adequately protect our business or permit us to maintain our competitive advantage. For example:

- others may be able to make products that are similar to our product candidates or utilize similar cell therapy technology but that are not covered by the claims of our current or future patent portfolio;
- we, or our current or future licensors or collaborators, might not have been the first to make the inventions covered by the issued patent or pending patent application that we license now or that we may license or own in the future;
- we, or our current or future licensors or collaborators, might not have been the first to file patent applications covering certain of our or their inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our licensed intellectual property rights;
- it is possible that our current or future licensed patent applications will not lead to issued patents;
- issued patents that we hold rights to may be held invalid or unenforceable, including as a result of legal challenges by our competitors or other third parties;
- our competitors or other third parties might conduct research and development activities in countries where we do not have patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets;
- we may not develop additional proprietary technologies that are patentable;
- the patents of others may harm our business;
- we may choose not to file a patent application in order to maintain certain trade secrets or know-how, and a third party may subsequently file a patent application covering such intellectual property; and
- third-party patents may issue with claims covering our activities; we may have infringement liability exposure arising from such patents.

Should any of these events occur, they could have a material adverse effect on our business, financial condition, results of operations and prospects.

Risks Related to This Offering and Ownership of Our Common Stock

We do not know whether an active, liquid and orderly trading market will develop for our common stock or what the market price of our common stock will be and as a result it may be difficult for you to sell your shares of our common stock.

Prior to this offering there has been no public market for shares of our common stock. An active trading market for our shares may never develop or be sustained following this offering. You may not be able to sell your shares quickly or at the market price if trading in shares of our common stock is not active. The initial public offering price for our common stock will be determined through negotiations with the underwriters, and the negotiated price may not be indicative of the market price of the common stock after the offering. As a result of these and other factors, you may be unable to resell your shares of our common stock at or above the initial public offering price. Further, an inactive market may also impair our ability to raise capital by selling shares of our common stock and may impair our ability to enter into strategic partnerships or acquire companies or products by using our shares of common stock as consideration.

The price of our stock may be volatile, and you could lose all or part of your investment.

The trading price of our common stock following this offering is likely to be highly volatile and could be subject to wide fluctuations in response to various factors, some of which are beyond our control, including limited trading volume. In addition to the factors discussed in this "Risk Factors" section and elsewhere in this prospectus, these factors include:

- the commencement, enrollment or results of our planned preclinical studies or clinical trials of our product candidates or any preclinical studies or future clinical trials we may conduct, or changes in the development status of our product candidates;
- our decision to initiate a preclinical study or clinical trial, not to initiate a preclinical study or clinical trial or to terminate an existing preclinical study or clinical trial;
- adverse results or delays in preclinical studies or clinical trials of our product candidates;
- any delay in our regulatory filings for our product candidates and any adverse development or perceived adverse development with respect to the applicable regulatory authority's review of such filings, including, without limitation, the FDA's issuance of a "refusal to file" letter or a request for additional information;
- our failure to commercialize our product candidates;
- adverse regulatory decisions, including failure to receive regulatory approval of our product candidates;
- changes in laws or regulations applicable to our product candidates, including, but not limited to, clinical trial requirements for approvals;
- adverse developments concerning our manufacturers or suppliers;
- our inability to obtain adequate product supply for any licensed product or inability to do so at acceptable prices;
- our inability to establish collaborations, if needed;
- additions or departures of key scientific or management personnel;
- unanticipated serious safety concerns related to the use of our product candidates;

- introduction of new products or services offered by us or our competitors;
- announcements of significant acquisitions, strategic partnerships, joint ventures or capital commitments by us or our competitors;
- our ability to effectively manage our growth;
- the size and growth of our initial target markets;
- our ability to successfully treat additional types of B cell-mediated autoimmune diseases;
- actual or anticipated variations in quarterly operating results;
- our cash position;
- our failure to meet the estimates and projections of the investment community or that we may otherwise provide to the public;
- publication of research reports about us or our industry or positive or negative recommendations or withdrawal of research coverage by securities analysts;
- changes in the market valuations of similar companies;
- overall performance of the equity markets;
- sales of our common stock by us or our stockholders in the future;
- trading volume of our common stock;
- changes in accounting practices;
- ineffectiveness of our internal controls;
- disputes or other developments relating to proprietary rights, including patents, litigation matters and our ability to obtain patent protection for our technologies;
- significant lawsuits, including patent or stockholder litigation;
- general political and economic conditions; and
- other events or factors, many of which are beyond our control.

In addition, the stock market in general, and The Nasdaq Global Market and biopharmaceutical companies in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of these companies. Broad market and industry factors may negatively affect the market price of our common stock, regardless of our actual operating performance. In the past, securities class action litigation has often been instituted against companies following periods of volatility in the market price of a company's securities. If the market price of our common stock after this offering does not exceed the initial public offering price, you may not realize any return on your investment in us and may lose some or all of your investment. In the past, securities class action litigation has often been instituted against companies following periods of volatility in the market price of a company's securities. This type of litigation, if instituted, could result in substantial costs and a diversion of management's attention and resources, which would harm our business, operating results or financial condition.

If you purchase our common stock in this offering, you will incur immediate and substantial dilution in the book value of your shares.

The initial public offering price is substantially higher than the net tangible book value per share of our common stock. Investors purchasing common stock in this offering will pay a price per share that substantially exceeds the book value of our tangible assets after subtracting our liabilities. As a result, investors purchasing common stock in this offering will incur immediate dilution of $ per share, based on the initial public

offering price of $ per share, which is the midpoint of the price range set forth on the cover page of this prospectus. Further, investors purchasing common stock in this offering will contribute approximately % of the total amount invested by stockholders since our inception but will own only approximately % of the shares of common stock outstanding after giving effect to this offering.

This dilution is due to our investors who purchased shares prior to this offering having paid substantially less when they purchased their shares than the price offered to the public in this offering and the exercise of stock options granted to our employees. To the extent outstanding options are exercised, there will be further dilution to new investors. As a result of the dilution to investors purchasing shares in this offering, investors may receive significantly less than the purchase price paid in this offering, if anything, in the event of our liquidation. For a further description of the dilution that you will experience immediately after this offering, see "Dilution."

We do not intend to pay dividends on our common stock, so any returns will be limited to the value of our stock.

We currently anticipate that we will retain future earnings for the development, operation and expansion of our business and do not anticipate declaring or paying any cash dividends for the foreseeable future. Any return to stockholders will therefore be limited to the appreciation of their stock.

Our principal stockholders and management own a significant percentage of our stock and will be able to exert significant control over matters subject to stockholder approval.

Prior to this offering, our executive officers, directors, and 5% stockholders beneficially owned, in the aggregate, approximately 88.7% of our voting stock as of June 30, 2019, and, upon the closing of this offering, that same group will continue to beneficially own a significant percentage of our outstanding voting stock. Accordingly, even after this offering, these stockholders will have the ability to influence us through this ownership position and significantly affect the outcome of all matters requiring stockholder approval. For example, these stockholders may be able to significantly affect the outcome of elections of directors, amendments of our organizational documents, or approval of any merger, sale of assets, or other major corporate transaction. This may prevent or discourage unsolicited acquisition proposals or offers for our common stock that you may feel are in your best interest as one of our stockholders.

We are an emerging growth company, and we cannot be certain if the reduced reporting requirements applicable to emerging growth companies will make our common stock less attractive to investors.

We are an emerging growth company, as defined in the Jumpstart Our Business Startups Act, or JOBS Act. For as long as we continue to be an emerging growth company, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended, or the Sarbanes-Oxley Act, reduced disclosure obligations regarding executive compensation in this prospectus and our periodic reports and proxy statements and exemptions from the requirements of holding nonbinding advisory votes on executive compensation and stockholder approval of any golden parachute payments not previously approved. We could be an emerging growth company for up to five years following the year in which we complete this offering, although circumstances could cause us to lose that status earlier. We will remain an emerging growth company until the earlier of (1) the last day of the fiscal year (a) following the fifth anniversary of the completion of this offering, (b) in which we have total annual gross revenue of at least $1.07 billion or (c) in which we are deemed to be a large accelerated filer, which requires the market value of our common stock that is held by non-affiliates to exceed $700 million as of the prior June 30th, and (2) the date on which we have issued more than $1 billion in non-convertible debt during the prior three-year period.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have elected to use this extended

transition period for complying with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date we (i) are no longer an emerging growth company or (ii) affirmatively and irrevocably opt out of the extended transition period provided in the JOBS Act. As a result, we will not be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies and our financial statements may not be comparable to other public companies that comply with new or revised accounting pronouncements as of public company effective dates.

Further, even after we no longer qualify as an emerging growth company, we may still qualify as a "smaller reporting company" which would allow us to take advantage of many of the same exemptions from disclosure requirements including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act and reduced disclosure obligations regarding executive compensation in this prospectus and our periodic reports and proxy statements. We cannot predict if investors will find our common stock less attractive because we may rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our stock price may be more volatile.

If we fail to establish and maintain proper and effective internal control over financial reporting, our operating results and our ability to operate our business could be harmed.

Ensuring that we have adequate internal financial and accounting controls and procedures in place so that we can produce accurate financial statements on a timely basis is a costly and time-consuming effort that needs to be re-evaluated frequently. Our internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements in accordance with generally accepted accounting principles. In connection with this offering, we intend to begin the process of documenting, reviewing, and improving our internal controls and procedures for compliance with Section 404 of the Sarbanes-Oxley Act, which will require annual management assessment of the effectiveness of our internal control over financial reporting. We have begun recruiting additional finance and accounting personnel with certain skill sets that we will need as a public company.

Implementing any appropriate changes to our internal controls may distract our officers and employees, entail substantial costs to modify our existing processes, and take significant time to complete. These changes may not, however, be effective in maintaining the adequacy of our internal controls, and any failure to maintain that adequacy, or consequent inability to produce accurate financial statements on a timely basis, could increase our operating costs and harm our business. In addition, investors' perceptions that our internal controls are inadequate or that we are unable to produce accurate financial statements on a timely basis may harm our stock price and make it more difficult for us to effectively market and sell our service to new and existing customers.

We will incur significant increased costs as a result of operating as a public company, and our management will be required to devote substantial time to new compliance initiatives.

As a public company, we will incur significant legal, accounting and other expenses that we did not incur as a private company. We will be subject to the reporting requirements of the Securities Exchange Act of 1934, as amended, or the Exchange Act, which will require, among other things, that we file with the Securities and Exchange Commission, or the SEC, annual, quarterly and current reports with respect to our business and financial condition**.** In addition, the Sarbanes-Oxley Act, as well as rules subsequently adopted by the SEC and the Nasdaq Global Market to implement provisions of the Sarbanes-Oxley Act, impose significant requirements on public companies, including requiring establishment and maintenance of effective disclosure and financial controls and changes in corporate governance practices. Further, in July 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act, or the Dodd-Frank Act, was enacted. There are significant corporate governance and executive compensation related provisions in the Dodd-Frank Act that require the SEC to adopt additional rules and regulations in these areas such as "say on pay" and proxy access. Emerging growth companies are permitted to implement many of these requirements over a longer period and up to five years from the pricing of this offering. We intend to take advantage of this legislation for as long as we are permitted to do

so. Once we become required to implement these requirements, we will incur additional compliance-related expenses. Stockholder activism, the current political environment and the current high level of government intervention and regulatory reform may lead to substantial new regulations and disclosure obligations, which may lead to additional compliance costs and impact the manner in which we operate our business in ways we cannot currently anticipate.

We expect the rules and regulations applicable to public companies to continue to increase our legal and financial compliance costs and to make some activities more time-consuming and costly. If these requirements divert the attention of our management and personnel from other business concerns, they could have a material adverse effect on our business, financial condition and results of operations. The increased costs will decrease our net income or increase our net loss and may require us to reduce costs in other areas of our business or increase the prices of our products or services. For example, we expect these rules and regulations to make it more difficult and more expensive for us to obtain director and officer liability insurance and we may be required to incur substantial costs to maintain the same or similar coverage. We cannot predict or estimate the amount or timing of additional costs we may incur to respond to these requirements. The impact of these requirements could also make it more difficult for us to attract and retain qualified persons to serve on our board of directors, our board committees or as executive officers.

Sales of a substantial number of shares of our common stock by our existing stockholders in the public market could cause our stock price to fall.

If our existing stockholders sell, or indicate an intention to sell, substantial amounts of our common stock in the public market after the lock-up and other legal restrictions on resale discussed in this prospectus lapse, the trading price of our common stock could decline. Based on shares of common stock outstanding as of , 2019, upon the closing of this offering we will have outstanding a total of shares of common stock. Of these shares, only the shares of common stock sold in this offering by us, plus any shares sold upon exercise of the underwriters' option to purchase additional shares, will be freely tradable without restriction in the public market immediately following this offering. The underwriters, however, may, in their sole discretion, permit our officers, directors and other stockholders who are subject to these lock-up agreements to sell shares prior to the expiration of the lock-up agreements.

We expect that the lock-up agreements pertaining to this offering will expire 180 days from the date of this prospectus. In addition, shares of common stock that are either subject to outstanding options or reserved for future issuance under the 2019 Stock Option and Incentive Plan, or the 2019 Plan, will become eligible for sale in the public market to the extent permitted by the provisions of various vesting schedules, the lock-up agreements and Rule 144 and Rule 701 under the Securities Act of 1933, as amended, or the Securities Act. If these additional shares of common stock are sold, or if it is perceived that they will be sold, in the public market, the trading price of our common stock could decline.

After this offering, the holders of shares of our common stock will be entitled to rights with respect to the registration of their shares under the Securities Act, subject to the 180-day lock-up agreements described above. See "Description of Capital Stock—Registration Rights". Registration of these shares under the Securities Act would result in the shares becoming freely tradable without restriction under the Securities Act, except for shares held by affiliates, as defined in Rule 144 under the Securities Act. Any sales of securities by these stockholders could have a material adverse effect on the trading price of our common stock.

Future sales and issuances of our common stock or rights to purchase common stock, including pursuant to the 2019 Plan, could result in additional dilution of the percentage ownership of our stockholders and could cause our stock price to fall.

We expect that significant additional capital may be needed in the future to continue our planned operations, including conducting clinical trials, commercialization efforts, expanded research and development activities and

costs associated with operating a public company. To raise capital, we may sell common stock, convertible securities or other equity securities in one or more transactions at prices and in a manner we determine from time to time. If we sell common stock, convertible securities or other equity securities, investors may be materially diluted by subsequent sales. Such sales may also result in material dilution to our existing stockholders, and new investors could gain rights, preferences and privileges senior to the holders of our common stock, including shares of common stock sold in this offering.

Pursuant to the 2019 Plan, certain amendments of which became effective on the business day prior to the public trading date of our common stock, our management is authorized to grant stock options to our employees, directors and consultants.

Initially, the aggregate number of shares of our common stock that may be issued pursuant to stock awards under the 2019 Plan is shares. Additionally, the number of shares of our common stock reserved for issuance under the 2019 Plan will automatically increase on January 1 of each year, beginning on January 1, 2020 and continuing through and including January 1, 2029, by % of the total number of shares of our capital stock outstanding on December 31 of the preceding calendar year, or a lesser number of shares determined by our board of directors. Unless our board of directors elects not to increase the number of shares available for future grant each year, our stockholders may experience additional dilution, which could cause our stock price to fall.

Raising additional capital may cause dilution to our existing stockholders, restrict our operations or require us to relinquish rights to our technologies or product candidates.

We may seek additional capital through a combination of public and private equity offerings, debt financings, strategic partnerships and alliances and licensing arrangements. To the extent that we raise additional capital through the sale of equity or convertible debt securities, your ownership interest will be diluted, and the terms may include liquidation or other preferences that adversely affect your rights as a stockholder. The incurrence of indebtedness would result in increased fixed payment obligations and could involve certain restrictive covenants, such as limitations on our ability to incur additional debt, limitations on our ability to acquire or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. If we raise additional funds through strategic partnerships and alliances and licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies or product candidates or grant licenses on terms unfavorable to us.

We have broad discretion in the use of the net proceeds from this offering and may not use them effectively.

Our management will have broad discretion in the application of the net proceeds from this offering, including for any of the purposes described in the section entitled “Use of Proceeds,” and you will not have the opportunity as part of your investment decision to assess whether the net proceeds are being used appropriately. Because of the number and variability of factors that will determine our use of the net proceeds from this offering, their ultimate use may vary substantially from their currently intended use. Our management might not apply our net proceeds in ways that ultimately increase the value of your investment. The failure by our management to apply these funds effectively could harm our business. Pending their use, we may invest the net proceeds from this offering in short-term, investment-grade, interest-bearing securities. These investments may not yield a favorable return to our stockholders. If we do not invest or apply the net proceeds from this offering in ways that enhance stockholder value, we may fail to achieve expected financial results, which could cause our stock price to decline.

Anti-takeover provisions under our charter documents and Delaware law could delay or prevent a change of control which could limit the market price of our common stock and may prevent or frustrate attempts by our stockholders to replace or remove our current management.

Our amended and restated certificate of incorporation and amended and restated bylaws, which are to become effective at or prior to the closing of this offering, contain provisions that could delay or prevent a

change of control of our company or changes in our board of directors that our stockholders might consider favorable. Some of these provisions include:

- a board of directors divided into three classes serving staggered three-year terms, such that not all members of the board will be elected at one time;
- a prohibition on stockholder action through written consent, which requires that all stockholder actions be taken at a meeting of our stockholders;
- a requirement that special meetings of stockholders be called only by the chairman of the board of directors, the chief executive officer, or by a majority of the total number of authorized directors;
- advance notice requirements for stockholder proposals and nominations for election to our board of directors;
- a requirement that no member of our board of directors may be removed from office by our stockholders except for cause and, in addition to any other vote required by law, upon the approval of the holders of not less than 75% of the votes that all our stockholders would be entitled to cast in an annual election of directors;
- a requirement of approval of not less than 75% of all outstanding shares of our voting stock to amend any bylaws by stockholder action or to amend specific provisions of our certificate of incorporation; and
- the authority of the board of directors to issue preferred stock on terms determined by the board of directors without stockholder approval and which preferred stock may include rights superior to the rights of the holders of common stock.

In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporate Law, which may prohibit certain business combinations with stockholders owning 15% or more of our outstanding voting stock. These anti-takeover provisions and other provisions in our amended and restated certificate of incorporation and amended and restated bylaws could make it more difficult for stockholders or potential acquirors to obtain control of our board of directors or initiate actions that are opposed by the then-current board of directors and could also delay or impede a merger, tender offer or proxy contest involving our company. These provisions could also discourage proxy contests and make it more difficult for you and other stockholders to elect directors of your choosing or cause us to take other corporate actions you desire. Any delay or prevention of a change of control transaction or changes in our board of directors could cause the market price of our common stock to decline.

Our bylaws to be effective upon the consummation of this offering designate certain courts as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers, or employees.

Pursuant to our amended and restated bylaws, to be effective upon the completion of this offering, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware (or, if the Chancery Court does not have jurisdiction, the federal district court for the District of Delaware or other state courts of the State of Delaware) will be the sole and exclusive forum for state law claims for: (i) any derivative action or proceeding brought on our behalf; (ii) any action asserting a claim of breach of a fiduciary duty or other wrongdoing by any of our directors, officers, employees or agents to us or our stockholders; (iii) any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law or our certificate of incorporation or bylaws; (iv) any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or bylaws; or (v) any action asserting a claim governed by the internal affairs doctrine. This exclusive forum provision will not apply to any causes of action arising under the Securities Act or the Exchange Act. In addition, our amended and restated bylaws will provide that any person or entity purchasing

or otherwise acquiring any interest in shares of our common stock is deemed to have notice of and consented to the foregoing provisions. We recognize that the forum selection clause in our bylaws may impose additional litigation costs on stockholders in pursuing any such claims, particularly if the stockholders do not reside in or near the State of Delaware. Additionally, the forum selection clauses in our amended and restated bylaws may limit our stockholders' ability to bring a claim in a forum that they find favorable for disputes with us or our directors, officers or employees, which may discourage such lawsuits against us and our directors, officers and employees even though an action, if successful, might benefit our stockholders. The Court of Chancery of the State of Delaware may also reach different judgments or results than would other courts, including courts where a stockholder considering an action may be located or would otherwise choose to bring the action, and such judgments may be more or less favorable to us than our stockholders. Alternatively, if a court were to find the choice of forum provision contained in our amended and restated bylaws to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions, which could materially adversely affect our business, financial condition and operating results.

If securities or industry analysts do not publish research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

The trading market for our common stock will depend in part on the research and reports that securities or industry analysts publish about us or our business. Securities and industry analysts do not currently, and may never, publish research on our company. If no securities or industry analysts commence coverage of our company, the trading price for our stock would likely be negatively impacted. In the event securities or industry analysts initiate coverage, if one or more of the analysts who covers us downgrades our stock or publishes inaccurate or unfavorable research about our business, our stock price may decline. If one or more of these analysts ceases coverage of our company or fails to publish reports on us regularly, demand for our stock could decrease, which might cause our stock price and trading volume to decline.

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This prospectus, including the sections entitled "Prospectus Summary," "Risk Factors," "Management's Discussion and Analysis of Financial Condition and Results of Operations" and "Business," contains express or implied forward-looking statements that are based on our management's belief and assumptions and on information currently available to our management. Although we believe that the expectations reflected in these forward-looking statements are reasonable, these statements relate to future events or our future operational or financial performance, and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by these forward-looking statements. Forward-looking statements in this prospectus include, but are not limited to, statements about:

- the timing of our planned IND submission for DSG3-CAART;
- the success, cost and timing and conduct of our clinical trial program, initially our planned Phase 1 clinical trial of DSG3-CAART, and our other product candidates, including statements regarding the timing of initiation and completion of the clinical trials and the period during which the results of the clinical trials will become available;
- the timing of and our ability to obtain and maintain regulatory approval of our product candidates, including DSG3-CAART, MuSK-CAART and DSG3/1-CAART, in any of the indications for which we plan to develop them, and any related restrictions, limitations, and/or warnings in the label of an approved product candidate;
- our plans to pursue research and development of other product candidates;
- our plan to infuse our DSG3-CAART product candidate without lymphodepletion or other preconditioning agents initially in our planned Phase 1 clinical trial;
- the potential advantages of our CABA platform and our product candidates;
- the extent to which our scientific approach and CABA platform may potentially address a broad range of diseases;
- the potential benefits and success of our arrangements with Penn and CHOP and our scientificco-founders, Drs. Milone and Payne;
- our ability to successfully commercialize our product candidates, including DSG3-CAART and our other product candidates;
- the potential receipt of revenue from future sales of DSG3-CAART and our other product candidates;
- the rate and degree of market acceptance and clinical utility of DSG3-CAART and our other product candidates;
- our estimates regarding the potential market opportunity for DSG3-CAART and our other product candidates, and our ability to serve those markets;
- our sales, marketing and distribution capabilities and strategy, whether alone or with potential future collaborators;
- our ability to establish and maintain arrangements or a facility for manufacture of DSG3-CAART and our other product candidates;
- our ability to obtain funding for our operations, including funding necessary to initiate and complete our planned Phase 1 clinical trial of DSG3-CAART and our ongoing preclinical studies of MuSK-CAART, DSG3/1-CAART and FVIII-CAART;
- the potential achievement of milestones and receipt of payments under our collaborations;
- our ability to enter into additional collaborations with existing collaborators or other third parties;

- our expectations regarding our ability to obtain and maintain intellectual property protection for our product candidates and our ability to operate our business without infringing on the intellectual property rights of others;
- the success of competing therapies that are or become available, and our competitive position;
- our expectations related to the use of proceeds from this offering;
- the accuracy of our estimates regarding expenses, future revenues, capital requirements and needs for additional financing
- the impact of government laws and regulations in the United States and foreign countries; and
- our ability to attract and retain key scientific or management personnel.

In some cases, forward-looking statements can be identified by terminology such as “may,” “should,” “expects,” “intends,” “plans,” “anticipates,” “believes,” “estimates,” “predicts,” “potential,” “continue” or the negative of these terms or other comparable terminology. These statements are only predictions. You should not place undue reliance on forward-looking statements because they involve known and unknown risks, uncertainties and other factors, which are, in some cases, beyond our control and which could materially affect results. Factors that may cause actual results to differ materially from current expectations include, among other things, those listed under the section entitled “Risk Factors” and elsewhere in this prospectus. If one or more of these risks or uncertainties occur, or if our underlying assumptions prove to be incorrect, actual events or results may vary significantly from those implied or projected by the forward-looking statements. No forward-looking statement is a guarantee of future performance. You should read this prospectus and the documents that we reference in this prospectus and have filed with the Securities and Exchange Commission as exhibits to the registration statement, of which this prospectus is a part, completely and with the understanding that our actual future results may be materially different from any future results expressed or implied by these forward-looking statements.

The forward-looking statements in this prospectus represent our views as of the date of this prospectus. We anticipate that subsequent events and developments will cause our views to change. However, while we may elect to update these forward-looking statements at some point in the future, we have no current intention of doing so except to the extent required by applicable law. You should therefore not rely on these forward-looking statements as representing our views as of any date subsequent to the date of this prospectus.

This prospectus includes statistical and other industry and market data that we obtained from industry publications and research, surveys and studies conducted by third parties. Information that is based on estimates, forecasts, projections, market research or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances that are assumed in this information. Unless otherwise expressly stated, we obtained this industry, business, market, and other data from our own internal estimates and research as well as from reports, research surveys, studies, and similar data prepared by market research firms and other third parties, industry, medical and general publications, government data and similar sources. While we are not aware of any misstatements regarding any third-party information presented in this prospectus, their estimates, in particular, as they relate to projections, involve numerous assumptions, are subject to risks and uncertainties and are subject to change based on various factors, including those discussed under the section titled “Risk Factors” and elsewhere in this prospectus.

USE OF PROCEEDS

We estimate that the net proceeds from our sale of shares of our common stock in this offering will be approximately $ million, or $ million if the underwriters exercise in full their option to purchase additional shares, assuming an initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the net proceeds to us from this offering by $ million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. An increase (decrease) of 1.0 million shares in the number of shares offered by us, as set forth on the cover page of this prospectus, would increase (decrease) our net proceeds from this offering by $ million, assuming no change in the assumed initial public offering price per share and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. We do not expect that a change in the offering price or the number of shares by these amounts would have a material effect on our intended uses of the net proceeds from this offering, although it may impact the amount of time prior to which we may need to seek additional capital.

As of June 30, 2019, we had cash and cash equivalents of $75.3 million. We currently intend to use the net proceeds from this offering, together with our existing cash and cash equivalents, as follows:

- approximately $ million for the advancement of DSG3-CAART, our lead product candidate;
- approximately $ million for the advancement of our other product candidates;
- approximately $ million for establishment of our planned manufacturing facility; and
- the remainder, if any, to fund working capital and other general corporate purposes.

Based on our current plans, we believe our existing cash, together with the net proceeds from this offering, will be sufficient to fund our operations through .

This expected use of the net proceeds from this offering represents our intentions based upon our current plans and business conditions, which could change in the future as our plans and business conditions evolve. For example, we may use a portion of the net proceeds for the acquisition of businesses or technologies to continue to build our pipeline, our research and development capabilities and our intellectual property position, although we currently have no agreements, commitments or understandings with respect to any such transaction. We cannot predict with certainty all of the particular uses for the net proceeds to be received upon the completion of this offering or the amounts that we will actually spend on the uses set forth above. The amounts and timing of our actual expenditures may vary significantly depending on numerous factors, including the progress of our research and development, the status of and results from non-clinical studies or clinical trials we may commence in the future, as well as any collaborations that we may enter into with third parties for our product candidates or strategic opportunities that become available to us, and any unforeseen cash needs. As a result, our management will retain broad discretion over the allocation of the net proceeds from this offering.

Pending our use of proceeds from this offering, we intend to invest the net proceeds in a variety of capital preservation instruments, including short-term, investment-grade, interest-bearing instruments and U.S. government securities.

DIVIDEND POLICY

We have never declared or paid any cash dividends on our capital stock. We currently intend to retain all available funds and any future earnings to support our operations and finance the growth and development of our business, and therefore do not intend to pay cash dividends on our common stock for the foreseeable future. Any future determination related to dividend policy will be made at the discretion of our board of directors and will depend on, among other factors, our results of operations, financial condition, capital requirements, contractual restrictions, business prospects and other factors our board of directors may deem relevant. Investors should not purchase our common stock with the expectation of receiving cash dividends.

CAPITALIZATION

The following table sets forth our cash and restricted cash and total capitalization as of June 30, 2019:

- on an actual basis;
- on a pro forma basis to give effect to (i) the automatic conversion of all outstanding shares of our preferred stock into an aggregate of 19,356,835 shares of common stock upon the completion of this offering and (ii) the filing and effectiveness of our amended and restated certificate of incorporation; and
- on a pro forma as adjusted basis to give further effect to our sale and issuance of shares of common stock in this offering, at the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The pro forma as adjusted information below is illustrative only, and our capitalization following the completion of this offering will be adjusted based on the actual initial public offering price and other terms of this offering determined at pricing.

You should read this table together with "Use of Proceeds," "Selected Financial Information," "Management's Discussion and Analysis of Financial Condition and Results of Operations" and our financial statements and related notes included elsewhere in this prospectus.

	As of June 30, 2019		
(in thousands, except shares and per share data)	**Actual**	**Pro Forma**	**Pro Forma As Adjusted**
	(in thousands, except share and per share data)		
Cash	$ 75,258	$ 75,258	$
Convertible preferred stock (Series A, A-1, A-2 and B), $0.00001 par value; 20,762,168 shares authorized, 19,356,835 shares issued and outstanding, actual; no shares authorized, issued or outstanding, pro forma and pro forma as adjusted	$ 97,954	—	
Stockholders' (deficit) equity:			
Common stock, $0.00001 par value; 29,000,000 shares authorized, 5,772,484 shares issued and outstanding, actual; pro forma as adjusted	—		
Additional paid-in capital	—	97,954	
Accumulated deficit	(21,994)	(21,944)	
Total stockholders' (deficit) equity	(21,994)	75,960	
Total capitalization	$ 75,960	$ 75,960	$

A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the pro forma as adjusted amount of cash and restricted cash, additional paid-in capital, total stockholders' equity and total capitalization by approximately $ million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of 1.0 million shares in the number of shares offered by us in this offering would increase (decrease) the pro forma as adjusted amount of cash and restricted cash, additional paid-in capital, total stockholders' equity and total capitalization by approximately $ million, assuming the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

The table above excludes the following shares:

- 2,435,545 shares of common stock issuable upon the exercise of stock options outstanding as of June 30, 2019, at a weighted average exercise price of $1.97 per share;
- 291,454 shares of common stock available for future issuance under our 2018 Stock Option and Grant Plan, or 2018 Plan, as of June 30, 2019;
- shares of common stock that will be made available for future issuance under our 2019 Stock Option and Grant Plan, or 2019 Plan, upon the effectiveness of the registration statement of which this prospectus forms a part; and
- shares of common stock that will be made available for future issuance under our 2019 Employee Stock Purchase Plan, or 2019 ESPP, upon the effectiveness of the registration statement of which this prospectus forms a part.

DILUTION

If you invest in our common stock in this offering, your ownership interest will be immediately diluted to the extent of the difference between the initial public offering price per share of our common stock and the pro forma as adjusted net tangible book value per share of our common stock immediately after this offering.

As of June 30, 2019, our historical net tangible book value (deficit) was $(23.1) million, or $(3.99) per share of our common stock. Net tangible book value (deficit) per share represents our total tangible assets (total assets less intangible assets) less total liabilities and preferred stock, divided by the total number of our outstanding shares of common stock as of June 30, 2019.

Our pro forma net tangible book value as of June 30, 2019 was approximately $74.9 million, or $2.98 per share of pro forma common stock. Pro forma net tangible book value (deficit) per share represents the amount of our total tangible assets (total assets less intangible assets) less total liabilities, divided by the total number of outstanding shares of our common stock as of June 30, 2019, after giving effect to the automatic conversion of all outstanding shares of our convertible preferred stock as of June 30, 2019 into an aggregate of 19,356,835 shares of common stock upon the completion of this offering.

After giving effect to (i) the pro forma adjustments set forth above and (ii) the sale and issuance of shares of common stock in this offering, at the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us, our pro forma as adjusted net tangible book value as of June 30, 2019 would have been approximately $ million, or $ per share of our common stock. This represents an immediate increase in pro forma net tangible book value of approximately $ per share to our existing stockholders and an immediate dilution of $ per share to investors.

Dilution per share to investors participating in this offering is determined by subtracting pro forma as adjusted net tangible book value per share after this offering from the initial public offering price per share paid by investors participating in this offering. The following table illustrates this dilution (without giving effect to any exercise by the underwriters of their option to purchase additional shares):

Assumed initial public offering price per share		$
Historical net tangible book value per share as of June 30, 2019	$(3.99)	
Increase in net tangible book value per share attributable to pro forma adjustments described above		
Pro forma net tangible book value per share as of June 30, 2019	$ 2.98	
Increase in pro forma net tangible book value per share attributable to investors participating in this offering		
Pro forma as adjusted net tangible book value per share immediately after this offering		
Dilution in pro forma as adjusted net tangible book value per share to new investors participating in this offering		$

The dilution information discussed above is illustrative and will change based on the actual initial public offering price and other terms of this offering determined at pricing. If the underwriters exercise their option to purchase additional shares in full, our pro forma as adjusted net tangible book value per share after this offering would be approximately $ per share, and the dilution in pro forma as adjusted net tangible book value per share to new investors participating in this offering would be $ per share.

A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the pro forma as

adjusted net tangible book value by $ per share and the dilution to investors participating in this offering by $ per share, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated expenses payable by us.

Similarly, each increase (decrease) of 1.0 million shares in the number of shares offered by us in this offering would increase (decrease) the pro forma as adjusted net tangible book value by $ per share and the dilution to investors participating in this offering by $ per share, assuming the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated expenses payable by us.

The following table summarizes, on a pro forma as adjusted basis as of June 30, 2019, the differences between the number of shares of common stock purchased from us, the total cash consideration and the average price per share paid to us by existing stockholders and by new investors purchasing shares in this offering, at the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover of this prospectus before deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. As the table shows, new investors purchasing shares of common stock in this offering will pay an average price per share substantially higher than our existing investors paid.

	SHARES PURCHASED		TOTAL CONSIDERATION		AVERAGE PRICE PER SHARE
	NUMBER	PERCENT	AMOUNT	PERCENT	
Existing stockholders		%	$	%	$
New investors participating in this offering					
Total		100%	$	100%	

If the underwriters exercise their option to purchase additional shares in full, the number of shares of common stock held by existing stockholders will be reduced to % of the total number of shares of common stock to be outstanding after this offering, and the number of shares of common stock held by investors participating in this offering will be further increased to % of the total number of shares of common stock to be outstanding after this offering.

The above discussion and tables are based on 5,772,484 shares of common stock issued and outstanding as of June 30, 2019 and gives effect to the conversion of all of our outstanding preferred stock into shares of our common stock upon the completion of this offering and excludes:

- 2,435,545 shares of common stock issuable upon the exercise of stock options outstanding as of June 30, 2019, with a weighted average exercise price of $1.97 per share;
- 291,454 shares of common stock available for future issuance under our 2018 Plan as of June 30, 2019;
- shares of common stock that will be made available for future issuance under our 2019 Plan upon the effectiveness of the registration statement of which this prospectus forms a part; and
- shares of common stock that will be made available for future issuance under our 2019 ESPP upon the effectiveness of the registration statement of which this prospectus forms a part.

A $1.00 increase (decrease) in the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, would increase (decrease) the total consideration paid by investors in this offering by approximately $ million, assuming the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us. Similarly, each increase (decrease) of

1.0 million shares in the number of shares offered by us in this offering would increase (decrease) the total consideration paid by investors in this offering by approximately $ million, assuming the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, remains the same, and after deducting estimated underwriting discounts and commissions and estimated offering expenses payable by us.

To the extent that outstanding options are exercised or shares are issued under our equity incentive plans, you will experience further dilution. In addition, we may choose to raise additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. To the extent that additional capital is raised through the sale of equity or convertible debt securities, the issuance of these securities may result in further dilution to our stockholders.

SELECTED FINANCIAL INFORMATION

The statements of operations and comprehensive loss data for the period from April 3, 2017 (inception) to December 31, 2017 and for the year ended December 31, 2018 and the balance sheet data as of December 31, 2017 and 2018 have been derived from our audited financial statements included elsewhere in this prospectus. The statements of operations and comprehensive loss data for the six months ended June 30, 2018 and 2019 and the balance sheet data as of June 30, 2019 have been derived from our unaudited financial statements included elsewhere in this prospectus and have been prepared on the same basis as the audited financial statements. In the opinion of management, the interim data reflect all normal recurring adjustments necessary for the fair presentation of the financial information in those statements. You should read this data together with our financial statements and related notes included elsewhere in this prospectus and in the section of this prospectus titled "Management's Discussion and Analysis of Financial Condition and Results of Operations." Our historical results are not necessarily indicative of the results to be expected in the future, and results for the six-month period ended June 30, 2019 are not necessarily indicative of the results to be expected for the full year ending December 31, 2019.

	Period from April 3, 2017 (inception) to December 31, 2017	December 31, 2018	Six Months Ended June 30,	
			2018	2019
	(in thousands, except share and per share data)			
Statements of Operations Data:				
Operating expenses:				
Research and development	$ —	$ 4,467	$ 639	$ 5,425
General and administrative	250	1,726	409	2,367
Total operating expenses	250	6,193	1,048	7,792
Loss from operations	(250)	(6,193)	(1,048)	(7,792)
Other income and (expense):				
Interest income	—	235	27	902
Fair value adjustments on convertible notes	—	(6,244)	—	—
Net loss	(250)	(12,202)	(1,021)	(6,890)
Deemed dividend	—	—	—	(5,326)
Net loss to common stockholders	$ (250)	$ (12,202)	$ (1,021)	$ (12,216)
Net loss per share, basic and diluted(1)	$ (0.12)	$ (4.58)	(0.29)	(4.99)
Weighted-average shares used in computing net loss per share, basic and diluted(1)	2,052,588	2,663,207	3,548,955	2,448,788
Pro forma net loss per share, basic and diluted(1)		$ (2.24)		$ (0.56)
Weighted-average shares used in computing pro forma net loss per share, basic and diluted(1)		5,447,398		21,768,343

(1) See Notes 2 and 10 to our audited financial statements and Notes 2 and 10 to our unaudited interim financial statements included elsewhere in this prospectus for a description of how we compute basic and diluted net loss per share and basic and diluted pro forma net loss per share, and the weighted-average number of shares used in the computation of these per share amounts.

	As of December 31,		As of June 30,
	2017	2018	2019
		(in thousands)	
Balance Sheet Data:			
Cash and cash equivalents	$ 1	$ 33,017	$ 75,258
Total assets	1	34,174	77,836
Working capital(1)	(249)	33,051	74,446
Total liabilities	250	943	1,876
Convertible preferred stock	—	43,921	97,954
Accumulated deficit	(250)	(12,452)	(21,994)
Total stockholders' deficit equity	(249)	(10,690)	(21,994)

(1) We define working capital as current assets less current liabilities. See our financial statements and related notes included elsewhere in this prospectus for further details regarding our current assets and current liabilities.

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

You should read the following discussion and analysis of our financial condition and results of operations together with the section entitled "Selected Financial Information" and our financial statements and related notes appearing elsewhere in this prospectus. Some of the information contained in this discussion and analysis or set forth elsewhere in this prospectus, including information with respect to our plans and strategy for our business and related financing, includes forward-looking statements that involve risks and uncertainties. As a result of many factors, including those factors set forth in the section entitled "Risk Factors," our actual results could differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis. You should carefully read the section entitled "Risk Factors" to gain an understanding of the important factors that could cause actual results to differ materially from our forward-looking statements. Please also see the section entitled "Special Note Regarding Forward-Looking Statements."

Overview

We are a biotechnology company focused on the discovery and development of engineered T cell therapies for B cell-mediated autoimmune diseases. Our proprietary technology utilizes CAAR T cells that are designed to selectively bind and eliminate B cells that produce disease-causing autoantibodies, or pathogenic B cells, while sparing normal B cells. Our lead CAAR T cell product candidate was designed based on or CAR T cell technology that has been successfully developed and is marketed for the treatment of B cell cancers. We believe our technology, in combination with our proprietary Cabaletta Approach for selective B cell Ablation platform, called our CABA platform, has applicability across over two dozen B cell-mediated autoimmune diseases that we have identified, reviewed and prioritized. In order to accelerate product development for our lead program and to access a proven cell therapy manufacturing platform, we have entered into a collaboration with Penn. We hold multiple agreements with Penn to develop CAAR T cell therapies for the treatment of these diseases. Our goal is to leverage our team's expertise in autoimmunity and engineered T cell therapy and our collaboration with Penn to rapidly discover and develop our portfolio of CAAR T product candidates. Our initial focus is on pemphigus vulgaris, or PV, which is an autoimmune blistering skin disease. We plan to submit an IND to the FDA in the second half of 2019 and to advance our lead product candidate, DSG3-CAART, into a Phase 1 trial for the treatment of mucosal pemphigus vulgaris, or mPV, in 2020. We are also advancing additional product candidates currently in discovery-stage or preclinical development for the treatment of MuSK MG, mucocutaneous PV, or mcPV, and Hemophilia A with FVIII alloantibodies.

We were incorporated in April 2017. In August 2018, we entered into multiple agreements with Penn to develop the CAAR T technology to treat B cell-mediated autoimmune diseases. Our operations to date have been financed primarily by net proceeds of $86.4 million from the sale of convertible notes and convertible preferred stock. As of June 30, 2019, we had $75.3 million in cash and cash equivalents.

Since inception, we have had significant operating losses, much of which are attributable to research and development costs pursuant to sponsored research and research service agreements. Our net loss was $0.3 million for the period from April 3, 2017 (inception) through December 31, 2017, $12.2 million for the year ended December 31, 2018 and $6.9 million for the six month period ended June 30, 2019. As of June 30, 2019, we had an accumulated deficit of $22.0 million. Our primary use of cash is to fund operating expenses, which consist primarily of research and development expenditures and, to a lesser extent, general and administrative expenditures. Cash used to fund operating expenses is impacted by the timing of when we pay these expenses, as reflected in the change in our accounts payable and accrued expenses. We expect to continue to incur net losses for the foreseeable future, and we expect our research and development expenses, general and administrative expenses, and capital expenditures will continue to increase. In particular, we expect our expenses to increase as we continue our development of, and seek regulatory approvals for, our product candidates, and begin to commercialize any approved products, as well as hire additional personnel, develop commercial infrastructure, pay fees to outside consultants, lawyers and accountants, and incur increased costs associated with being a public

company such as expenses related to services associated with maintaining compliance with Nasdaq listing rules and SEC requirements, insurance and investor relations costs. Our net losses may fluctuate significantly from quarter-to-quarter and year-to-year, depending on the timing of our clinical trials and our expenditures on other research and development activities.

Based upon our current operating plan, we believe that the net proceeds from this offering, together with our existing cash and cash equivalents as of June 30, 2019, will enable us to fund our operating expenses and capital expenditure requirements through . To date, we have not had any products approved for sale and have not generated any product sales. We do not expect to generate any revenues from product sales unless and until we successfully complete development and obtain regulatory approval for one or more of our product candidates, which we expect will take a number of years. If we obtain regulatory approval for any of our product candidates, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution. As a result, until such time, if ever, as we can generate substantial product revenue, we expect to finance our cash needs through equity offerings, debt financings or other capital sources, including collaborations, licenses and other similar arrangements. However, we may be unable to raise additional funds or enter into such other arrangements when needed or on favorable terms, if at all. Any failure to raise capital as and when needed could have a negative impact on our financial condition and on our ability to pursue our business plans and strategies. If we are unable to raise capital, we will need to delay, reduce or terminate planned activities to reduce costs.

Amended and Restated License Agreement with The Trustees of the University of Pennsylvania

In July 2019, we entered into the License Agreement with Penn and CHOP, which we refer to as the Institutions, pursuant to which we obtained (a) a non-exclusive, non-sublicensable, worldwide research license to make, have made and use products in two subfields of use, (b) effective as of October 2018, an exclusive, worldwide, royalty-bearing license, with the right to sublicense, under certain of the Institutions' intellectual property to make, use, sell, offer for sale and import products in the same two subfields of use, and (c) effective as of October 2018, a non-exclusive, worldwide, royalty-bearing license, with limited rights to sublicense, under certain of Penn's know-how to make, have made, use, sell, offer for sale, import and have imported products in the same two subfields of use. Our rights are subject to the rights of the U.S. government and certain rights retained by the Institutions.

Unless earlier terminated, the License Agreement will expire with respect to a product upon the later of (a) the expiration of the last to expire patent or patent application covering such product or (b) 10 years after the first commercial sale of such product. We may terminate the License Agreement in its entirety or on a subfield-by-subfield basis at any time for convenience upon a certain number of days' written notice. Penn may terminate the License Agreement in its entirety or on a subfield-by-subfield basis for our uncured material breach, including for our failure to meet certain diligence obligations and milestone events. We, however, may extend the achievement date of any milestone event for an additional period of time by making a payment in a certain amount, subject to certain limitations in the number of times each event may be extended.

Sponsored Research Agreements

Penn

We have sponsored research agreements with Penn for the laboratories of Drs. Payne and Milone, who are also our scientific co-founders and members of our scientific advisory board. Under these agreements, we are committed to funding a defined research plan for three years through April 2021. The total estimated three-year cost of the two agreements is $8.5 million, which satisfies the $2.0 million annual obligation under the License Agreement.

The Regents of the University of California

In October 2018, we executed a research agreement with The Regents of the University of California. Under this agreement, we are committed to funding scientific research through October 2020.

Master Translational Research Service Agreements

In October 2018, we entered into a Services Agreement with Penn pursuant to which Penn agreed to perform certain services related to the research and development of the technology licensed to us under the License Agreement, as well as certain clinical, regulatory and manufacturing services. The research and development activities are detailed in Penn organization-specific addenda that are separately executed. The Services Agreement will expire on the later of (i) October 19, 2021 or (ii) completion of the services for which we have engaged Penn under the Services Agreement. As of December 31, 2018, we had executed three project addenda and the three projects are anticipated to commence and conclude in 2019. In January 2019, we executed two additional project addenda under the Services Agreement for manufacturing and development work. The two projects are anticipated to commence in 2019. The manufacturing addendum is expected to occur through June 2020. The development addendum is expected to occur through December 2019.

Components of Operating Results

Revenue

To date, we have not generated any revenue from product sales and do not expect to generate any revenue from the sales of products for several years, if at all. If our development efforts for our current or future product candidates are successful and result in marketing approval, we may generate revenue in the future from product sales. We cannot predict if, when or to what extent we will generate revenue from the commercialization and sale of our product candidates. We may never succeed in obtaining regulatory approval for any of our product candidates.

We may also in the future enter into license or collaboration agreements for our product candidates or intellectual property, and we may generate revenue in the future from payments as a result of such license or collaboration agreements.

Operating Expenses

Research and Development

Our research and development expenses include:

- personnel costs, which include salaries, benefits and stock-based compensation expense;
- expenses incurred under agreements with consultants, third-party contract organizations that conduct research and development activities on our behalf;
- costs related to sponsored research service agreements;
- costs related to production of preclinical and clinical materials, including fees paid to contract manufacturers;
- laboratory and vendor expenses related to the execution of preclinical studies and planned clinical trials; and
- laboratory supplies and equipment used for internal research and development activities.

We have not reported program costs since inception because historically we have not tracked or recorded our research and development expenses on a pre-clinical program-by-program basis. We use our personnel and infrastructure resources across the breadth of our research and development activities, which are directed toward identifying and developing product candidates.

We expense all research and development costs in the periods in which they are incurred. Costs for certain research and development activities are recognized based on an evaluation of the progress to completion of specific tasks using information and data provided to us by Penn, our vendors and third-party service providers.

We expect our research and development expenses to increase substantially for the foreseeable future as we continue to invest in research and development activities related to developing our product candidates, including investments in manufacturing, as our programs advance and we conduct clinical trials. The process of conducting the necessary clinical research to obtain regulatory approval is costly and time-consuming, and the successful development of our product candidates is highly uncertain. As a result, we are unable to determine the duration and completion costs of our research and development projects or when and to what extent we will generate revenue from the commercialization and sale of any of our product candidates.

Because of the numerous risks and uncertainties associated with product development, we cannot determine with certainty the duration and completion costs of the current or future preclinical studies and clinical trials or if, when, or to what extent we will generate revenues from the commercialization and sale of our product candidates. We may never succeed in achieving regulatory approval for our product candidates. The duration, costs and timing of preclinical studies and clinical trials and development of our product candidates will depend on a variety of factors, including:

- successful completion of preclinical studies and IND-enabling studies;
- development of chemistry, manufacturing and controls, or CMC, processes and procedures for purposes of IND applications;
- successful patient enrollment in, and the initiation and completion of, clinical trials;
- receipt of regulatory approvals from applicable regulatory authorities;
- establishing commercial manufacturing capabilities or arrangements with third-party manufacturers;
- obtaining and maintaining patent and trade secret protection and non-patent exclusivity;
- launching commercial sales of our product candidates, if and when approved, whether alone or in collaboration with others;
- acceptance of our product candidates, if and when approved, by patients, the medical community and third-party payors;
- effectively competing with other therapies and treatment options;
- a continued acceptable safety and efficacy profile following approval;
- enforcing and defending intellectual property and proprietary rights and claims; and
- achieving desirable medicinal properties for the intended indications.

We may never succeed in achieving regulatory approval for any of our product candidates. We may obtain unexpected results from our preclinical studies and clinical trials. We may elect to discontinue, delay or modify clinical trials of some product candidates or focus on others. A change in the outcome of any of these factors could mean a significant change in the costs and timing associated with the development of our current and future preclinical and clinical product candidates. For example, if the FDA or another regulatory authority, were to require us to conduct clinical trials beyond those that we currently anticipate will be required for the completion of clinical development, or if we experience significant delays in execution of or enrollment in any of our preclinical studies or clinical trials, we could be required to expend significant additional financial resources and time on the completion of preclinical and clinical development. We expect our research and development expenses to increase for the foreseeable future as we continue the development of product candidates.

General and Administrative Expenses

Our general and administrative expenses consist primarily of personnel costs, costs related to maintenance and filing of intellectual property, depreciation expense and other expenses for outside professional services, including legal, human resources, audit and accounting services. Personnel costs consist of salaries, benefits and stock-based compensation expense. We expect our general and administrative expenses to increase over the next several years to support our continued research and development activities, manufacturing activities, increased costs of operating as a public company and the potential commercialization of our product candidates. We anticipate our general and administrative costs will increase and with respect to the hiring of additional personnel, developing commercial infrastructure, fees to outside consultants, lawyers and accountants, and increased costs associated with being a public company such as expenses related to services associated with maintaining compliance with Nasdaq listing rules and SEC requirements, insurance and investor relations costs.

Other Income and (Expense)

Our other income and (expense) includes (i) interest income earned on cash reserves in our operating account; and (ii) fair value adjustments on convertible notes for which we have elected the fair value option of accounting.

Results of Operations for the six months ended June 30, 2018 and 2019

The following sets forth our results of operations for the six months ended June 30, 2018 and 2019:

	Six Months Ended June 30,	
	2018	2019
	(in thousands)	
Statements of Operations Data:		
Operating expenses:		
Research and development	$ 639	$ 5,425
General and administrative	409	2,367
Total operating expenses	1,048	7,792
Loss from operations	(1,048)	(7,792)
Other income and (expense):		
Interest income	27	902
Net loss	$ (1,021)	$ (6,890)

Research and Development Expenses

Research and development expenses were $0.6 million for the six months ended June 30, 2018 as compared to $5.4 million for the six months ended June 30, 2019. The increase of $4.8 million in our research and development expenses period-on-period reflects that our principal operations did not commence until April 2018 when we entered into two SRAs with Penn. Specific increases in our research and development expenses period-on-period include:

- $1.7 million for manufacturing of preclinical and clinical supplies;
- $1.3 million of personnel costs, including $0.5 million of stock-based compensation expense;
- $0.9 million with respect to sponsored research activities; and
- $0.9 million of development services, including preclinical testing, clinical operations and regulatory.

General and Administrative Expenses

General and administrative expenses were $0.4 million for the six months ended June 30, 2018 as compared to $2.4 million for the six months ended June 30, 2019. The increase of $2.0 million in our general and administrative expenses period-on-period includes:

- $0.8 million increased costs of services, including legal, audit and accounting, public relations, recruiting and other consulting fees;
- $0.9 million of increased costs related to personnel, including $0.3 million of stock-based compensation expense; and
- $0.3 million increase in other general and administrative expenses.

Other Income and (Expense)

Other income or (expense) for the six month periods ended June 30, 2018 and 2019 comprises interest income which has increased $0.9 million deriving from our increased cash resulting from proceeds received from our issuances of our convertible notes in May 2018 and convertible preferred stock in October 2018 and January 2019.

Results of Operations for the period from April 3, 2017 (inception) to December 31, 2017 and year ended December 31, 2018

The following sets forth our results of operations for the period from April 3, 2017 (inception) to December 31, 2017:

	Period from April 3, 2017 (inception) to December 31, 2017	Year Ended December 31, 2018
	(in thousands)	
Statements of Operations Data:		
Operating expenses:		
Research and development	$ —	$ 4,467
General and administrative	250	1,726
Total operating expenses	250	6,193
Loss from operations	(250)	(6,193)
Other income and (expense):		
Interest income	—	235
Fair value adjustments on convertible notes	—	(6,244)
Net loss	$ (250)	$ (12,202)

Research and Development Expenses

Research and development expenses were $0 for the period from April 3, 2017 (inception) to December 31, 2017, as our principal operations did not commence until April 2018 when we entered into two SRAs with Penn. Research and development expenses increased to $4.5 million for the year ended December 31, 2018 and include:

- $2.0 million for sponsored research activities;
- $1.2 million for the license of intellectual property from Penn in exchange for shares of our common stock;

- $0.7 million for manufacturing of preclinical and clinical supplies;
- $0.5 million of personnel costs, including $0.5 million of stock-based compensation expense; and
- $0.1 million for services and other expenses.

General and Administrative Expenses

General and administrative expenses were $0.3 million for the period from April 3, 2017 (inception) through December 31, 2017 related to services to us, comprised of:

- $0.2 million of legal fees; and
- $0.1 million in consulting and other services.

General and administrative expenses increased to $1.7 million for the year ended December 31, 2018, and were primarily comprised of:

- $1.2 million for legal, accounting, consulting, recruiting and other services;
- $0.4 million of personnel costs, including $0.2 million of stock-based compensation expense; and
- $0.1 million for other general and administrative expenses.

Other Income and (Expense)

We had no other income or (expense) for the period from April 3, 2017 (inception) to December 31, 2017. Our other income and (expense) for the year ended December 31, 2018 includes:

- interest income of $0.2 million earned on cash reserves in our operating account; and
- fair value adjustments on our convertible notes for which we have elected the fair value option of accounting.

Liquidity and Capital Resources

Since our inception in April 2017 through June 30, 2019, our operations have been financed by proceeds of $86.4 million from the sale of convertible notes and our convertible preferred stock. As of June 30, 2019, we had $75.3 million in cash and cash equivalents. Cash in excess of immediate requirements is invested in accordance with our investment policy, primarily with a view to liquidity and capital preservation.

We have incurred losses since our inception and, as of June 30, 2019, we had an accumulated deficit of $22.0 million. Our primary use of cash is to fund operating expenses, which consist primarily of research and development expenditures, and to a lesser extent, general and administrative expenditures. Cash used to fund operating expenses is impacted by the timing of when we pay these expenses, as reflected in the change in our outstanding accounts payable and accrued expenses.

Any product candidates we may develop may never achieve commercialization and we anticipate that we will continue to incur losses for the foreseeable future. We expect that our research and development expenses, general and administrative expenses, and capital expenditures will continue to increase. As a result, until such time, if ever, as we can generate substantial product revenue, we expect to finance our cash needs through a combination of equity offerings, debt financings or other capital sources, including potentially collaborations, licenses and other similar arrangements. Our primary uses of capital are, and we expect will continue to be, compensation and related expenses, third-party clinical research, manufacturing and development services, costs relating to the build-out of our headquarters, laboratories and manufacturing facility, license payments or milestone obligations that may arise, laboratory and related supplies, clinical costs, manufacturing costs, legal and other regulatory expenses and general overhead costs.

Based upon our current operating plan, we believe that the net proceeds from this offering, together with our existing cash and cash equivalents as of June 30, 2019, will enable us to fund our operating expenses and capital expenditure requirements through at least from the date of this offering. We have based this estimate on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we currently expect. We will continue to require additional financing to advance our current product candidates through clinical development, to develop, acquire or in-license other potential product candidates and to fund operations for the foreseeable future. We will continue to seek funds through equity offerings, debt financings or other capital sources, including potentially collaborations, licenses and other similar arrangements. However, we may be unable to raise additional funds or enter into such other arrangements when needed on favorable terms or at all. If we do raise additional capital through public or private equity offerings, the ownership interest of our existing stockholders, including investors in this offering, will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect our stockholders' rights. If we raise additional capital through debt financing, we may be subject to covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. Any failure to raise capital as and when needed could have a negative impact on our financial condition and on our ability to pursue our business plans and strategies. If we are unable to raise capital, we will need to delay, reduce or terminate planned activities to reduce costs.

Because of the numerous risks and uncertainties associated with research, development and commercialization of pharmaceutical products, we are unable to estimate the exact amount of our operating capital requirements. Our future funding requirements will depend on many factors, including, but not limited to:

- the scope, progress, results and costs of researching, developing and manufacturing our lead product candidates or any future product candidates, and conducting preclinical studies and clinical trials;
- the timing of, and the costs involved in, obtaining regulatory approvals or clearances for our lead product candidates or any future product candidates;
- the number and characteristics of any additional product candidates we develop or acquire;
- the timing of any cash milestone payments if we successfully achieve certain predetermined milestones;
- the cost of manufacturing our lead product candidate or any future product candidates and any products we successfully commercialize, including costs associated with building-out our manufacturing capabilities;
- our ability to establish and maintain strategic collaborations, licensing or other arrangements and the financial terms of any such agreements that we may enter into;
- the expenses needed to attract and retain skilled personnel;
- the costs associated with being a public company; and
- the timing, receipt and amount of sales of any future approved or cleared products, if any.

Further, our operating plans may change, and we may need additional funds to meet operational needs and capital requirements for clinical trials and other research and development activities. We currently have no credit facility or committed sources of capital. Because of the numerous risks and uncertainties associated with the development and commercialization of our product candidates, we are unable to estimate the amounts of increased capital outlays and operating expenditures associated with our current and anticipated product development programs.

Cash Flows

The following table summarizes our cash flows for the periods indicated:

	Period from April 3, 2017 (inception) to December 31, 2017	Year Ended December 31, 2018	Six Months Ended June 30, 2018	Six Months Ended June 30, 2019
		(in thousands)		
Net cash provided by (used in):				
Operating activities	$ —	$ (4,661)	$ (1,686)	$ (6,086)
Investing activities	—	—	—	(380)
Financing activities	1	37,677	12,535	48,707
Net increase in cash and cash equivalents	$ 1	$ 33,016	$10,849	$42,241

Operating Activities

During the period from April 3, 2017 (inception) through December 31, 2017, cash used in operating activities of $0 was attributable to a net loss of $0.3 million offset by a net change of $0.3 million in our net operating assets and liabilities.

During the year ended December 31, 2018, cash used in operating activities of $4.7 million was attributable to:

- our net loss of $12.2 million;
- largely offset by non-cash charges of $8.0 million for changes in fair value of our convertible notes, common stock issued for the Penn license and stock-based compensation charges; and
- increased by the net change of $0.5 million in our net operating assets and liabilities.

During the six months ended June 30, 2018, cash used in operating activities of $1.7 million was attributable to:

- our net loss of $1.0 million;
- offset by non-cash charges of $0.1 million with respect to stock-based compensation charges; and
- increased by the net change of $0.8 million in our net operating assets and liabilities.

During the six months ended June 30, 2019, cash used in operating activities of $6.1 million was attributable to:

- our net loss of $6.9 million;
- offset by non-cash charges of $0.9 million for stock-based compensation charges and depreciation; and
- increased by the net change of $0.1 million in our net operating assets and liabilities.

Investing Activities

We had no investing activities during the period from April 3, 2017 (inception) through December 31, 2017, the year ended December 31, 2018 or the six months ended June 30, 2018. For the six month period ended June 30, 2019, we used $0.4 million of cash and cash equivalents in investing activities consisting of purchases of property and equipment.

Financing Activities

During the period from April 3, 2017 (inception) through December 31, 2017, cash provided by financing activities amounted to $1 thousand in the issuance of vested and non-vested, restricted common stock to our founders.

During the year ended December 31, 2018, cash provided by financing activities amounted to $37.7 million comprised of:

- $12.5 million of proceeds upon the issuance of convertible notes in May 2018;
- $12.6 million of proceeds on the milestone closing of the convertible notes and issuance of our SeriesA-1 convertible preferred stock in October 2018; and
- $12.6 million net proceeds upon the issuance of our Series A convertible preferred stock in October 2018.

For the six months ended June 30, 2018, our financing activities provided $12.5 million of proceeds upon the issuance of convertible notes in May 2018.

For the six months ended June 30, 2019, our financing activities provided $48.7 million of proceeds upon the issuance of Series B convertible preferred stock in January 2019.

Critical Accounting Policies and Significant Judgments and Estimates

Our management's discussion and analysis of our financial condition and results of operations is based on our financial statements, which have been prepared in accordance with generally accepted accounting principles, or GAAP. The preparation of these financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements, as well as the reported expenses incurred during the reporting periods. Our estimates are based on our historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions. We believe that the accounting policies discussed below are critical to understanding our historical and future performance, as these policies relate to the more significant areas involving management's judgments and estimates.

Research and Development Costs

We estimate costs of research and development activities conducted by service providers, which include activities under the License Agreement, the conduct of sponsored research, preclinical studies and contract manufacturing activities. We record the estimated costs of research and development activities based upon the estimated amount of services provided but not yet invoiced and include these costs in the accrued and other current liabilities or prepaid expenses on the balance sheets and within research and development expense on the statements of operations.

We estimate these costs based on factors such as estimates of the work completed and budget provided and in accordance with agreements established with our collaboration partners and third-party service providers. We make significant judgments and estimates in determining the accrued liabilities and prepaid expense balances in each reporting period. As actual costs become known, we adjust our accrued liabilities or prepaid expenses. We have not experienced any material differences between accrued costs and actual costs incurred since our inception.

Stock-based Compensation

We recognize compensation costs related to stock-based awards, including stock options andnon-vested stock, based on the estimated fair value of the awards on the date of grant. We estimate the grant date fair value, and the resulting stock-based compensation, using the Black-Scholes option-pricing model, or Black-Scholes. The grant date fair value of the stock-based awards is generally recognized on a straight-line basis over the requisite service period, which is generally the vesting period of the respective awards.

Black-Scholes requires the use of subjective assumptions to determine the fair value of stock-based awards. These assumptions include:

- *Fair Value of Common Stock*—Historically, for all periods prior to this initial public offering, the fair value of the shares of common stock underlying our stock-based awards was estimated on each grant date by our board of directors. In order to determine the fair value of our common stock underlying option grants, our board of directors considered, among other things, valuations of our common stock prepared by an unrelated third-party valuation firm in accordance with the guidance provided by the American Institute of Certified Public Accountants Practice Guide, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation*, or the Practice Aid.
- *Expected Term*—The expected term represents the period that stock-based awards are expected to be outstanding. The expected term for option grants is determined using the simplified method. The simplified method deems the expected term to be the midpoint between the vesting date and the contractual life of the stock-based awards.
- Expected Volatility—Since we have been a privately held company and do not have any trading history for our common stock, the expected volatility is estimated based on the average volatility for comparable publicly traded biotechnology companies over a period equal to the expected term of the stock option grants. The comparable companies were chosen based on their similar size, stage in the life cycle or area of specialty. We will continue to apply this process until a sufficient amount of historical information regarding the volatility of our own stock price becomes available.
- Risk-Free Interest Rate—The risk-free interest rate is based on the U.S. Treasury zero coupon issues in effect at the time of grant for periods corresponding with the expected term of option.
- Expected Dividend—We have never paid dividends on our common stock and have no plans to pay dividends on our common stock. Therefore, we used an expected dividend yield of zero.

The fair value of each of our awards for the period from April 3, 2017 (inception) through June 30, 2019 has been estimated using Black-Scholes based on the following assumptions:

Risk-free interest rate	1.82%—2.96%
Expected term (in years)	5.5—6.2
Expected volatility	70.3%—73.2%
Expected dividend yield	—%

We will continue to use judgment in evaluating the assumptions utilized for our stock-based compensation expense calculations on a prospective basis. In addition to the assumptions used in Black-Scholes, the amount of stock-based compensation expense we recognize in our financial statements includes stock option forfeitures as they occurred.

The following table details stock-based awards that we granted since inception:

Grant Date	Type of Award	Number of Shares Subject to Awards Granted	Per share Exercise Price or Purchase Price	Estimate of Common Stock Fair Value per Share on Grant Date
August 2017–January 2018	Restricted common stock and non-vested, restricted common stock	694,506	$ 0.0001	$ 0.0001—0.262[1]
May 2018	Non-vested, restricted common stock	4,356,000	$ 0.0001	0.492
October 2018	Options	1,367,023	$ 0.67	1.603
November 2018	Options	90,000	$ 0.67	1.603
January 2019	Options	208,922	$ 2.82	3.454
February 2019	Options	97,331	$ 4.20	4.205
March 2019	Options	193,141	$ 4.20	4.205
May 2019	Options	200,565	$ 4.20	4.205
June 2019	Options	278,563	$ 4.20	4.205

(1) *De minimis* value as principal operations had not yet commenced.

(2) In connection with the issuance of convertible notes in May 2018, awards with respect to 4,356,000 shares of common stock issued in August 2017 were amended to include vesting provisions that require continued service to us in order to vest in those shares. As such, the modified shares of common stock became compensatory upon such modification. The fair value of each award on the modification date was determined to be $0.49 per share of common stock by calibrating to the recent convertible note issuance considering the maximum conversion price and the seniority of the convertible notes.

(3) For purposes of measuring compensation for accounting purposes with respect to awards in October and November 2018 we performed a retrospective common stock valuation as of October 28, 2018 with the assistance of an independent third-party valuation specialist. In this retrospective valuation, we employed an OPM framework and utilized the back-solve method for inferring and allocating the equity value predicated on the sale of our Series A preferred stock. This method was selected as management concluded that the recent financing transaction was an arm's-length transaction. Furthermore, as of the valuation date we were at an early stage of development and future liquidity events were difficult to forecast. Application of the OPM back-solve method involves making assumptions for the expected time to liquidity, volatility and risk-free rate and then solving for the value of equity such that value for the most recent financing equals the amount paid. In the October 28, 2018 retrospective valuation and for purposes of the OPM allocation of total equity value determined with reference to a recent financing transaction, we assumed a 71% volatility rate and a 1.3-year weighted average estimated term. We then reflected a discount for lack of marketability of 35% to arrive at a $1.60 per share valuation of our common stock.

(4) For purposes of measuring compensation for accounting purposes with respect to awards in January 2019 we performed a retrospective common stock valuation as of January 2, 2019 with the assistance of an independent third-party valuation specialist. For our January 2019 valuation, the independent third-party valuation specialist used a hybrid back-solve method considering two scenarios in a Probability Weighted Expected Return Method, or PWERM, framework and using the OPM to allocate value in one of the scenarios. The scenarios included: a trade-sale scenario predicated on the arm's-length capital raise that transpired just prior to the valuation date and an IPO scenario also based on the recent arm's length transaction. Under the hybrid method, the per share value calculated under the two scenarios are weighted based on expected exit outcomes and the quality of the information specific to each allocation methodology to arrive at a final estimated fair value per share value of the common stock before a discount for lack of marketability is applied. For the January 2019 valuation we (i) assigned a 90% probability of occurrence to the trade-sale scenario, with a 75% volatility rate and a 1.6-year weighted average estimated term applied within the OPM, then reflected a discount for lack of marketability of 30%; and (ii) we assigned a 10% probability of occurrence to the IPO scenario, with a 30% discount rate and a 0.8-year estimated term to an IPO event, then reflected a discount for lack of marketability of 15%.

(5) For our February 2019 valuation, the independent third-party valuation specialist used a hybrid back-solve method considering two scenarios in a PWERM framework and using the OPM to allocate value in one of the scenarios. The scenarios included: a trade-sale scenario predicated on the arm's-length capital raise that transpired prior to the valuation date and an IPO scenario with reference to the same arms' length capital transaction. Under the hybrid method, the per share value calculated under the two scenarios are weighted based on expected exit outcomes and the quality of the information specific to each allocation methodology to arrive at a final estimated fair value per share value of the common stock before a discount for lack of marketability is applied. For the February 2019 valuation, we: (i) assigned a 65% probability of occurrence to the trade-sale scenario, with a 76% volatility rate and a 1.6-year weighted average estimated term applied within the OPM, then reflected a discount for lack of marketability of 30%; and (ii) we assigned a 35% probability of occurrence to the IPO scenario, with a 30% discount rate and a 0.7-year estimated term to an IPO event, then reflected a discount for lack of marketability of 15%.

Historically, for all periods prior to this offering, the fair values of the shares of common stock underlying our stock-based awards were estimated on each grant date by our board of directors. In order to determine the fair value of our common stock, our board of directors considered, among other things, contemporaneous valuations of our common stock prepared by an independent third-party valuation specialist in accordance with the Practice Aid.

Given the absence of a public trading market for our common stock, our board of directors exercised their judgment and considered a number of objective and subjective factors to determine the best estimate of the fair value of our common stock, including contemporaneous valuations performed by an independent third party, our stage of development, important developments in our operations, the prices at which we sold shares of our preferred stock, the rights, preferences and privileges of our preferred stock relative to those of our common stock, actual operating results and financial performance, the conditions in the biotechnology industry and the economy in general, the stock price performance and volatility of comparable public companies, and the lack of liquidity of our common stock, among other factors. After the closing of this offering, our board of directors will determine the fair value of each share of underlying common stock based on the closing price of our common stock as reported on the date of the grant. Our board of directors intended all options granted to be exercisable at a price per share not less than the per share fair value of our common stock underlying those options on the grant date.

In conducting the retrospective valuation, we and the independent third-party valuation specialist considered all objective and subjective factors that it believed to be relevant for each valuation conducted in accordance with the Practice Aid, including our best estimate of our business condition, prospects and operating performance at each valuation date. Other significant factors included:

- the prices of our preferred stock sold to outside investors in arm's-length transactions, and the rights, preferences and privileges of our preferred stock as compared to those of our common stock, including the liquidation preferences of our preferred stock;
- our stage of development and business strategy and the material risks related to our business and industry;
- the valuation of publicly traded companies in the life sciences and biotechnology sectors, as well as recently completed mergers and acquisitions of guideline companies;
- our results of operations and financial position;
- the composition of, and changes to, our management team and board of directors;
- the lack of liquidity of our common stock;
- any external market conditions affecting the life sciences and biotechnology industry sectors;

- the likelihood of achieving a liquidity event for the holders of our common stock and stock options, such as an IPO, or a sale of our company, given prevailing market conditions; and
- the state of the IPO market for similarly situated privately held life sciences companies.

The estimates of fair value of our common stock are highly complex and subjective. There are significant judgments and estimates inherent in the determination of the fair value of our common stock. These judgments and estimates include assumptions regarding our future operating performance, the time to completing an IPO or other liquidity event, the related valuations associated with these events, and the determinations of the appropriate valuation methods at each valuation date. The assumptions underlying these valuations represent management's best estimates, which involve inherent uncertainties and the application of management judgment. If we had made different assumptions, our stock-based compensation expense, net loss and net loss per share applicable to common stockholders could have been materially different.

Determination of Estimated Offering Price

We and our underwriters determined the estimated price range set forth on the cover of this preliminary prospectus, which is $ to $ per share. In comparison, our estimate of the fair value of our common stock was $ per share at , which was determined by our board of directors with the assistance of an independent third-party valuation of our common stock as of .

We note that, as is typical in initial public offerings, the estimated price range for this offering was not derived using a formal determination of fair value but was determined based upon discussions between us and the underwriters. Among the factors considered in setting the estimated range were prevailing market conditions, estimates of our business potential, progress in our clinical trials and developments in our business, the general condition of the securities market and the market prices of, and demand for, publicly-traded common stock of generally comparable companies.

Based upon the assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus, the aggregate intrinsic value of options outstanding as of June 30, 2019 was $ million, all of which related to unvested options.

Determination of the Fair Value of Convertible Notes, Series A-1 Convertible Preferred Stock and Series A-2 Convertible Preferred Stock

We have elected the fair value option for the accounting for our convertible notes issued in 2018. Fair value adjustments to the convertible notes are included in our other income and (expenses). The fair value of the initial closing of our convertible notes in May 2018 was determined to be equal to the proceeds of $12.5 million on issuance. The fair value of the convertible notes on conversion and of the milestone-based closing in October 2018 was determined to be equal to the value of our Series A-1 convertible preferred stock and Series A-2 convertible preferred stock into which the convertible notes were converted, which was determined to be $3.39 per share of Series A-1 convertible preferred stock and Series A-2 convertible preferred stock, using an OPM framework and utilized the back-solve method for inferring and allocating the equity value predicated on the concurrent sale of Series A convertible preferred stock. This method was selected as we concluded that the sale of the Series A convertible preferred stock was an arm's-length transaction. Application of the OPM back-solve method involves making assumptions for the expected time to liquidity, volatility and risk-free rate and then solving for the value of equity such that value for the most recent financing equals the amount paid. The OPM allocation of total equity value was determined with reference to a recent financing transaction and we assumed a 71% volatility rate, a 1.3-year estimated term and a probability weighted average discount for lack of marketability of 35%.

Emerging Growth Company Status

We are an emerging growth company, as defined in the JOBS Act. Under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards issued subsequent to the enactment of the JOBS Act until such time as those standards apply to private companies. We have elected to use this extended transition period for complying with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date we (i) are no longer an emerging growth company or (ii) affirmatively and irrevocably opt out of the extended transition period provided in the JOBS Act. As a result, our financial statements may not be comparable to companies that comply with new or revised accounting pronouncements as of public company effective dates.

Recently Adopted Accounting Pronouncements

In May 2017, the FASB issued ASU2017-09, *Compensation—Stock Compensation* (Topic 718): "*Scope of Modification Accounting*," which provides guidance about which changes to the terms or conditions of a stock-based payment award require an entity to apply modification accounting in Topic 718. The amendments in this ASU should be applied prospectively to an award modified on or after the adoption date. This guidance was effective for all entities for annual periods and interim periods within those annual periods, beginning after December 15, 2017. We adopted ASU 2017-09 effective January 1, 2018, which did not impact our financial statements or financial statement disclosures.

Recently Issued Accounting Pronouncements

In February 2016, the FASB issued ASU2016-02, *Leases* (Topic 842), with guidance regarding the accounting for and disclosure of leases. The update requires lessees to recognize the liabilities related all leases, including operating leases, with a term greater than 12 months on the balance sheet. This update also requires lessees and lessors to disclose key information about their leasing transactions. This guidance will be effective for public companies for annual and interim periods beginning after December 15, 2018. For all other entities, including emerging growth companies, this standard is effective for annual reporting periods beginning after December 15, 2019, and interim periods within annual periods beginning after December 15, 2020. Early adoption is permitted. We have yet to evaluate the effect that ASU 2016-02 will have on our financial statements or financial statement disclosures.

In July 2017, the FASB issued ASU2017-11, *Earnings Per Share* (Topic 260), Distinguishing Liabilities from Equity (Topic 480) and Derivatives and Hedging (Topic 815): *I. Accounting for Certain Financial Instruments with Down Round Features; II. Replacement of the Indefinite Deferral for Mandatorily Redeemable Financial Instruments of Certain Nonpublic Entities and Certain Mandatorily Redeemable Noncontrolling Interests with a Scope Exception*. Part I of this update addresses the complexity of accounting for certain financial instruments with down round features. Down round features are features of certain equity-linked instruments (or embedded features) that result in the strike price being reduced on the basis of the pricing of future equity offerings. Current accounting guidance creates cost and complexity for entities that issue financial instruments (such as warrants and convertible instruments) with down round features that require fair value measurement of the entire instrument or conversion option. Part II of this update addresses the difficulty of navigating Topic 480, Distinguishing Liabilities from Equity, because of the existence of extensive pending content in the FASB Accounting Standards Codification. This pending content is the result of the indefinite deferral of accounting requirements about mandatorily redeemable financial instruments of certain nonpublic entities and certain mandatorily redeemable noncontrolling interests. The amendments in Part II of this update do not have an accounting effect. For public business entities, the amendments in Part I of ASU 2017-11 are effective for fiscal years and interim periods within those years beginning after December 15, 2018. For all other entities, the amendments in Part I of this update are effective for fiscal years beginning after December 15, 2019, and interim periods within fiscal years beginning after December 15, 2020. Early adoption is permitted for all entities, including adoption in an interim period. We are currently assessing the potential impact of adopting ASU 2017-11 on our financial statements and financial statement disclosures.

Contractual Obligations and Commitments

In February 2019, we entered into an operating lease agreement for new office space in Philadelphia, Pennsylvania. The lease term commenced in May 2019 and will expire in July 2022. The initial annual base rent is $0.3 million, and such amount will increase by 2% annually on each anniversary of the commencement date.

Our commitments include:

- *The License Agreement.* Under the License Agreement, we are required to make milestone payments upon successful completion of certain development, regulatory and sales milestones on a target-by-target and country-by-country basis. The payment obligations under the License Agreement are contingent upon future events such as our achievement of specified development, regulatory and commercial milestones and we will be required to make development milestone payments and royalty payments in connection with the sale of products developed under the License Agreement. As of December 31, 2018, we were unable to estimate the timing or likelihood of achieving the milestones or making future product sales. We are also obligated to pay $2.0 million annually for three years beginning August 2018 for funding to the laboratories of Drs. Payne and Milone.

  Under the License Agreement, we must use commercially reasonable efforts to develop and commercialize a product in each subfield. During the term of the License Agreement until the first commercial sale of the first product, we are obligated to pay Penn a non-refundable, non-creditable annual license maintenance fee of $10,000. We are required to pay certain milestone payments upon the achievement of specified clinical and commercial milestones. Milestone payments are reduced by a certain percentage for the second product that achieves a milestone, by an additional percentage for the third product that achieves a milestone, and so on, for each subsequent product that achieves a milestone. In the event that we are able to successfully develop and launch multiple products under the License Agreement, total milestone payments could approach $20.0 million. Penn is also eligible to receive tiered royalties at percentage rates in the low single-digits, subject to an annual minimum royalty, on annual worldwide net sales of any products that are commercialized by us or our sublicensees that contain or incorporate, or are covered by, the intellectual property licensed by us. To the extent we sublicense our license rights under the License Agreement, Penn would be eligible to receive tiered sublicense income at percentage rates in the mid-single to low double-digits. We have also entered into a subscription and technology transfer agreement with Penn, pursuant to which we will pay Penn an upfront subscription fee and a nominal non-refundable royalty on net sales of products, a portion of which will be credited toward milestone payments and royalties under this License Agreement. Technology transfer activities would be at our cost and subject to agreement as to the technology to be transferred.

- *Master Translational Research Services Agreement with Penn.* Under the Services Agreement, we have contracted for additional research and development services from various laboratories within Penn. The Services Agreement will expire on the later of (i) October 19, 2021 or (ii) completion of the services for which we have engaged Penn under the Services Agreement. As of December 31, 2018, we had executed three project addenda with work expected to commence and conclude in 2019. In January 2019, we executed two further project addenda with work expected to commence in 2019 and conclude in 2020. In July 2019, we executed an additional project addendum with work expected to commence in 2019.

- *Sponsored Research Agreements.* We have SRAs with Drs. Payne and Milone. Under the SRAs, we have committed to funding a defined research plan for three years through April 2021. We have estimated the three-year cost of the two SRAs to be $8.5 million, which satisfies the $2.0 million annual obligation under the License Agreement.

- *Research Agreement with The Regents of the University of California.* Under the research agreement, we have committed to funding scientific research through October 2020.

- *Research Service Agreement with the Children's Hospital of Philadelphia.* Under the research services agreement, we contracted for the manufacturing of preclinical study and clinical trial material through April 2019.

Off-Balance Sheet Arrangements

During the periods presented, we did not have, nor do we currently have, any off-balance sheet arrangements as defined under SEC rules.

Quantitative and Qualitative Disclosures about Market Risk

Interest Rate Risk

We are exposed to market risks in the ordinary course of our business. These risks primarily include interest rate sensitivities. We held cash and cash equivalents of $33.0 million as of December 31, 2018 and $75.3 million as of June 30, 2019. We generally hold our cash in interest-bearing money market treasury fund accounts. Our primary exposure to market risk is interest rate sensitivity, which is affected by changes in the general level of U.S. interest rates. Due to the short-term maturities of our cash equivalents and the low risk profile of our investments, an immediate 100 basis point change in interest rates would not have a material effect on the fair market value of our cash equivalents.

BUSINESS

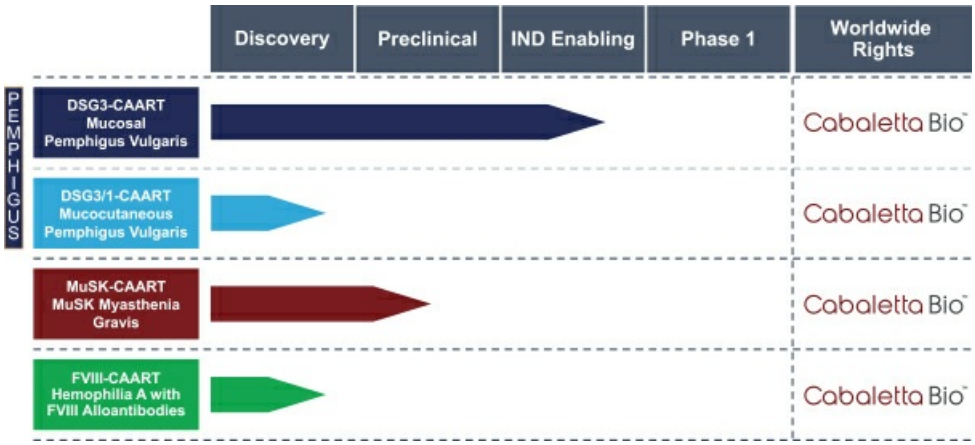
Overview

We are a biotechnology company focused on the discovery and development of engineered T cell therapies for B cell-mediated autoimmune diseases. Our proprietary technology utilizes chimeric autoantibody receptor, or CAAR, T cells that are designed to selectively bind and eliminate B cells that produce disease-causing autoantibodies, or pathogenic B cells, while sparing normal B cells. Our lead CAAR T cell product candidate was designed based on chimeric antigen receptor, or CAR, T cell technology that has been successfully developed and is marketed for the treatment of B cell cancers. We believe our technology, in combination with our proprietary Cabaletta Approach for selective B cell Ablation platform, called our CABA platform, has applicability across over two dozen B cell-mediated autoimmune diseases that we have identified, reviewed and prioritized. In order to accelerate product development for our lead program and to access a proven cell therapy manufacturing platform, we have entered into a collaboration with the University of Pennsylvania, or Penn. We hold multiple agreements with Penn to develop CAAR T therapies for the treatment of these diseases. Our goal is to leverage our team's expertise in autoimmunity and engineered T cell therapy and our collaboration with Penn to rapidly discover and develop our portfolio of CAAR T cell product candidates. Our initial focus is on pemphigus vulgaris, or PV, which is an autoimmune blistering skin disease. We plan to submit an Investigational New Drug application, or IND, to the U.S. Food and Drug Administration, or the FDA, in the second half of 2019 and to advance our lead product candidate, DSG3-CAART, into a Phase 1 trial for the treatment of mucosal pemphigus vulgaris, or mPV, in 2020. We are also advancing additional product candidates currently in discovery-stage or preclinical development for the treatment of muscle-specific kinase myasthenia gravis, or MuSK MG, mucocutaneous PV, or mcPV and Hemophilia A with factor VIII, or FVIII, alloantibodies.

B cell-mediated autoimmune diseases occur when certain populations of B cells mistakenly produce autoantibodies, which are directed against specific healthy tissue or cells in the body. The presence of autoantibodies can manifest in a variety of autoimmune diseases and result in the destruction of healthy tissue in the body. Current treatment options for B cell-mediated autoimmune diseases are generally limited to corticosteroids and other generalized immunosuppressants that offer only temporary disease suppression, may require chronic, in-hospital administration and are associated with potentially life-threatening side effects. We believe the ideal therapy for B cell-mediated autoimmune diseases would selectively and completely eliminate the pathogenic B cells while sparing the body's normal B cells.

We are pioneering the development of a new class of engineered T cell therapies that express CAARs to selectively engage and eliminate pathogenic B cells. Our CAARs build upon the scientific foundation of CARs, differing primarily in the use of the antigen rather than an antibody fragment, which enables the CAAR T cells to serve as a "decoy" for specific autoantibodies expressed on the surface of B cells. This allows these pathogenic B cells to engage with the CAAR T cells instead of benign antigens, resulting in their elimination. By harnessing the power of targeted cell therapy, we believe our CABA platform has the potential to be a one-time curative therapy that may be a more effective and safer therapy option than current treatments. We have developed our CABA platform to inform product candidate development from scientific, clinical and commercial assessment through CAAR design. Using our CABA platform, we have identified and thoroughly evaluated over two dozen B cell-mediated autoimmune diseases that we believe will be amenable to treatment with the Cabaletta approach and have advanced several of our highest priority targets into discovery and preclinical testing.

Our current product candidate pipeline is illustrated below.



Our initial therapeutic focus is on PV, a chronic, autoimmune blistering skin disease that affects over 17,000patients across the United States and over 25,000 patients across the European Union. The affected PV population in Asia is recognized to be significantly higher than in each of the United States and the European Union. Despite a current standard of care that includes corticosteroids and adjunctive immunosuppressive agents, PV remains associated with frequent recurrences as well as substantial morbidity and mortality. Our lead product candidate, DSG3-CAART, is being evaluated for the treatment of mPV, a subtype of PV that affects mucosal surfaces. mPV is caused by autoantibodies against the cell adhesion protein desmoglein 3, or DSG3. DSG3-CAART is designed to selectively target B cells expressing autoantibodies specific for DSG3, which may prevent these B cells from producing DSG3 antibodies that are the cause of mPV while preserving general B cell immune function. We are advancing DSG3-CAART towards an IND submission with the FDA. Our next PV-directed product candidate, DSG3/1-CAART, is being designed to target B cells expressing autoantibodies against DSG3 and desmoglein 1, or DSG1. It is being developed for the treatment of mucocutaneous PV, or mcPV, another subtype of PV that affects both mucosal and skin surfaces and is caused by autoantibodies against DSG3 and DSG1, respectively.

Our second product candidate, MuSK-CAART, is designed to treat a subset of patients with myasthenia gravis, or MG. MG is an autoimmune disease induced by autoantibodies targeting the neuromuscular junction, or NMJ, which can lead to life-threatening muscle weakness. Our product candidate targets B cells expressing autoantibodies against a transmembrane protein, muscle-specific kinase, or MuSK, and is being developed for the treatment of MuSK MG.

We are also pursuing development of an additional product candidate, FVIII-CAART, which is being designed to treat a subset of patients with Hemophilia A, an X-linked bleeding disorder caused by mutations in the FVIII gene. While our CABA platform is primarily focused on the treatment of B cell-mediated autoimmune diseases, we believe our approach may be applicable in other instances where B cell antibody production is implicated in response to exogenous FVIII, which is administered for the treatment of Hemophilia A. Specifically, we have identified an unmet need in cases where the immune system produces antibodies against exogenous antigens, which is known as an alloimmune response. Some patients receiving repeated administrations of exogenous FVIII will develop alloantibodies against the treatment, also known as inhibitors, neutralizing its therapeutic potential. Patients with FVIII alloantibodies may often require high-dose FVIII, immune tolerance induction with FVIII, agents that mimic FVIII or plasmapheresis to remove the FVIII alloantibodies. FVIII-CAART leverages a CAAR designed to target B cells expressing alloantibodies against

FVIII, and it is initially being developed as an adjunctive therapy for Hemophilia A patients who develop FVIII alloantibodies.

Our strategy is to build upon our first mover advantage in the field of cell therapy for B cell-mediated autoimmune diseases and further advance the discovery, development and commercialization of our CAAR T portfolio. Our scientific founders are leading experts in B cell-mediated autoimmune diseases and CAR T technology, and we are led by an experienced team with demonstrated success in discovering, developing, manufacturing, and evaluating novel cell therapy products in clinical trials. In addition, we have partnered our discovery and initial development efforts with Penn, a pioneer in cell and gene therapy with a proven track record of expertise in the translational research, clinical development and manufacturing of cell therapy products, in order to accelerate timelines for our first product candidate to enter clinical trials. To date, we have raised an aggregate of $88 million from leading investors including Adage Capital Partners, 5AM Ventures, Boxer Capital, LLC of Tavistock Group, Cormorant Asset Management, Deerfield Management and RedMile Group as well as Penn.

Our History and Team

Our scientific co-founders, Aimee Payne, M.D., Ph.D., and Michael Milone, M.D., Ph.D., began partnering at Penn in 2013 to combine Dr. Payne's expertise in B cell-mediated autoimmune diseases with Dr. Milone's deep and experienced insights into the design and implementation of CAR T products. Dr. Payne is a worldwide leader in characterizing B cell-mediated autoantibody repertoires in PV and other autoimmune diseases. Dr. Milone is a renowned scientist in CAR T therapy and was a co-inventor of and a key driver in the preclinical discovery and development efforts that yielded Kymriah, the first FDA-approved CAR T therapy for the treatment of B cell cancers. Dr. Payne's laboratory surmised that by incorporating an antigen instead of an antibody fragment as the extracellular domain of the CAAR, specific pathogenic B cells could be targeted. This resulted in a collaboration between the two investigators to apply the scientific foundation of CAR T technology as it has been advanced by Drs. Payne and Milone in order to address B cell-mediated autoimmune diseases.

Their first scientific publication, "Reengineering chimeric antigen receptor T cells for targeted therapy of autoimmune disease" (*Science*, July 2016), attracted the attention of a colleague, Steven Nichtberger, M.D., who is an adjunct professor at the Wharton School at the University of Pennsylvania, teaching a class on biotech company formation, financing and leadership in the Vagelos Life Sciences & Management Program. Additionally, Dr. Nichtberger has experience creating and building companies, including a novel cellular therapy company, which required transferring the technology from an academic institution, establishing a research and development organization, hiring of manufacturing and quality teams, creating novel manufacturing processes, reaching agreement with the FDA on novel clinical development pathways and constructing a commercial-scale Good Manufacturing Practices, or GMP, facility that manufactured autologous cell therapy products for clinical trials. In 2017, based on over a year of interaction and discussions regarding the optimal strategy to advance the scientific opportunity into a commercially developed product portfolio that could offer potentially curative treatment options to patients, Drs. Payne, Milone and Nichtberger decided to launch Cabaletta Bio.

The longstanding and highly productive partnership between ourco-founders has been complemented by additional management experience that brings a successful history of translating academic cellular therapy research from Penn and elsewhere into commercially sponsored clinical trials and the establishment of a GMP manufacturing facility and organization. Gwendolyn Binder, Ph.D., our Executive Vice President, Science and Technology, was an early member of the Translational Research Program Operations team at Penn for over five years and participated in the submission and acceptance of multiple INDs for novel engineered T cell therapy products. As part of the cell therapy organization at Penn, Dr. Binder partnered with Dr. Milone and others to drive the IND-enabling translational studies that facilitated the initial CAR T clinical trial in B cell cancers at Penn. Dr. Binder also built and led a clinical stage biotechnology company's manufacturing operations and quality teams, including creation of a fully functioning commercial grade GMP facility. Dr. Binder also built the translational research program and ultimately led the company's research organization.

Our Research and Manufacturing Collaboration with Penn

Our CABA platform has already produced multiple product candidates through our sponsored research agreements, or SRAs, with Penn for the laboratories of our scientific co-founders, Drs. Payne and Milone. Our continuing relationship with our scientific co-founders provides important guidance and insights to us. Our contractual relationship with Penn through ongoing licensing and research arrangements also provides important services around manufacturing supply.

In July 2019, we amended and restated our worldwide license agreement with Penn to develop our CAAR T technology to treat B cell-mediated autoimmune and alloimmune diseases. This license agreement provides us with access to multiple patent families covering CAAR T therapy as applied to the field of B cell-mediated autoimmune and alloimmune diseases and to the robust intellectual property portfolio created by Penn under these SRAs in this field. See "—Our Material Agreements—Amended and Restated License Agreement with Penn."

Our ongoing collaboration with Penn is also based on a Master Translational Research Services Agreement, or Services Agreement, that we entered into in October 2018, along with multiple additional agreements under the Services Agreement to engage and partner in individual Penn entities, including cell product manufacturing, correlative research, vector manufacturing, clinical trial operations and protocol development. In addition to the Services Agreement, we have agreements in place with various functional areas and centers that provide additional resources to Penn as well as contractual commitments from Penn with the goal of providing the capacity to manufacture our lead product candidate, DSG3-CAART. Penn has also agreed to manufacture vector product for use in our clinical trials. Penn's obligations are subject to certain limitations and termination rights. See "—Our Material Agreements—Master Translational Research Services Agreement with Penn".

We believe Penn is uniquely suited to be our partner in our efforts to develop product candidates leveraging our CAAR T technology based on a decade of experience, including manufacturing and clinical support for approximately a dozen active cell therapy clinical trials. The original manufacturing process for the first FDA-approved CAR T therapy was developed at Penn before being transferred to Novartis Pharmaceuticals Corporation during late-stage clinical trials. We currently plan to leverage Penn's experience, validated standard operating procedures, manufacturing facilities and staffing to accelerate initial development efforts for our lead product candidate.

Our Strategy

Our goal is to build upon our first mover advantage and expertise in cell therapies for B cell-mediated autoimmune diseases to accelerate the discovery, development and commercialization of our CAAR T cell therapies, with a focus on reliable manufacturing. We believe achieving this goal could result in potentially curative therapies for patients with unmet medical needs who suffer from certain B cell-mediated autoimmune diseases. To achieve this goal, key elements of our strategy include:

- ***Achieving clinical proof-of-concept for our lead product candidate, DSG3-CAART in mPV, the first in a series of well-understood and validated B cell-mediated autoimmune diseases for which we are developing CAAR T cell product candidates.*** It is well-established that the presence of DSG3 autoantibodies and DSG3 autoantibody producing B cells in patients are both necessary and sufficient to cause mPV in the vast majority of cases. We believe our biologic understanding coupled with the well-understood clinical signs, symptoms and natural course of the disease, identify mPV as a model disease to evaluate our CAAR T approach. In addition, we have made significant investment in the design and development of DSG3-CAART, generating a lead candidate that has demonstrated robust target engagement and no off-target toxicities in preclinical studies. Taken together, our Phase 1 clinical trial evaluating DSG3-CAART for the treatment of mPV represents an optimal first opportunity to establish initial clinical proof-of-concept of our CABA platform.
- ***Leveraging our CABA platform to identify optimal targets for the CAAR T approach and apply learnings from DSG3-CAART to advance additional product candidates.*** Shortly after inception, we

undertook a comprehensive review of all known B cell-mediated autoimmune diseases in order to evaluate and prioritize the opportunity for selective destruction of B cells in an effort to cure B cell- mediated autoimmune diseases. Central to this analysis were (i) scientific, clinical and commercial assessment, (ii) epitope mapping to determine regions targeted by autoantibodies, (iii) evaluation of the ability to optimize the CAAR construct and design with the goal of selectively ablating reactive B cells, and (iv) evaluation of existing or required development of new preclinical models and *in vitro* and *in vivo* clinical testing. As we performed this analysis of potential product candidates, we considered possible paths for clinical trial design and regulatory approval. This analysis incorporated the extensive learnings gleaned from years of effort devoted to development of DSG3-CAART. We prioritized the targets and since then have been focused on being first to discover and develop a series of products with each providing the potential for cure of an important B cell-mediated autoimmune disease in patients. We intend to continue to apply our proprietary learnings from DSG3-CAART, including scientific and regulatory learnings, to most effectively advance these additional opportunities. Preclinical studies that are generally similar to, and informed by, DSG3-CAART preclinical studies are actively ongoing with other CAAR T cell product candidates.

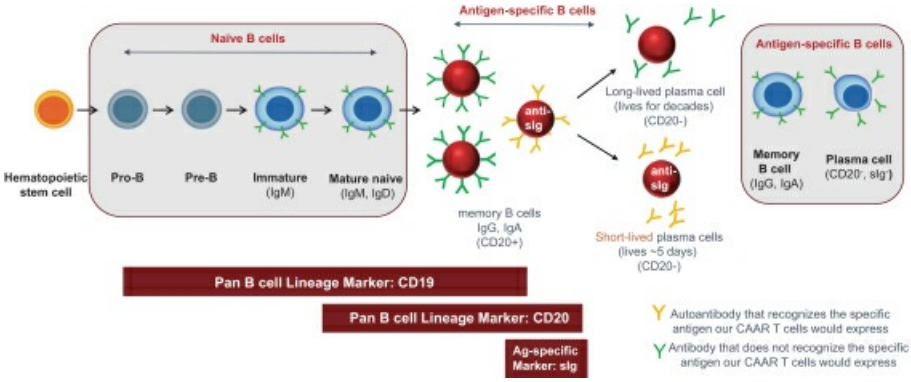
- ***Expanding upon our established IP position and first mover advantage in CAAR T therapy targeted towards B cell-mediated autoimmune diseases***. We are focused on protecting our intellectual property as we continue to pursue the development of future product candidates. We believe the issued U.S. patent on our initial CAAR constructs is the first patent covering cells engineered to express the known pathogenic epitopes recognized by DSG3 and DSG1 autoantibodies, which we are working to supplement with additional patent filings. The design of a broadly effective CAAR requires a deep understanding of the location of immunogenic epitopes targeted by autoantibodies, a competency that we believe we are uniquely positioned to utilize in product candidate development. We believe there is a particularly high value to the first mover advantage including, but not limited to, experience in discovery, preclinical development, regulatory efforts, intellectual property and insights from clinical trials that can be translated across programs.

- ***Leveraging our cellular therapy experience and knowledge in addition to knowledge gained through our Penn collaboration to rapidly build our own fully-integrated internal infrastructure.*** We have differentiated expertise that we believe is uniquely suited for the continued buildout of our CABA platform specializing in B cell-mediated autoimmune diseases. Our scientific co-founders who initially developed our technology continue to collaborate closely with us through SRAs. In addition, our management team has a successful history of building the capabilities of cell therapy-based companies from the discovery and preclinical stage through Phase 3 readiness. In combination with our team, which possesses significant experience in executing on manufacturing strategies for cell therapy products, our partnership with Penn allows us to utilize their existing infrastructure to accelerate our ability to submit our first IND. In parallel, we continue to build out an experienced team to manage the relationship with Penn while also developing and continuing to implement a path to our manufacturing independence. Ultimately, we intend to prepare and build our own manufacturing facility upon achieving sufficient initial clinical trial data for DSG3-CAART.

B Cell-Mediated Autoimmune Diseases: Overview and Current Treatment Paradigm

The body's immune system, which is designed to protect the body from infection and cancer, includes B cells and T cells. B cells are responsible for producing antibodies against antigens that the body perceives as foreign whereas T cells are responsible for cell-mediated immunity. In the case of B cell-mediated autoimmune diseases, certain populations of the patient's B cells mistakenly produce antibodies directed against normal tissues and cells, leading to disease. While these autoantibodies are the major effectors of B cell-mediated autoimmune diseases, the underlying root cause of each B cell-mediated autoimmune disease is the defective B cells that mistakenly make these pathogenic antibodies. These pathogenic B cells express autoantibodies on their

surface with the same antigen specificity as the circulating pathogenic autoantibodies, which can be used to distinguish them from the healthy B cell population, as shown in the figure below.



Antibodies are B cell receptors that drive B cell maturation. *CD19 serves as a B cell marker throughout the naïve B cell phase, while CD20 is a surface marker expressed later in B cell maturation. CAAR T is capable of eradicating antigen specific B cells and preventing their further development to antibody producing plasma cells. IgM: immunoglobulin M; IgD: immunoglobulin D; IgA: immunoglobulin A; sIg: surface immunoglobulin, representing the autoantibody on the B cell surface.*

Current treatment options for autoimmune mediated diseases involve generalized immune suppression, achieved through corticosteroids, immunosuppressive medications and biologics. Most commonly, corticosteroids are used on both a chronic and acute basis to control disease, and act via a variety of mechanisms to control or downregulate multiple inflammatory pathways. In many cases, systemic immunosuppressive medications often used in chemotherapy such as mycophenolate, azathioprine and methotrexate, are added in an effort to minimize symptoms and manage the expected recurrences in patients. Biologic therapies have emerged as a new class of therapies and have a variety of targets including cytokines, B cells, and co-stimulation molecules. One particular biologic, rituximab, is an anti-CD20 antibody and is employed in multiple autoimmune diseases. Rituximab was approved by the FDA in 2018 for treatment of moderate to severe PV. Currently existing treatment options target parts of the immune system in addition to disease-causing B cells, and in general require chronic administration to reduce recurrence rates. We believe the ideal therapy in autoimmune diseases would completely and specifically eliminate the pathogenic B cells while sparing the immune cells that protect against infection, without requiring chronic administration.

Our Approach

Using our CABA platform, we are developing engineered T cell therapy candidates that express CAARs, which serve as “decoys” for antibodies expressed on the surface of B cells. We believe these CAARs enable the T cells to specifically engage and eliminate pathogenic B cells while sparing normal T cells. By harnessing the power of cell therapy, our technology has the potential to overcome the ability of these B cells to evade elimination and thus lead to durable responses. Our CAAR T platform is based on the foundation of established CAR T therapeutics, differing primarily in their use of the antigen rather than an antibody fragment to target pathogenic B cells. We believe our technology has broad applicability and we are building a portfolio of product candidates for B cell-mediated autoimmune diseases.

Background: CAR T Cells

Engineered T cell therapy is a type of immunotherapy in which human T cells are genetically modified to express specific receptors, enabling the T cells to recognize and eliminate pathogenic cells.

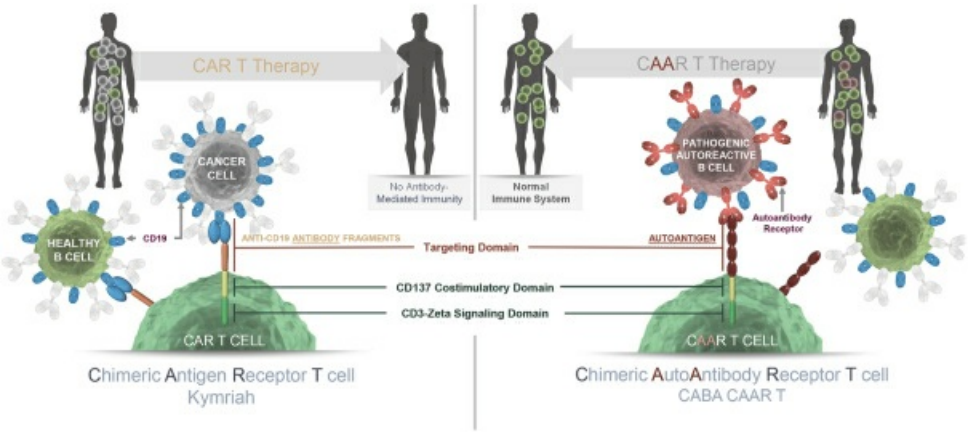
A key application of engineered cell therapy involves the use of CARs, which are engineered molecules that enable T cells to identify specific antigens present on the surface of diseased cells. When expressed on the patient's T cells, the CAR directs the T cells to kill cells that express a particular antigen. These CAR-expressing T cells, or CAR T cells, can proliferate, generating memory CAR T cells.

Many companies are using CAR T technology to develop therapies for the treatment of B cell cancers. Several drug candidates have demonstrated clinical success, leading to the first FDA regulatory approvals of CAR T therapies for certain B cell cancers. In these B cell cancers, CAR T therapy has resulted in complete remission of disease in many patients, even in cancer patients with severe, refractory disease. Despite success in treating certain B cell cancers, we believe that CARs have not yet been developed or evaluated as a treatment option for other types of B cell-mediated autoimmune diseases in patients.

Our Technology: CAARs

Our CAAR T platform builds upon the scientific foundation of CARs to enable targeted B cell elimination in an autoimmune setting, which may lead to complete and durable remission of disease while sparing all other B cell populations that can provide beneficial immunity from infection.

The co-stimulatory domain and the signaling domain of both a CAR T cell and CAAR T cell carry out the same activation and cytotoxic functions once the engineered cell therapy engages a B cell. Our CAAR T cells differ from CAR T cells primarily in the extracellular targeting domain. Our CAAR T cells incorporate the relevant parts of the autoantigen that is subject to attack in autoimmune disease, as shown in the figure below.



Key differences between CAR T (left) vs. CAAR T therapy (right). *A CAR T cell typically contains a signaling domain and a co-stimulatory domain and incorporates antibody fragments that recognize CD19, a specific antigen present in both leukemia cells and healthy B cells. In contrast, a CAAR T cell typically contains an antigen as its targeting domain rather than an antibody fragment. The antigen recognizes the specific, pathogenic antibody along with the limited population of B cells that produce the antibody. The model CAAR T cell depicted here contains an identical signaling domain and a co-stimulatory domain. The primary difference between a CAR T cell and a CAAR T cell is the target domain expressed on the cell surface. The example shown demonstrates the pan-B cell ablation that happens when targeting the B cell lineage marker, CD19, and the highly selective pathologic B cell targeting approach of CAAR T.*

Potential Advantages of CAAR T Cell Therapy in B Cell-Mediated Autoimmune Diseases

In contrast to currently available therapies for B cell-mediated autoimmune diseases, based on observations of CAR T efficacy in refractory B cell cancers, we believe a single CAAR T treatment could potentially offer complete and durable remission of certain specific B cell-mediated autoimmune diseases while leaving the humoral, or bodily fluid, antibody-producing immune system intact. We believe our CAAR T cells can recognize the specific autoantibodies that are responsible for causing an underlying disease and kill the cells that express the autoantibodies on their surface. As a result, we believe CAAR T cell therapy used in B cell-mediated autoimmune disease has the potential for durable elimination of pathogenic B cells and an associated elimination of clinical recurrences with an improved safety profile relative to the current standard of care.

Enhanced target specificity and preservation of humoral immune system

Preservation of the humoral immune system represents a potentially meaningful benefit over existing CD19- or CD20-targeting methods for B cell ablation, as patients would be less susceptible to infection throughout the remainder of their lives and would not require chronic in-hospital treatment with intravenous immunoglobulin, or IVIG, or other prophylactic therapies. Additionally, because self-reactive B cells make up only 0.01% to 1% of the normal B cell population, we believe the risk of on-target toxicity may be reduced compared to systemically immunosuppressive medications thatnon-specifically weaken the immune system. Continued use of these drugs poses significant risks, such as the potential for fatal infections due to the non-specific tempering of the immune system related to the complete depletion of CD20+ or CD19+ B cells.

Potential for complete, long-lasting elimination of pathogenic B cells

The current standard of care for B cell-mediated autoimmune disease displays limited and transient therapeutic benefit while also weakening the humoral immune system. We believe our CAAR T cells have the potential to eliminate the reactive, antibody-producing B cells that are ultimately responsible for disease, while sparing normal B cells. The curative potential of CAAR T cells would be consistent with clinical findings from use of CAR T products in B cell cancers and would be a significant improvement relative to the current standard of care for certain B cell-mediated autoimmune diseases.

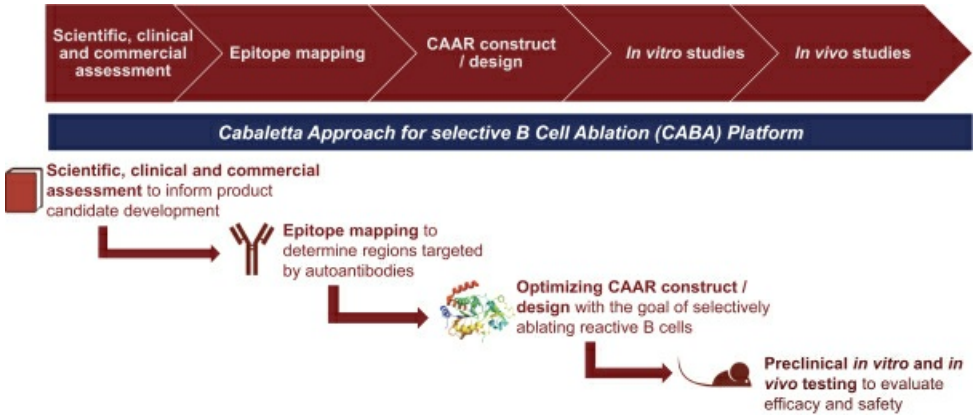
While CAR T has demonstrated significant clinical success in B cell cancers, cancer cells employ a variety of mechanisms to evade detection by targeting immune cells, and antigen escape poses a significant risk of failure for CAR T cell treatment in oncology. Antigen escape in CAR T treatment occurs when the antigen that the CAR T cell targets is lost from the malignant cell. Clinically, this results in response rates that decline from an initial complete response level of about 80% to approximately 50% over a period of years.

We believe this risk of antigen escape is reduced in our setting as mechanisms to evade CAAR T therapy would involve B cell receptor down-regulation or mutation such that antigen specificity is lost. We believe that the implication of this is that the mutated B cell would no longer produce autoantibodies that recognize the antigen and therefore should no longer be pathogenic. We also believe that a single infusion of CAAR T cells has the potential for curative effects due to either complete ablation of pathogenic cells or production of memory CAAR T cells.

Our CABA Platform

Our team has developed our CABA platform to inform product candidate development from indication selection through preclinical studies. Using our CABA platform, our team has identified our highest priority target indications following a rigorous analysis of B cell-mediated autoimmune diseases. A deep understanding of the antigenic epitopes targeted in these diseases is required to design and construct a successful CAAR. Our scientific founders have studied B cell repertoires for many years in the context of PV. Their expertise is essential to provide insights and guidance regarding our portfolio of products. We leverage the experience and

insight gained from the development of each product candidate to improve the efficiency of our CABA platform in evaluating additional potential product candidates.



Scientific, Clinical and Commercial Assessment

Through broad literature review and consultation with internal and external experts, we have identified and continue to monitor the universe of diseases where pathogenic B cells are implicated in disease pathophysiology. From this set of possible indications, our team then evaluates each disease based on numerous criteria, which include, but are not limited to:

Biologic Opportunity for Cure

- the presence of the antibody is well established in patients with the clinical manifestations of the disease;
- the identified antibody has been shown to be necessary and sufficient in causing clinical disease;
- there is a correlation between antibody titer and disease activity;
- B cell-depleting therapies are shown or believed to be effective in treating the disease;
- the antibody repertoire has been or can be characterized for the disease;

Identifiable and Underserved Patient Populations

- a routine and established antibody test exists or can be developed for diagnosis and biomarker assessment;
- the clinical course and severity of the disease warrant a cellular therapy despite current standard of care;
- products in development do not have the potential to materially improve outcomes versus the current standard of care;

Evaluation of Preclinical and Clinical Development Pathway

- preclinical *in vitro* and *in vivo* models exist or can be developed; and
- potential clinical trial designs and endpoints appear reasonable and achievable.

In addition to assessing the underlying biologic and clinical rationale for each potential target, we also assess commercial feasibility of CAAR T therapy in various B cell-mediated indications. As part of this

assessment, we evaluate the direct lifetime drug and overall healthcare costs due to the burden from the disease, including the costs of managing potential adverse effects from existing standard of care compared to the potential CAAR T therapy.

We perform this rigorous and detailed conceptual analysis to enable us to be thorough and thoughtful before committing significant resources to a program. We believe this analysis allows us to prioritize and advance potential product candidates through the CABA platform with a higher degree of confidence and a higher probability of success.

Epitope Mapping

Epitope mapping involves identifying specific sites on the antigen that are responsible for binding to the antibody of interest. This step is required in order to facilitate an understanding of CAAR design and feasibility. An understanding of the locations of the key immunogenic epitopes on the antigen heavily informs the potential feasibility of a CAAR. With an understanding of these epitopes, we then leverage our cell therapy expertise to design the CAAR construct.

CAAR Construct / Design

Our scientists and collaborators design and create multiple CAAR constructs following completion of epitope mapping, which are tested against the antibody or antibodies of interest. The goal in CAAR design is to maximize the inclusion of known immunogenic epitopes on the antigen while also optimizing the size of the construct to improve the ability of the CAAR to bind to the antibody. Determining the location of antigen expression and if there are other antigens that may unintentionally cross-react with the CAAR will also inform CAAR design and feasibility. The size of the antigen will also determine whether a CAAR can be designed based on the size constraints of the delivery system. Once we have designed and developed optimal CAAR constructs, we test them in a variety of *in vitro* and *in vivo* studies.

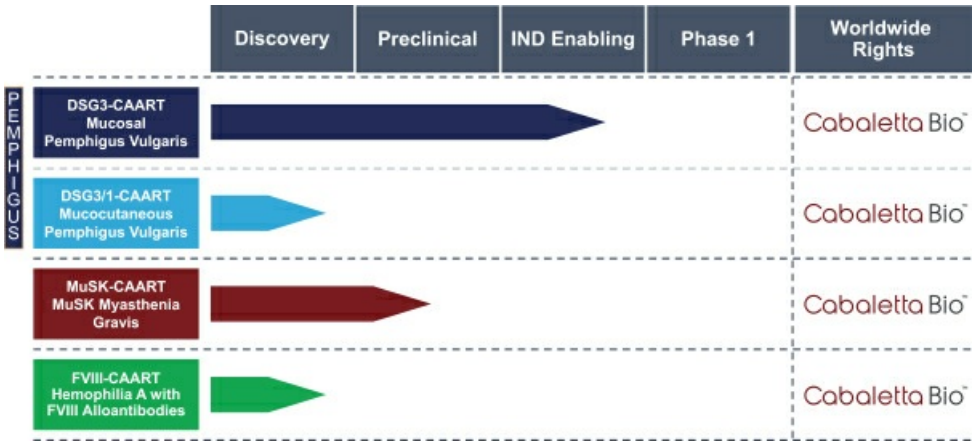
In Vitro *and* In Vivo *Testing*

In vitro preclinical testing is focused on establishing the specificity and activity of the potential CAAR T cell product candidate against B cells expressing known pathogenic target antibodies. Specificity is evaluated against non-target membrane proteins that may be expressed on other cells, with specific focus against any proteins that are known to bind to the antigen presented on the CAAR. CAAR T function is tested in the presence and absence of soluble, or free, antibodies isolated from patients, since these antibodies may enhance or inhibit CAAR T cell function. Where relevant animal models exist, the CAAR T cell product candidate is tested in one or more models to address specific questions around safety and the ability of the potential product candidate to reduce disease activity *in vivo*.

Pipeline

We are developing a portfolio of CAAR T cell product candidates for the treatment of B cell-mediated autoimmune diseases. Our lead product candidate, DSG3-CAART, targets B cells that express pathogenic autoantibodies against the DSG3 protein, which cause mPV. The publication of the first *in vivo* evidence of efficacy and safety of the candidate in an animal model was followed by additional preclinical studies to support our planned IND submission. Upon acceptance of our IND, we plan to open the first clinical trial site for our DSG3-CAART product candidate. Our next PV-directed product candidate, DSG3/1-CAART, targets B cells that give rise to pathogenic autoantibodies against either the DSG3 or DSG1 protein, which cause mcPV, and could address a broader PV population. Our second product candidate, MuSK-CAART, targets B cells that give rise to pathogenic autoantibodies against the MuSK receptor in patients with MG. An additional product candidate, FVIII-CAART, targets B cells that produce alloantibodies against exogenous FVIII in Hemophilia A patients who consequently require repeated and increased exogenous FVIII administration. We are exploring additional CAAR T cell product candidates that will focus on patients with B cell-mediated autoimmune diseases with well-defined antibody targets.

The chart below shows our CAAR T cell product candidates currently under development:



Our Product Candidates

DSG3-CAART for Mucosal PV

Our lead product candidate, DSG3-CAART, is a CAAR T cell therapy expressing DSG3 antigen epitopes as the extracellular domain of a chimeric immunoreceptor, and is designed to enable specific cytotoxicity toward B cells with DSG3 autoantibody targeting abilities. We believe this strategy has the potential to enable direct elimination of DSG3 autoantibody memory B cells and indirect elimination of DSG3-specific short-lived plasma cells that produce the pathogenic autoantibodies.

Scientific, Clinical and Commercial Assessment

PV is a potentially fatal, chronic autoimmune disease characterized by acantholysis, which is the loss of adhesion between cells of the skin or mucous membranes. Desmosomes are a collection of proteins that provide the structure for epithelial cells to connect with each other. PV results when specific pathogenic autoantibodies disrupt desmosomes by targeting DSG3 and/or DSG1, which are proteins that are part of the desmosomes. These autoantibodies cause the upper layer of the epidermis to split away from its base resulting in characteristic erosions and blisters. Widespread damage to the skin and mucous membranes increases susceptibility to life-threatening systemic infections. PV has two major subtypes:

- mPV—Characterized by DSG3 autoantibodies only, affecting only mucosal surfaces—accounts for approximately 25% of PV
- mcPV—Characterized by DSG3 autoantibodies and DSG1 autoantibodies, affecting both mucosal and cutaneous surfaces—accounts for approximately 75% of PV

The presence of DSG-specific antibodies is 98% to 100% sensitive and specific in identifying patients with PV. Based on a published consensus document, these antibodies have been deemed both necessary and sufficient to cause the disease. Thus, in the absence of DSG autoantibodies, PV generally does not occur. In mPV, patients will typically develop painful skin blisters on their mucosal membrane surface, including mouth, nose, throat, genitals, and other orifices, often leading to an inability to eat, drink and function normally. The pathogenic

DSG3 autoantibody is made by a specific small number of aberrant B cells, which express the DSG3 autoantibody on their surface. An overview of mPV and mcPV is provided in the figure below.

	Mucosal PV: 25% of U.S. pemphigus vulgaris	Mucocutaneous PV: 75% of U.S. pemphigus vulgaris
Autoantibody	Anti-DSG3	Anti-DSG3 + Anti-DSG 1
Clinical Manifestations	Painful blisters of the orifices (mouth, nose, larynx, esophagus, eyes, genitalia, rectum)	Blisters in orifices and on skin
Disease Incidence (US / EU)	350 / 600	1,050 / 1,800
Disease Prevalence (US / EU)	4,250 / 6,250	12,750 / 18,750

Visual evidence of clinical manifestations of PV. (Left panel) Inside of cheek of a patient with mPV, showing sloughing mucosa and blistering. (Right panel) Back of a patient showing cutaneous skin blistering and sloughing in a patient with mcPV.

Like most autoimmune diseases, the current standard of care for PV relies on general immune suppression, which is often transiently effective but can lead to severe infection, potentially resulting in hospitalization and death. First-line therapy for PV typically consists of corticosteroids in moderate to high doses in combination with the anti-CD20 monoclonal antibody rituximab where clinically appropriate. Second-line therapy focuses on the several systemically immunosuppressive medications such as mycophenolate, azathioprine and methotrexate. Additional options used in the acute setting with severe disease presentation include plasmapheresis, or infusions of intravenous immunoglobulin.

B cell depletion with rituximab was approved by the FDA for the treatment of PV in 2018 and is playing an increasing role as part of the standard of care because it has proven to be one of the more effective therapies for PV. However, data suggest that a significant number of patients treated with rituximab will relapse with or without chronic therapy. Despite the recent approval for use as an adjuvant therapy with corticosteroids in PV, rituximab has several limitations in terms of efficacy, safety and convenience. Rituximab treatment frequently results in relapse, which is reduced but still occurs despite chronic treatment every six months in PV. It does not specifically target the pathogenic B cells, but rather it depletes all CD20-expressing B cells, which leads to an ongoing risk of severe infection and death. As such, there remains not only an unmet medical need in PV, but also a need for safer therapies that can provide a reliable, durable and complete remission off of all other medications.

There are several emerging therapies also being developed for the treatment of PV, which are being evaluated in late-stage clinical trials. These therapies provide important alternative therapeutic options for patients; however, we believe based on early published data that these therapies are unlikely to be curative and do not specifically ablate autoantibody producing B cells.

Epitope Mapping

DSG3 consists of five extracellular cadherin, or EC, domains as shown schematically in the figure below. Since T cell activation depends on the intermembrane distance of the immunologic synapse, we tested different

combinations of ECs for expression in primary human T cells using DSG3 fragments as the extracellular domain as shown in the figure below.

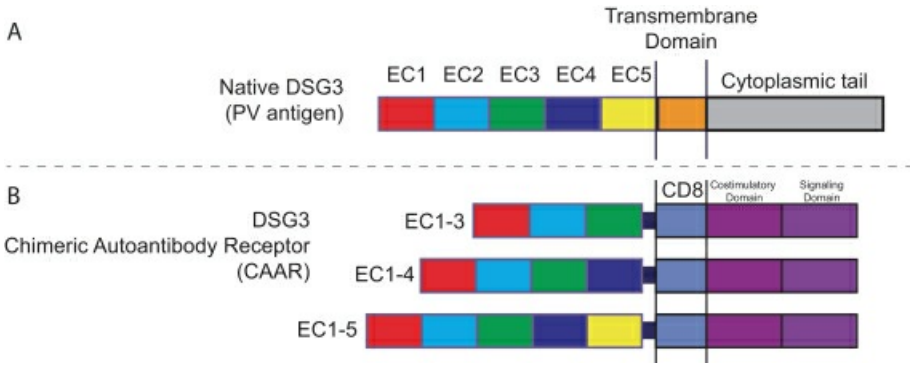
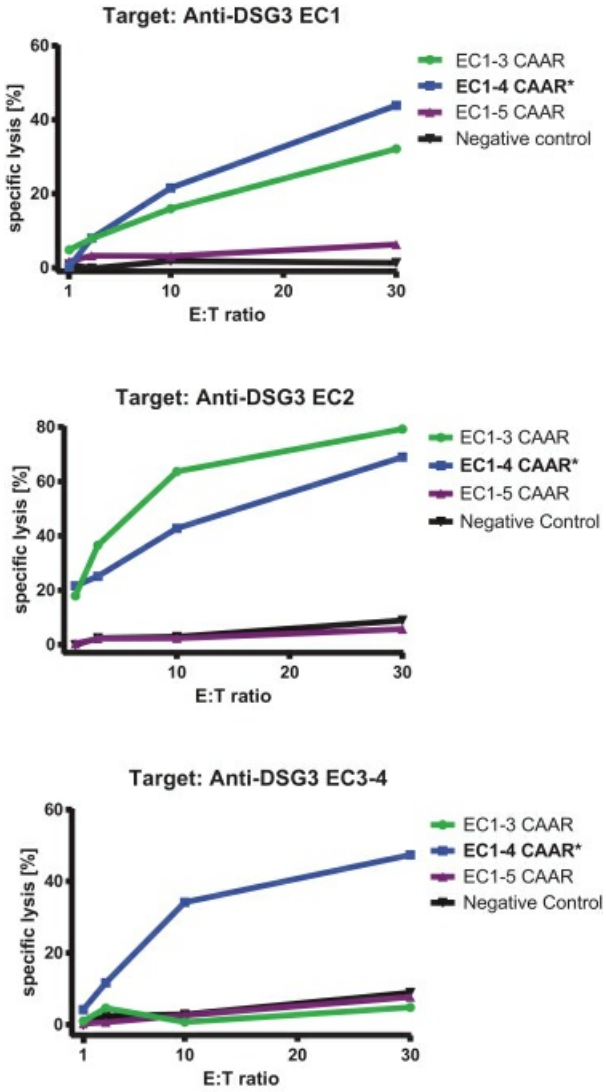


Image showing the naturally occurring DSG3 protein and the five EC domains. (B) The CAAR constructs that were evaluated in preclinical studies, containing the whole or subsets of the DSG3 protein. The transmembrane and intracellular signaling domains are identical to those in the CART19 studies published by Penn.

CAAR Construct / Design

The DSG3 EC1-5 CAAR was minimally functional, likely due to the extracellular domain being too large to enable CAAR function or aggregation of the CAAR on the T cell surface. The CAAR designs with either DSG3 EC1-3 or DSG3 EC1-4 showed interferon-gamma production after exposure to the target cells, demonstrating specific cytotoxic activity across targets. In addition, no cytokine production was detected after exposure to cells that did not express surface immunoglobulins or other non-target cells.

The DSG3 EC1-3 was not effective against one target cell known to bind to the DSG3 EC3-4 domain. Together, this data suggests that the DSG3 EC1-4 CAAR is the optimal construct to balance activity while retaining the ability to target locations of known pathogenic antibodies, as shown in the figures below.



*Cytotoxicity assay to assess killing activity of DSG3 CAART. Negative control is a CAR T with an antibody fragment attached to the extracellular domain. * indicates construct that was selected for further development. E:T ratio = effector to target ratio.*

In Vitro *Studies*

A variety of *in vitro* studies were conducted to evaluate DSG3-CAART from a preclinical efficacy and toxicity perspective. These studies included an evaluation of DSG3-CAART against proteins that are known to bind the DSG3 antigen, a screen of DSG3-CAART against an array of other membrane proteins and a set of studies designed to evaluate the potential effects of soluble DSG3 antibodies against DSG3-CAART. The results of these studies are summarized below.

Evaluation of DSG3-CAART reactivity against known DSG3 binding proteins. The DSG3 antigen presented on the extracellular domain of DSG3-CAART may naturally bind proteins in the body. These proteins may bind to and activate DSG3-CAART, potentially causing toxicity. The native binding proteins for DSG3 are the desmocollin proteins, which are important for cell adhesion in the skin and mucosa. We performed a variety of studies to test whether DSG3-CAART recognizes and activates the desmocollin proteins. Epithelial cells isolated from various primary organ systems that express some level of desmocollin proteins were screened. Potential DSG3-CAART activity was evaluated through the detection of cytokines released against each cell type and cytotoxicity. The data demonstrated an absence of inflammatory T cell cytokines after being exposed to these cells, indicating an absence of T cell activation. No cytotoxicity was detected except at very high, non-pharmacologically feasible doses. Collectively, we believe there is sufficient evidence to suggest that the DSG3 protein in the context of a CAAR does not interact with desmocollin proteins.

Evaluation of DSG3-CAART off-target binding against membrane proteins. A membrane protein array was utilized to screen the DSG3-CAART extracellular domain against 5,300 membrane proteins, which encompass the approximate number of membrane proteins contained in the human genome. The confirmatory screen yielded no off-target signals, except for one weak signal against a protein that is designed to bind to glycoproteins, and which was detected in both the test and control conditions. Further evaluation of this protein in cell-based assays indicated that DSG3-CAART does not recognize and activate against this protein.

Evaluation of the effect of soluble antibodies on DSG3-CAART function. We expect that circulating antibodies may prompt an active immune response against treatment with CAAR T cell therapy. These antibodies can induce proliferation of DSG3 CAAR T cells but also could neutralize the cells. In our preclinical *in vitro* studies, we observed that while DSG3 antibodies may have a variable effect on CAAR function, there was no systematic effect to enhance or reduce CAAR function. These dynamics were evaluated in a series of *in vitro* studies as follows:

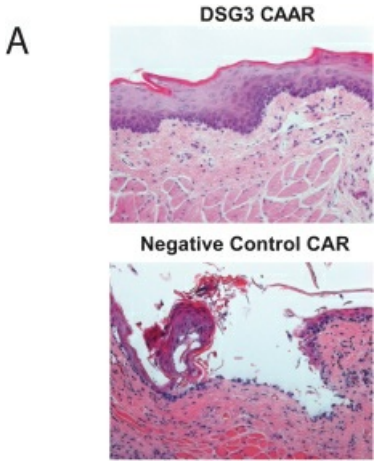
- *Soluble DSG3 antibodies were added to CAAR T cell cytotoxicity assays, at a range of concentrations likely to be encountered in patients, to assess the impact on CAAR function.* In all cases when the CAAR T cells were tested in the presence of soluble DSG3 antibodies, they retained their killing function. In addition, the presence of antibodies did not demonstrate a systematic effect to enhance or reduce the CAAR T cells' cytotoxic ability. Therefore, we believe that removal of circulating soluble DSG3 antibodies from patients prior to infusions may not be necessary to enable potential benefit.
- *Monoclonal DSG3 antibodies with an enhancing effect were evaluated in combination with PV patient serum to assess their impact on DSG3 CAAR T cell division and stimulation of cytokine production.* Monoclonal DSG3 antibodies were capable of inducing DSG3 CAAR T cell division and stimulated production of moderate levels of cytokine production, as measured by interferon gamma. Therefore, we believe the presence of DSG3 autoantibodies in patients may contribute to the DSG3 CAAR T cell population expansion post-infusion.

- *Antibodies purified from PV patients were added to DSG3 CAAR T cells at a range of concentrations known to commonly occur in patients in order to evaluate the extent to which patient serum may activate CAAR T cells.* These antibodies induced a dose dependent increase in interferon gamma. This increase was an order of magnitude lower than what was observed when DSG3-CAART engaged with target B cells.
- *Off-target toxicity may also be seen due to antibody-mediated bridging of DSG3 CAAR T cell cytotoxicity against hematopoietic cells that express receptors designed to bind to antibodies, known as Fc receptors.* To evaluate this, we loaded DSG3 antibodies onto cells expressing antibody-binding receptors, and evaluated the ability of DSG3 CAAR T cells to bind and activate against these targets *in vitro.* No evidence of cytotoxicity was observed, suggesting the potentially low risk of off-target killing mediated by this mechanism.

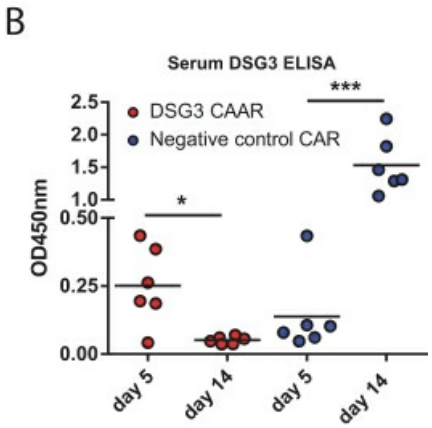
In Vivo *Studies*

To evaluate DSG3-CAART *in vivo*, three murine models were used. These models were designed to: directly compare the potency of DSG3-CAART in comparison with CART19 cells; evaluate the potential for on-target skin toxicity; and measure the activity of DSG3-CAART in the presence of polyclonal soluble DSG3 antibodies.

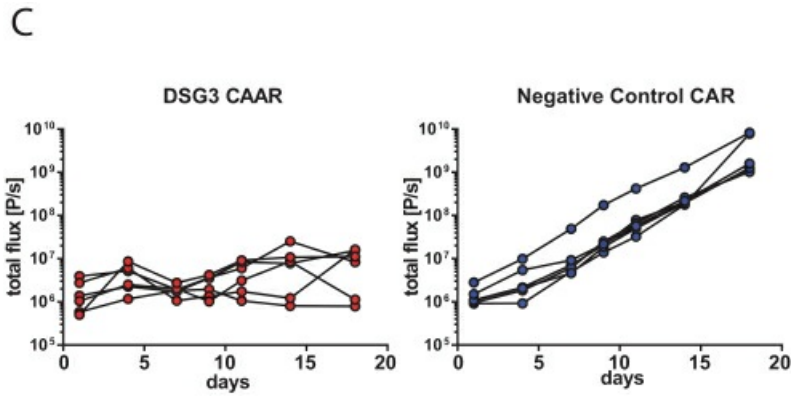
- *Evaluation of potency of DSG3-CAART in a human B cell tumor line compared to CART19 cells.*This B cell model contained genetically-modified B cells to express DSG3 antibodies on the cell surface in addition to luciferase, a bioluminescence marker, and allowed evaluation of DSG3-CAART's ability to engage and kill B cells that express the pathogenic antibody. CART19 cells were used as a positive control in this model as the B cells express CD19 on their cell surface. In this model, DSG3-CAART was found to result in a similar reduction of B cells compared to the CART19 cells.
- *Evaluation of on-target skin toxicity mediated by DSG3-CAART.* A human skin-xenografted model was used to evaluate the potential skin toxicity of DSG3-CAART by evaluating if the extracellular domain would react with desmocollin proteins, which are the known target for DSG3. These results were compared directly to a positive control CAR T expressing a DSG3 specific antibody as an extracellular domain. In this model, we observed the absence of skin toxicity mediated by the DSG3-CAART cells compared to the positive control, which did demonstrate skin toxicity.
- *Evaluation of DSG3-CAART in the presence of soluble antibodies.* We also tested a model where mice have circulating DSG3 antibodies to mimic the situation in PV patients. In this model, the DSG3 antibodies have well-defined and different epitopes with varying affinities, which may reflect the potential breadth of B cell targets that could be encountered in PV patients. The mice were then treated with DSG3-CAART, which was compared to non-CAAR expressing T cells. In this model, we observed amelioration of disease (see figure A below), reduction of DSG3 antibody titers (see figure B below), as well as control of the pathogenic B cells (see figure C below), by DSG3-CAART. We believe these results show the functional activity of DSG3-CAART in the presence of soluble antibody, which is further illustrated in the figures below.



Histology showing DSG3 CAAR maintaining normal epithelial cell structure in treated animals.



*OD450 is a proxy measure for serum DSG3-ELISA in this assay. * indicates statistically significant reduction in DSG3 serum antibody level in DSG3-CAART treated mice. P value is < 0.05. *** indicates statistically significant increase in DSG3 serum antibody level in the negative control CAR treated group. P value is < 0.001. p-value is a statistical calculation that relates to the probability that the difference between groups happened by chance, with a p-value of less than 0.05, or less than 5% probability that the difference happened by chance, generally being used as the threshold to indicate statistical significance.*



Total flux is a quantitative measure of cell bioluminescence, which approximates cell activity in this assay.

Clinical Development Plan

We intend to submit an IND to the FDA for a Phase 1 trial of DSG3-CAART. If accepted, subject to feedback from the FDA, we expect the DSG3-CAART trial will be designed as a Phase 1, open-label trial to assess the safety and tolerability of various dosing regimens of DSG3-CAART in the treatment of subjects with active mPV. DSG3-CAART will be administered by intravenous infusion, using a fractionated-dose infusion scheme of escalating numbers of DSG3-CAART cells for the initial cohorts in the first phase. This dosing scheme is designed to reduce the potential risks associated with acute infusion-related toxicities while preserving potential benefit for subjects by allowing a total infused dose that we believe is large enough to be potentially therapeutic based on prior CAR T trials.

We expect the trial will have three phases:

- Phase A: Fractionated dose escalation
- Phase B: Fractionation reduction at the selected dose
- Phase C: Expansion phase at the selected dose and administration scheme

In Phase A, the split dose uses dose fractionation to accommodate a low number of cells in the first infusion while still advancing the dose within the cohort up towards and spanning the range of cell doses that have been therapeutic in past gene-engineered T cell therapy trials. In Phase B, the dose selected from Phase A will be delivered in a decreasing number of dose fractionations to determine the dose fractionation strategy. In Phase C, subjects will be enrolled at the dose and fractionation, as determined in Phase A and B, to generate additional safety and outcome data to support the rationale for and design of future clinical trials.

Patients are eligible to be enrolled if they have a confirmed diagnosis of mPV based on colon biopsy for histology and positive DSG3 ELISA; active disease at screening; elevated DSG3 by ELISA; and previously been inadequately managed by, or refractory to, or relapsed after, or with contraindications to or intolerance of at least two prior systemic therapies. The primary objective of the trial is to evaluate the safety of DSG3-CAART cells and initial signs of target engagement.

We believe the risk of cytokine release syndrome, or CRS, a potentially life-threatening toxicity that has been observed after treatment with some types of immunotherapy, may be reduced with our CAAR T cells, due to its correlation with target burdens. In the context of treating cancer, the target cell population consists of all B

cells (healthy and cancerous), whereas our CAAR T cells only target the small subset of disease-causing reactive B cell population. In a clinical trial, while the possibility of cytokine release resulting from strongly activating soluble antibody cannot be ruled out, to date we have not observed any evidence of it in preclinical studies.

DSG3/1-CAART for mcPV

Scientific and Commercial Assessment

Our next PV product candidate, DSG3/1-CAART, is being designed to target DSG3 and/or DSG1 autoantibodies on pathogenic B cells that cause mcPV. mcPV is the most severe and most common subtype of PV and affects approximately 75% of PV patients. While mPV is caused by DSG3 autoantibodies, mcPV involves autoantibodies to both DSG3 and DSG1, resulting in the additional involvement of skin erosion and blistering. Similar to mPV, mcPV is typically treated with immune suppression, which has a high rate of relapse and potential for hospitalizations and fatal infections.

Epitope Mapping

DSG1 consists of five EC domains, with all known pathogenic epitopes occurring in the DSG1 EC1-4 domains. Similar to development of DSG3-CAART, we tested different combinations of DSG1 ECs for expression in primary human T cells using DSG1 fragments as the DSG1 EC domains. Given prior development of DSG3 CAAR, we leveraged those findings in the design of our DSG1 CAAR.

CAAR Construct / Design

We also tested multiple combinations of EC domains of DSG1 CAAR administered alone and in combination with the DSG3 EC1-4 CAAR to evaluate for cell-surface expression of the CAAR along with the potency and breadth of target cell killing. In this setting, the DSG1 EC1-4 CAAR showed robust and specific cytotoxicity towards all known pathogenic epitopes.

In Vitro *Studies*

CAAR development for mcPV, based on the targeting of DSG3- and/or DSG1-specific B cells, has shown promising preclinical results. DSG1 CAAR T cells specifically killed DSG1-specific B cells *in vitro*. In addition, we observed that with a 1:1 mixture of DSG3 and DSG1 CAAR T cells had killing capabilities without synergistic or antagonistic effect.

In Vivo *Studies*

The safety of DSG3 and DSG1-CAAR T cells was evaluated using human skin xenografts in comparison with anti-CART19 cells, which are known from human clinical trials not to cause direct skin toxicity. A 1:1 mixture of DSG3 and DSG1 CAAR T cells did not show off-target toxicity *in vivo.*

Development Plan

From a regulatory and clinical trial design perspective, we anticipate many of the elements incorporated into the planned DSG3-CAART trial will carry over to DSG3/1-CAART. We plan to evaluate the initial cohorts of patients from the planned DSG3-CAART trial to evaluate for safety and evidence of target engagement prior to proceeding with an IND submission for DSG3/1-CAART. We believe that, because mcPV is the most prevalent subset of PV and the patients are generally followed by the same subspecialists, it will allow for a wider patient pool eligible for a clinical trial. We anticipate the DSG3/1-CAART clinical trial protocol will have a significant amount of overlap with the DSG3-CAART protocol, but it will be informed by clinical data from the early cohorts in the DSG3-CAART trial. We further anticipate being able to use the same centers from the DSG3-CAART Phase 1 clinical trial to enroll patients for the DSG3/1-CAART clinical trials.

Currently, we are evaluating advanced manufacturing technologies that would potentially allow us to administerDSG3/1-CAART as a single product rather than requiring separate administration. The size of the DSG3/1 product candidate will likely require us to incorporate additional technologies to accommodate the size of the final CAAR construct. An evaluation of potential technologies to achieve this objective is ongoing. Upon completing the evaluation of these manufacturing technologies, we expect to conduct additional *in vitro* and *in vivo* studies using the combined product. While a product that administers a DSG3 CAAR and DSG1 CAAR as two separate products may be feasible, we believe that there would be significant advantages to developing a combined product from a regulatory and commercial perspective.

MuSK-CAART for MuSK Myasthenia Gravis

Scientific, Clinical and Commercial Assessment

MG is an autoimmune disease induced by autoantibodies targeting the neuromuscular junction, or NMJ, which can lead to life-threatening muscle weakness. Generalized MG, or gMG, is characterized by profound muscle weakness throughout the body, resulting in motor impairment, disabling fatigue, shortness of breath due to respiratory muscle weakness and episodes of respiratory failure.

gMG affects approximately 65,000 to 70,000 patients in the United States. The majority of patients who develop gMG have autoantibodies against some part of the NMJ that are known to be pathogenic. 80% to 90% of patients with gMG have autoantibodies against the acetylcholine receptor, or AchR, detectable in their serum. Approximately 6% to 7.5% of patients with gMG have autoantibodies against MuSK, which is a different target on the surface of the muscle membrane.

Patients diagnosed with MuSK MG have a different recommended treatment course compared to patients with AchR MG. Importantly, many patients with MuSK MG respond poorly to cholinesterase inhibitors, which are often the first line of therapy in AchR MG. In that setting, patients with MuSK MG are typically started on corticosteroids in addition to one or more steroid-sparing immunosuppressive agents. Corticosteroids are tapered to the extent possible to prevent disease relapse, though many remain dependent on corticosteroid despite concomitant treatment with immunosuppressive medications. In the acute setting, plasmapheresis may be used to address severe disease. Rituximab is often considered as a second-line therapeutic option in patients with an inadequate response to initial immunosuppressive medications. Importantly, complement is not thought to be meaningfully implicated in the pathophysiology of MuSK MG, and complement inhibitors are not indicated for treatment of disease.

Epitope Mapping

The MuSK protein has a similar structure and size as compared to DSG3. MuSK contains four extracellular domains, as shown below:

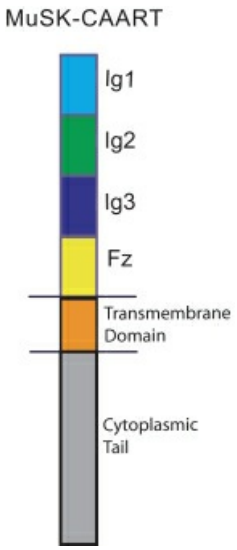


Figure illustrating the extracellular domains of the wild-type MuSK protein.

Studies conducted in patients with MuSK MG have revealed that the autoantibodies may be against epitopes located in each of the extracellular domains for MuSK.

CAAR Construct and Design

With an understanding that pathogenic autoantibody epitopes may target any domain of MuSK, multiple MuSK CAAR candidates have been engineered that incorporate all extracellular domains. Each CAAR construct is being or will be tested in preliminary *in vitro* and *in vivo* experiments.

Development Plan

The initial *in vitro* studies with our MuSK-CAART product candidate are ongoing. We expect these studies to be followed by *in vivo* studies to evaluate safety of the MuSK-CAAR construct along with evaluation of target engagement.

FVIII-CAART for Hemophilia A with Factor VIII Alloantibodies

While our CABA platform is primarily directed towards the treatment of B cell-mediated autoimmune diseases, we believe the approach may be applicable in other instances where B cell antibody production is implicated. Specifically, we have identified an opportunity to apply the CABA platform to develop potential CAAR adjunctive therapies in cases where the immune system has or produces antibodies against potential therapies, which is known as an alloimmune response. These alloantibodies can prevent a particular therapy from being delivered effectively because the therapy is degraded by the immune response due to alloantibody binding.

We believe our approach has the potential to address the alloantibody response by specifically ablating the B cells responsible for producing the alloantibodies through a similar mechanism seen in autoimmune disease. With the alloantibody producing cells ablated, the treatment could then be provided.

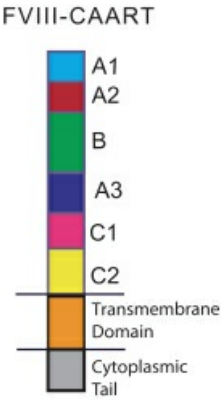
Scientific, Clinical and Commercial Assessment

Hemophilia A is an X-linked bleeding disorder caused by mutations in the FVIII gene resulting in a deficiency of functional FVIII, a critical factor in blood coagulation. It affects about 1:5,000 male births. Severe Hemophilia A, where FVIII levels are less than 1% of normal, accounts for about 60% of all cases and is characterized by frequent spontaneous bleeds. Currently, Hemophilia A is treated with FVIII replacement via intravenous administration.

The main complication of FVIII replacement therapy is that 20% to 30% of patients with severe disease develop neutralizing alloantibodies against the FVIII protein. These alloantibodies decrease the levels of FVIII and at high-titers, render attempts to replace or stimulate the production of FVIII ineffective. The risk of alloantibody development for patients with severe Hemophilia A is highest during their initial FVIII exposures. The standard treatment to reverse alloantibody formation consists of repeated high-dose infusions of FVIII, which has limited efficacy, a high cost and is difficult to titrate to an appropriate therapeutic level for the patient. We believe FVIII-CAART could be effective in addressing patients with Hemophilia A who have developed FVIII antibodies that require repeated, high-dose administrations of FVIII.

Epitope Mapping

The following image depicts FVIII, which is a large glycoprotein consisting of six domains that interact with each other to form the full complex.



Studies conducted in patients with Hemophilia A have revealed that acquired FVIII alloantibodies following exogenous FVIII administration are typically directed against A2, C1 and C2 domains of FVIII.

CAAR Construct and Design

Preliminary FVIII CAAR and CAAR-like constructs have been engineered that target parts, but not all, of the FVIII domains. Dr. Milone, one of our scientific co-founders, has led the development of one such construct.

Development Plan

Internally, we are conducting additional studies to optimize our FVIII-CAART development. The focus of these studies will be to fully characterize any additional pathogenic epitopes and construct a FVIII-CAART that

includes additional FVIII domains. Given the size of the FVIII protein, this will likely require us to incorporate additional technologies to reduce the size of the final CAAR construct. An evaluation of potential technologies to achieve this objective is ongoing.

Manufacturing

Vector Manufacturing

The lentiviral vector that we plan to use in the initial subjects in our Phase 1 clinical trial for DSG3-CAART was manufactured at CHOP. We have also reserved multiple vector manufacturing slots at Penn, which we may use in our DSG3-CAART or subsequent clinical trials. In parallel, we are in discussions with multiple CMOs to secure production slots for vector which may be used in our DSG3-CAART or subsequent clinical trials. We believe these efforts will provide us with sufficient clinical-grade vector to move forward with our anticipated clinical trials.

Cell Manufacturing

We have entered into a collaboration with the Clinical Cell and Vaccine Production Facility, or CVPF, at Penn, to provide focused scientific, technical and regulatory support for CAAR T cell manufacture. CVPF is accredited by the Foundation for the Accreditation of Cell Therapy and is capable of and experienced at supporting manufacture for early-phase clinical trials of novel cell therapy products in first-in-man clinical trials. We expect to rely upon CVPF to provide initial Phase 1 clinical trial drug supply for DSG3-CAART. Penn's manufacturing process for DSG3-CAART is directly related to the process developed at Penn for early clinical trials of the CART19, which subsequently became known commercially as Kymriah. The process was later transferred to Novartis Pharmaceuticals Corporation and further modified for the Kymriah program.

As we scale our manufacturing of DSG3-CAART and our other product candidates to meet our expected needs for further clinical trials, we may or may not rely on Penn, but we also expect to rely on contract manufacturing organizations, or CMOs, and other third parties for the manufacturing and processing of our clinical trial materials. Any CMO that we select will be subject to cGMP requirements. We believe the use of contract manufacturing for our pipeline programs will be cost-effective and allow us to rapidly prepare for clinical trials in accordance with our development plans. In preparation for this transition, we have engaged multiple third-party contractors to manufacture clinical grade viral vector used to deliver the applicable CAAR gene into the T cells. We have also initiated development work with certain contractors for cGMP and commercial vector production. We expect third-party manufacturers will be capable of providing and processing sufficient quantities of our product candidates to meet anticipated clinical trial demands and commercial need.

Once we have sufficient clinical data from subjects in our DSG3-CAART study, we intend to begin the process of engineering and then establishing our own commercial scale GMP-compliant manufacturing facility. We believe this will allow us to enhance supply chain control, increase supply capacity and help ensure clinical and commercial demand for our pipeline programs is met in the event that DSG3-CAART receives marketing approval. Informed by our experience in building cell therapy facilities and creating supply chains, we plan to develop a robust supply chain with alternative sources to maintain continuous supply. In parallel with these activities, we are evaluating and executing proof-of-concept studies to test advanced manufacturing and automation technologies to continuously improve the manufacturing process and meet commercial and scalability targets.

Commercialization

Our aim is to become a fully integrated cellular therapy company in order to improve the lives of patients with B cell-mediated autoimmune diseases. We have designed a strategic approach to move forward with our lead product candidate, DSG3-CAART, while at the same time having a number of product candidates in

development. The product candidates from our CABA platform address clinical indications where there is a compelling opportunity to improve clinical outcomes in comparison with the current standard of care in an easily identified patient population. Our initial product candidates are focused on rare disease populations where we believe there is potential to commercialize independently. This is due to a concentration of treatment paradigms and limited but easily identified patient populations. Our plan is to focus commercialization and launch efforts initially in the United States, and eventually in the European Union and Asia-Pacific geographies.

Competition

The biotechnology and pharmaceutical industries are characterized by rapidly advancing technologies, intense competition and a strong focus on intellectual property. We face competition from many different players, including large and specialty pharmaceutical and biotechnology companies, academic research organizations and governmental agencies. Any therapeutic candidates we successfully develop and commercialize will compete with the existing standard of care as well as any novel therapies that may gain regulatory approval in the future.

Existing treatment options for PV are limited. Rituximab, marketed by Roche Holding AG, is the first drug to have received approval for PV in the United States in over 60 years. In Europe, the approved therapies for PV are corticosteroids, azathioprine and rituximab. Other standard of care treatments include various immunosuppressants and intravenous immunoglobulin infusions given monthly or on another periodic chronic basis. Additionally, multiple biopharmaceutical companies have therapies in clinical development. We are aware that Affibody AB, Alexion Pharmaceuticals, Inc., argenx SE, Immunovant, Inc., Momenta Pharmaceuticals, Inc., Novartis Pharmaceuticals Corporation, Ono Pharmaceutical Co., Ltd., Principia Biopharma Inc., Rubius Therapeutics, Inc., among others, are developing treatments for PV.

Competition in the MuSK MG autoimmune space is currently dominated by the current standard of care, rituximab. A second approved approach to treating patients is IVIG, which is available through CSL Behring LLC, Grifols, S.A., and Mitsubishi Tanabe Pharma Corporation. Additionally, multiple biopharmaceutical companies have therapies in clinical development. We are aware that argenx SE, BioMarin Pharmaceutical Inc., Catalyst Partners, Inc., CuraVac, Inc., GlaxoSmithKline PLC, Millennium Pharmaceuticals, Inc. (subsidiary of Takeda Pharmaceutical Company Limited), Novartis Pharmaceuticals Corporation, and Ra Pharmaceuticals, Inc., among others, are developing drugs that may have utility for the treatment of MuSK MG.

Multiple therapies are approved or in development for the treatment of Hemophilia A patients who develop alloantibodies against FVIII. Standard of care is typically immune tolerance induction, or ITI, therapy with higher doses of FVIII. Available treatments for those who do not respond to ITI include anti-inhibitor coagulation complexes, recombinant factor VIIa, and bispecific factor IXa- and factor X-directed antibodies. Companies who market products or are developing product candidates within these categories of medicine include Catalyst Pharmaceuticals, Inc., Novo Nordisk A/S, OPKO Health, Inc., Roche Holding AG and Takeda Pharmaceutical Company. In addition, we are aware that Alnylam Pharmaceuticals, Inc., Apitope Technology Ltd., Bayer AG, GC Pharma (formerly known as Green Cross Corporation), Idogen AB, Novo Nordisk A/S and Pfizer Inc., Sanofi, Spark Therapeutics, Inc., and uniQure N.V. are developing product candidates with other mechanisms that have the potential to treat Hemophilia A patients with FVIII alloantibodies.

We believe we are the first and only company developing CAAR T drug candidates for the treatment of B cell-mediated autoimmune diseases. However, despite the significant differences in discovery, development and target populations between oncology and autoimmune targets, we recognize that companies with an investment and expertise in CAR T cell development for oncology indications could attempt to leverage their expertise into B cell-mediated autoimmune disease-affected populations. We are aware of biotechnology companies that are exploring other methods of engineering T cells for the treatment of autoimmune conditions. Companies that are developing drug candidates for autoimmune diseases using either traditional CAR T or CAR T regulatory cell approaches include Atara Biotherapeutics, Inc. and Sangamo Therapeutics, Inc. In addition, some biotechnology

companies are engineering red blood cells to incorporate self-antigens with the goal of tolerizing the immune system to treat autoimmune and alloimmune conditions; these companies include Rubius Therapeutics, Inc. and SQZ Biotechnologies Co.

Our belief is that the majority of products currently under development will not be direct competitors to our products. Current standard of care therapy, and other most products in development, require repeated administration of an oral or intravenous drug that often produces an incomplete response or is effective for a limited period of time prior to patient relapse. While these products may be used prior to our products or used in addition to our products, we do not believe that the use will restrict the affected patient populations that we intend to target. Potential competition may arise from other cell therapy approaches that are or may be explored as a potential cure for indications we are currently targeting, but we believe we are currently well-positioned compared to our competitors.

Many of the companies against which we are competing or against which we may compete in the future have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved products than we do. Mergers and acquisitions in the pharmaceutical and biotechnology industry may result in even more resources being concentrated among a smaller number of our competitors. Smaller or early stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs.

Intellectual Property and Barriers to Entry

We strive to protect the proprietary technologies that we believe are important to our business, including pursuing and maintaining patent protection intended to cover our product candidates and their use, as well as other inventions that are important to our business. In addition to patent protection, we also rely on know-how, confidentiality agreements, invention assignment agreements and trade secrets to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection, to develop and maintain our proprietary position. The confidentiality agreements are designed to protect our proprietary information and the invention assignment agreements are designed to grant us ownership of technologies that are developed for us by our employees, consultants or certain other third parties. We seek to preserve the integrity and confidentiality of our data and trade secrets by maintaining physical security of our premises and physical and electronic security of our information technology systems. While we have confidence in our agreements and security measures, either may be breached, and we may not have adequate remedies. In addition, our trade secrets may otherwise become known or independently discovered by competitors.

Our commercial success depends in part upon our ability to obtain and maintain patent and other proprietary protection for commercially important technologies, inventions and trade secrets related to our business, defend and enforce our intellectual property rights, particularly our patent rights, preserve the confidentiality of our trade secrets and operate without infringing valid and enforceable intellectual property rights of others.

The patent positions for biotechnology companies like us are generally uncertain and can involve complex legal, scientific and factual issues. In addition, the coverage claimed in a patent application can be significantly reduced before a patent is issued, and its scope can be reinterpreted and even challenged after issuance. As a result, we cannot guarantee that any of our product candidates will be protectable or remain protected by enforceable patents. We cannot predict whether the patent applications we are currently pursuing will issue as patents in any particular jurisdiction or whether the claims of any issued patents will provide sufficient proprietary protection from competitors. Any patents that we hold may be challenged, circumvented or invalidated by third parties.

As of July 1, 2019, our patent estate (all of which has been in-licensed) included one issued U.S. patent, seven pending U.S. patent applications, and 13 pending foreign patent applications. See "—Our Material Agreements—Amended and Restated License Agreement with Penn."

With regard to our DSG3-CAART and DSG3/1-CAART product candidates, we have one issued U.S. patent with claims directed to a genetically modified cell containing a chimeric autoantibody receptor containing an extracellular domain containing DSG3, DSG1 or fragments thereof, which is scheduled to expire in 2035, without taking a potential patent term extension into account. We also have four pending U.S. patent applications and counterpart patent applications pending in Canada, China and Europe, which if issued, would be expected to expire in 2035. This patent family is owned by Penn and exclusively licensed to us in the field of the license.

With regard to our MuSK-CAAR T cell product candidate, we have one pending U.S. patent application and one pending International, or PCT, patent application, which if issued, would be expected to expire in 2039. This patent family is owned by Penn and exclusively licensed to us in the field of the license.

With regard to our FVIII-CAAR T cell product candidate, we have one pending U.S. patent application and counterpart patent applications pending in Australia, Canada, China, Europe, Japan, Korea, Mexico, New Zealand, and Russia, which if issued, would be expected to expire in 2037. This patent family is co-owned by Penn and CHOP and is exclusively licensed to us in the field of the license.

The term of individual patents depends upon the legal term of the patents in the countries in which they are obtained. In most countries in which we file, the patent term is 20 years from the earliest date of filing a non-provisional patent application.

In the United States, the term of a patent covering an FDA-approved drug may be eligible for a patent term extension under the Hatch-Waxman Act as compensation for the loss of patent term during the FDA regulatory review process. The period of extension may be up to five years beyond the expiration of the patent, but cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval. Only one patent among those eligible for an extension may be extended, and a given patent may only be extended once. Similar provisions are available in Europe and in certain other jurisdictions to extend the term of a patent that covers an approved drug. It is possible that issued U.S. patents covering each of our product candidates may be entitled to patent term extensions. If our product candidates receive FDA approval, we intend to apply for patent term extensions, if available, to extend the term of patents that cover the approved product candidates. We also intend to seek patent term extensions in any jurisdictions where they are available, however, there is no guarantee that the applicable authorities, including the FDA, will agree with our assessment of whether such extensions should be granted, and even if granted, the length of such extensions.

In addition to patent protection, we also rely on know-how and trade secret protection for our proprietary information that is not amenable to, or that we do not consider appropriate for, patent protection, to develop and maintain our proprietary position. However, trade secrets can be difficult to protect. Although we take steps to protect our proprietary information, including restricting access to our premises and our confidential information, as well as entering into agreements with our employees, consultants, advisors and potential collaborators, third parties may independently develop the same or similar proprietary information or may otherwise gain access to our proprietary information. As a result, we may be unable to meaningfully protect our know-how, trade secrets, and other proprietary information.

In addition, we plan to rely on regulatory protection based on orphan drug exclusivities, data exclusivities, and market exclusivities. See "—Government Regulation" for additional information.

Our Material Agreements

Amended and Restated License Agreement with Penn

In July 2019, we entered into an amended and restated license agreement, or the License Agreement, with Penn and the Children's Hospital of Philadelphia, or CHOP, and together with Penn, the Institutions, pursuant to which we obtained (a) a non-exclusive, non-sublicensable, worldwide research license to make, have made and use products in two subfields of use, (b) effective as of October 2018, an exclusive, worldwide, royalty-bearing license, with the right to sublicense, under certain patent rights of the Institution to make, use, sell, offer for sale and import products in the same two subfields of use, and (c) effective as of October 2018, a non-exclusive, worldwide, royalty-bearing license, with limited rights to sublicense, under certain of Penn's know-how, which know-how satisfies certain criteria and is listed on a mutually agreed-to schedule, to make, have made, use, sell, offer for sale, import and have imported products in the same two subfields of use. As of July 2019, no such know-how has been scheduled. Our rights are subject to the rights of the U.S. government and certain rights retained by the Institutions.

Unless earlier terminated, the License Agreement will expire with respect to a product upon the later of (a) the expiration of the last to expire patent or patent application covering such product or (b) 10 years after the first commercial sale of such product. We may terminate the License Agreement in its entirety or on a subfield-by-subfield basis at any time for convenience upon a certain number of days' written notice. Penn may terminate the License Agreement in its entirety or on a subfield-by-subfield basis for our uncured material breach, including for our failure to meet certain diligence obligations and milestone events. We, however, may extend the achievement date of any milestone event for an additional period of time by making a payment in a certain amount, subject to certain limitations in the number of times each event may be extended.

Penn maintains control of all filing, prosecution and maintenance of the Institutions' patent rights licensed by us, and we are responsible for all ongoing patent costs during the term of the agreement. We also reimbursed Penn for its out-of-pocket expenses incurred prior to the effective date of the agreement with respect to the filing, prosecution and maintenance of the patent rights licensed by us. Under the terms of the License Agreement, we are also obligated to pay $2.0 million annually for three years beginning August 2018 for funding to the laboratories of each of Drs. Milone and Payne. See "—Sponsored Research Agreements with the Trustees of the University of Pennsylvania."

Under the License Agreement, we must use commercially reasonable efforts to develop and commercialize a product in each subfield. During the term of the License Agreement until the first commercial sale of the first product, we are obligated to pay Penn a non-refundable, non-creditable annual license maintenance fee of $10,000. We are required to pay certain milestone payments upon the achievement of specified clinical and commercial milestones. Milestone payments are reduced by a certain percentage for the second product that achieves a milestone, by an additional percentage for the third product that achieves a milestone, and so on, for each subsequent product that achieves a milestone. In the event that we are able to successfully develop and launch multiple products under the License Agreement, total milestone payments could approach $20.0 million. Penn is also eligible to receive tiered royalties at percentage rates in the low single-digits, subject to an annual minimum royalty, on annual worldwide net sales of any products that are commercialized by us, our affiliates or our sublicensees that contain, use, embody, result from the use of or incorporate, or are covered by, the intellectual property licensed by us. To the extent we sublicense our license rights under the License Agreement, Penn would be eligible to receive tiered sublicense income at percentage rates in the mid-single to low double-digits. We have also entered into a subscription and technology transfer agreement with Penn, pursuant to which we will pay Penn an upfront subscription fee and a nominal non-refundable royalty on the net sales of products, a portion of which will be credited toward milestone payments and royalties under this License Agreement. Technology transfer activities would be at our cost and subject to agreement as to the technology to be transferred.

Sponsored Research Agreements with Penn

Dr. Michael Milone

In April 2018, we and Penn entered into a Sponsored Research Agreement for the laboratory of Dr. Milone, or the Milone SRA, pursuant to which we agreed to sponsor certain research related to the development of (i) T cell based immunotherapies for autoimmune and alloimmune antibodies of pathologic significance and (ii) a clinical grade microfluidic device designed for single step selection and activation of T cells from blood samples to be conducted in Dr. Milone's laboratory at Penn. Under the Milone SRA, Penn granted us a perpetual, irrevocable, non-transferable, non-exclusive license to use all intellectual property resulting from the research sponsored by us for internal research purposes. In addition, Penn granted us an option to include, in exchange for a fee, any intellectual property resulting from the research sponsored by us that relates to CAAR T cell therapies for hemophilia and/or pemphigus within the scope of the License Agreement. Penn also granted us an option to negotiate a license to all other intellectual property resulting from the research sponsored by us. Unless earlier terminated, the Milone SRA will expire on April 23, 2021.

Dr. Aimee Payne

In April 2018, we and Penn entered into a Sponsored Research Agreement for the laboratory of Dr. Payne, or the Payne SRA, pursuant to which we agreed to sponsor certain research related to the development of T cell based immunotherapies for autoimmune and alloimmune antibodies of pathologic significance to be conducted in Dr. Payne's laboratory at Penn. Under the Payne SRA, Penn granted us a perpetual, irrevocable, non-transferable, non-exclusive license to use all intellectual property resulting from the research sponsored by us for internal research purposes. In addition, Penn granted us an option to include, in exchange for a fee, any intellectual property resulting from the research sponsored by us that relates to CAAR T cell therapies for hemophilia, MG and/or pemphigus within the scope of the License Agreement. Penn also granted us an option to negotiate a license to all other intellectual property resulting from the research sponsored by us. Unless earlier terminated, the Payne SRA will expire on April 23, 2021.

We have committed to funding a defined research plan for three years through April 2021 under both the Milone SRA and Payne SRA. We have estimated the three-year cost of the two SRAs to be $8.5 million, which satisfies the $2.0 million annual obligation under the License Agreement.

Master Translational Research Services Agreement with Penn

In October 2018, we entered into a Master Translational Research Services Agreement with Penn, or the Services Agreement, pursuant to which Penn agreed to perform certain services related to the research and development of the technology licensed to us under the License Agreement, as well as certain clinical, regulatory and manufacturing services. The Services Agreement will expire on the later of (i) October 19, 2021 or (ii) completion of the services for which we have engaged Penn under the Services Agreement. Either party may terminate this agreement with or without cause upon a certain number of days' written notice. The services encompassed by the Services Agreement are performed by different organizations at Penn pursuant to certain addenda to the Services Agreement, including the CAROT Addendum and the CVPF Addendum. In addition, in July 2019 we and Penn entered into an Alliance Agreement pursuant to which we will pay Penn a nominal annual fee in order for Penn to provide an adequate and consistent level of support to the services that it provides to us.

The CAROT Addendum

Under the Center for Advanced Retinal and Ocular Therapeutics, or CAROT, Addendum, Penn manufactures vector that is then to be used by the CVPF in the manufacture of our product candidates. In the event that certain materials owned by Penn are incorporated into a product developed for us, Penn has agreed to grant us a limited license to use those materials. Further, Penn agreed to grant us an exclusive, paid-up, royalty-free, transferable, irrevocable, perpetual exclusive license to any deliverables produced under the CAROT

Addendum, except with respect to certain technical information of Penn that is contained or incorporated in the deliverables, to which Penn agreed to grant us a limited nonexclusive license. However, any necessary technology transfer would be pursuant to the subscription and technology transfer agreement described above.

The CVPF Addendum

Under the CVPF Addendum, Penn conducts process validation studies and large scale engineering runs for our product candidates. Under the CVPF Addendum, CVPF will contractually agree to manufacture agreed upon quantities of DSG3-CAART material for use in connection with our Phase 1 clinical trial, unless the agreement is terminated by either party. Any necessary technology transfer would be pursuant to the subscription and technology transfer agreement described above.

Research Agreement with The Regents of the University of California

In October 2018, we entered into a Research Agreement, or the UC Agreement, with The Regents of the University of California, or the UC Regents, pursuant to which the UC Regents agreed to perform certain research projects relating to the safety and efficacy of MuSK CAAR T cells in various models of anti-MuSK MG, or the UC Research.

The UC Agreement provides that the UC Regents will own all rights to any intellectual property developed solely by UC Regents employees in conducting the UC Research, or developed solely by any of our employees that conduct the UC Research using the UC Regents' facilities or resources. The UC Regents granted us an irrevocable, royalty-free, nonexclusive, worldwide, nontransferable, perpetual license to use this UC-owned intellectual property for internal research purposes only.

We and the UC Regents jointly own the rights to any intellectual property jointly developed by our employees and UC Regents employees in conducting the UC Research, provided that our employees did not use the UC Regents' facilities or resources in the research. We were granted an option to acquire a non-exclusive or exclusive, worldwide, transferable license, including the right to sublicense, to make, use sell, offer for sale, import and otherwise exploit products embodying these joint inventions.

If we exercise our option with respect to certain intellectual property under the UC Agreement, any license we enter into will require us to diligently pursue timely commercial development and marketing of product candidates using such intellectual property, and will be subject to other terms and conditions to be negotiated at the time of entering into any such license. Unless earlier terminated, the term of the UC Agreement will expire on October 1, 2020.

Government Regulation

U.S. Regulation

As a biopharmaceutical company that operates in the United States, we are subject to extensive regulation. Our cell products will be regulated as biologics. With this classification, commercial production of our products will need to occur in registered facilities in compliance with cGMP for biologics. The FDA categorizes human cell- or tissue-based products as either minimally manipulated or more than minimally manipulated, and has determined that more than minimally manipulated products require clinical trials to demonstrate product safety and efficacy and the submission of a BLA for marketing authorization. Our products are considered more than minimally manipulated and will require evaluation in clinical trials and the submission and approval of a BLA before we can market them.

Government authorities in the United States (at the federal, state and local level) and in other countries extensively regulate, among other things, the research, development, testing, manufacturing, quality control,

approval, labeling, packaging, storage, record-keeping, promotion, advertising, distribution, post-approval monitoring and reporting, marketing and export and import of biopharmaceutical products such as those we are developing. Our product candidates must be approved by the FDA before they may be legally marketed in the United States and by the appropriate foreign regulatory agency before they may be legally marketed in foreign countries. Generally, our activities in other countries will be subject to regulation that is similar in nature and scope as that imposed in the United States, although there can be important differences. Additionally, some significant aspects of regulation in Europe are addressed in a centralized way, but country-specific regulation remains essential in many respects. The process for obtaining regulatory marketing approvals and the subsequent compliance with appropriate federal, state, local and foreign statutes and regulations require the expenditure of substantial time and financial resources.

U.S. Biological Product Development

In the United States, the FDA regulates biologics under the Federal Food, Drug, and Cosmetic Act, or FDCA, and the Public Health Service Act, or PHSA, and their implementing regulations. Biologics are also subject to other federal, state and local statutes and regulations. The process of obtaining regulatory approvals and the subsequent compliance with appropriate federal, state, local and foreign statutes and regulations require the expenditure of substantial time and financial resources. Failure to comply with the applicable U.S. requirements at any time during the product development process, approval process or after approval, may result in delays to the conduct of a study, regulatory review and approval or subject an applicant to administrative or judicial sanctions. These sanctions could include, among other actions, the FDA's refusal to approve pending applications, withdrawal of an approval, license suspension or revocation, refusal to allow an applicant to proceed with clinical trials, imposition of a clinical hold, issuance of untitled or warning letters, product recalls or withdrawals from the market, product seizures, total or partial suspension of production or distribution, injunctions, fines, refusals of government contracts, restitution, disgorgement of profits, or civil or criminal investigations or penalties. Any agency or judicial enforcement action could have a material adverse effect on us.

Our drug product candidates must be approved by the FDA through the Biologics License Application, or BLA, process before they may be legally marketed in the United States. The process required by the FDA before a biologic may be marketed in the United States generally involves the following:

- completion of extensive nonclinical, sometimes referred to as preclinical, laboratory tests, animal studies and formulation studies in accordance with applicable regulations, including the FDA's Good Laboratory Practice, or GLP, regulations and standards;
- submission to the FDA of an IND which must become effective before human clinical trials may begin;
- approval by an independent institutional review board, or IRB, representing each clinical site before each clinical trial may be initiated;
- performance of adequate and well-controlled human clinical trials in accordance with applicable IND regulations, good clinical practices, or GCPs, and other clinical trial-related regulations to establish the safety and efficacy of the proposed drug product candidate for its proposed indication;
- submission to the FDA of a BLA, which includes not only the results of the clinical trials, but also, detailed information on the chemistry, manufacture and quality controls for the product candidate and proposed labelling;
- satisfactory completion of an FDA pre-approval inspection of the manufacturing facility or facilities where the product is produced to assess compliance with the FDA's current good manufacturing practice, or cGMP, requirements to assure that the facilities, methods and controls are adequate to preserve the product's identity, strength, quality, purity and potency;
- potential FDA audit of the preclinical trial sites and/or clinical trial sites that generated the data in support of the BLA; and

- FDA review and approval of the BLA prior to any commercial marketing or sale of the product in the United States.

The data required to support a BLA is generated in two distinct development stages: preclinical and clinical. The preclinical development stage generally involves laboratory evaluations of drug chemistry, formulation and stability, as well as studies to evaluate toxicity in animals, which support subsequent clinical testing. The conduct of the preclinical studies must comply with federal regulations, including GLPs. The sponsor must submit the results of the preclinical studies, together with manufacturing information, analytical data, any available clinical data or literature and a proposed clinical protocol, as well as other information, to the FDA as part of the IND. An IND is a request for authorization from the FDA to administer an investigational drug product to humans. The central focus of an IND submission is on the general investigational plan and the protocol(s) for human trials. The IND automatically becomes effective 30 days after receipt by the FDA, unless the FDA raises concerns or questions regarding the proposed clinical trials and places the IND on clinical hold within that 30-day time period. In such a case, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial can begin. The FDA may also impose clinical holds on a drug product candidate at any time before or during clinical trials due to safety concerns, non-compliance, or other issues affecting the integrity of the trial. Accordingly, we cannot be sure that submission of an IND will result in the FDA allowing clinical trials to begin, or that, once begun, issues will not arise that could cause the trial to be suspended or terminated.

In addition to the submission of an IND to the FDA before initiation of a clinical trial in the United States, certain human clinical trials involving recombinant or synthetic nucleic acid molecules had historically been subject to review by the Recombinant DNA Advisory Committee, or RAC, of the NIH Office of Biotechnology Activities, or the NIH Office of Biotechnology Activities, or OBA, pursuant to the NIH Guideline. On August 17, 2018, the NIH issued a notice in the Federal Register and issued a public statement proposing changes to the oversight framework for gene therapy trials, including changes to the applicable NIH Guidelines to modify the roles and responsibilities of the RAC with respect to human clinical trials of gene therapy products, and requesting public comment on its proposed modifications. During the public comment period, which closed October 16, 2018, the NIH announced that it will no longer accept new human gene transfer protocols for review as a part of the protocol registration process or convene the RAC to review individual clinical protocols. In April 2019, NIH announced the updated guidelines, which reflect these proposed changes, and clarify that these trials will remain subject to the FDA's oversight and other clinical trial regulations, and oversight at the local level will continue as set forth in the NIH Guidelines. Specifically, under the NIH Guidelines, supervision of human gene transfer trials includes evaluation and assessment by an Institutional Biosafety Committee, or IBC, a local institutional committee that reviews and oversees research utilizing recombinant or synthetic nucleic acid molecules at that institution. The IBC assesses the safety of the research and identifies any potential risk to public health or the environment, and such review may result in some delay before initiation of a clinical trial. While the NIH Guidelines are not mandatory unless the research in question is being conducted at or sponsored by institutions receiving NIH funding of recombinant or synthetic nucleic acid molecule research, many companies and other institutions not otherwise subject to the NIH Guidelines voluntarily follow them.

The clinical stage of development involves the administration of the drug product candidate to healthy volunteers and patients under the supervision of qualified investigators, generally physicians not employed by or under the trial sponsor's control, in accordance with GCPs, which include the requirement that all research subjects provide their informed consent for their participation in any clinical trial. Clinical trials are conducted under protocols detailing, among other things, the objectives of the clinical trial, dosing procedures, subject selection and exclusion criteria, and the parameters to be used to monitor subject safety and assess efficacy. Each protocol, and any subsequent amendments to the protocol, must be submitted to the FDA as part of the IND. Further, each clinical trial must be reviewed and approved by an IRB at or servicing each institution at which the clinical trial will be conducted. An IRB is charged with protecting the welfare and rights of trial participants and considers such items as whether the risks to individuals participating in the clinical trials are minimized and are reasonable in relation to anticipated benefits. The IRB also approves the informed consent form that must be

provided to each clinical trial subject or his or her legal representative and must monitor the clinical trial until completed.

There are also requirements governing the reporting of ongoing clinical trials and completed clinical trial results to public registries. Sponsors of certain clinical trials of FDA-regulated products, including biologics, are required to register and disclose certain clinical trial information, which is publicly available at www.clinicaltrials.gov.

Clinical trials are generally conducted in three sequential phases, known as Phase 1, Phase 2 and Phase 3, and may overlap. Phase 1 clinical trials generally involve a small number of healthy volunteers who are initially exposed to a single dose and then multiple doses of the drug product candidate. The primary purpose of these clinical trials is to assess the metabolism, pharmacologic action tolerability, adverse effects, and safety of the drug product candidate and, if possible, to gain early evidence on effectiveness. Phase 2 clinical trials typically involve studies in disease-affected patients to determine the dose required to produce the desired benefits. At the same time, safety and further pharmacokinetic and pharmacodynamic information is collected, as well as identification of possible adverse effects and safety risks and preliminary evaluation of efficacy. Phase 3 clinical trials generally involve large numbers of patients at multiple sites, in multiple countries, and are designed to provide the data necessary to demonstrate the efficacy of the product for its intended use, its safety in use, and to establish the overall benefit/risk relationship of the product and provide an adequate basis for product approval. Phase 3 clinical trials may include comparisons with placebo and/or other comparator treatments. The duration of treatment is often extended to mimic the actual use of a product during marketing. Generally, two adequate and well-controlled Phase 3 clinical trials are required by the FDA for approval of a BLA. In certain instances, FDA may condition approval of a BLA on the sponsor's agreement to conduct additional clinical trials to further assess the biologic's safety and effectiveness after BLA approval. Such post-approval trials are sometimes referred to as Phase 4 clinical trials. These trials are used to gain additional experience from the treatment of patients in the intended therapeutic indication and further document clinical benefit in the case of drugs approved under Accelerated Approval regulations. Failure to exhibit due diligence with regard to conducting Phase 4 clinical trials could result in withdrawal of approval for products.

Progress reports detailing the results of the clinical trials, among other information, must be submitted at least annually to the FDA, and written IND safety reports must be submitted to the FDA and the investigators for serious and unexpected suspected adverse events, findings from other studies suggesting a significant risk to humans exposed to the biologic, findings from animal or in vitro testing that suggest a significant risk for human subjects, and any clinically important increase in the rate of a serious suspected adverse reaction over that listed in the protocol or investigator brochure. Phase 1, Phase 2 and Phase 3 clinical trials may not be completed successfully within any specified period, if at all. The FDA, the IRB, or the sponsor may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research subjects or patients are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution if the clinical trial is not being conducted in accordance with the IRB's requirements or if the drug has been associated with unexpected serious harm to patients. Additionally, some clinical trials are overseen by an independent group of qualified experts organized by the clinical trial sponsor, known as a data safety monitoring board or committee. This group provides authorization for whether or not a trial may move forward at designated intervals based on access to certain data from the trial and may halt the clinical trial if it determines that there is an unacceptable safety risk for subjects or other grounds, such as interim data suggesting a lack of efficacy. We may also suspend or terminate a clinical trial based on evolving business objectives and/or competitive climate. Concurrent with clinical trials, companies usually complete additional animal studies and must also develop additional information about the chemistry and physical characteristics of the drug product candidate as well as finalize a process for manufacturing the product in commercial quantities in accordance with cGMP requirements. The manufacturing process must be capable of consistently producing quality batches of the drug product candidate and, among other things, must develop methods for testing the identity, strength, quality, potency and purity of the final product. Additionally, appropriate packaging must be selected and tested and

stability studies must be conducted to demonstrate that the drug product candidate does not undergo unacceptable deterioration over its shelf life.

BLA and FDA Review Process

Following trial completion, trial data are analyzed to assess safety and efficacy. The results of preclinical studies and clinical trials are then submitted to the FDA as part of a BLA, along with proposed labeling for the product and information about the manufacturing process and facilities that will be used to ensure product quality, results of analytical testing conducted on the chemistry of the drug product candidate, and other relevant information. The BLA is a request for approval to market the biologic for one or more specified indications and must contain proof of safety, purity, potency and efficacy, which is demonstrated by extensive preclinical and clinical testing. The application may include both negative or ambiguous results of preclinical and clinical trials as well as positive findings. Data may come from company-sponsored clinical trials intended to test the safety and efficacy of a use of a product, or from a number of alternative sources, including studies initiated by investigators. To support marketing approval, the data submitted must be sufficient in quality and quantity to establish the safety and efficacy of the investigational product to the satisfaction of the FDA. FDA approval of a BLA must be obtained before a biologic may be marketed in the United States.

Under the Prescription Drug User Fee Act, or PDUFA, as amended, each BLA must be accompanied by a significant user fee, which is adjusted on an annual basis. PDUFA also imposes an annual prescription drug product program fee. Fee waivers or reductions are available in certain circumstances, including a waiver of the application fee for the first application filed by a small business.

Once a BLA has been accepted for filing, which occurs, if at all, sixty days after the BLA's submission, the FDA's goal is to review BLAs within 10 months of the filing date for standard review or six months of the filing date for priority review, if the application is for a product intended for a serious or life-threatening condition and the product, if approved, would provide a significant improvement in safety or effectiveness. The FDA has substantial discretion in the approval process and may refuse to accept any application or decide that the data is insufficient for approval, and may require additional preclinical, clinical or other studies before it accepts the filing. Additionally, the review process is often significantly extended by FDA requests for additional information or clarification.

After the BLA submission is accepted for filing, the FDA reviews the BLA to determine, among other things, whether the proposed drug product candidate is safe and effective for its intended use, and whether the drug product candidate is being manufactured in accordance with cGMP to assure and preserve the drug product candidate's identity, strength, quality, purity and potency. The FDA may refer applications for novel drug product candidates or drug product candidates which present difficult questions of safety or efficacy to an advisory committee, typically a panel that includes clinicians and other experts, for review, evaluation and a recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions. The FDA will likely re-analyze the clinical trial data, which could result in extensive discussions between the FDA and us during the review process. The review and evaluation of a BLA by the FDA is extensive and time consuming and may take longer than originally planned to complete, and we may not receive a timely approval, if at all.

Before approving a BLA, the FDA will conduct a pre-approval inspection of the manufacturing facilities for the new product to determine whether the facilities comply with cGMPs. The FDA will not approve the product unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. In addition, before approving a BLA, the FDA may also audit data from clinical trials to ensure compliance with GCP requirements. After the FDA evaluates the application, manufacturing process and manufacturing facilities, it may issue an approval letter or a Complete Response Letter. An approval letter authorizes commercial marketing of the

product with specific prescribing information for specific indications. A Complete Response Letter indicates that the review cycle of the application is complete and the application will not be approved in its present form. A Complete Response Letter usually describes all of the specific deficiencies in the BLA identified by the FDA. The Complete Response Letter may require additional clinical data and/or an additional pivotal Phase 3 clinical trial(s), and/or other significant and time-consuming requirements related to clinical trials, preclinical studies or manufacturing. If a Complete Response Letter is issued, the applicant may either resubmit the BLA, addressing all of the deficiencies identified in the letter, withdraw the application or request a hearing. Even if such data and information is submitted, the FDA may ultimately decide that the BLA does not satisfy the criteria for approval. Data obtained from clinical trials are not always conclusive, and the FDA may interpret data differently than we interpret the same data.

There is no assurance that the FDA will ultimately approve a product for marketing in the United States, and we may encounter significant difficulties or costs during the review process. If a product receives marketing approval, the approval may be significantly limited to specific populations, severities of allergies, and dosages or the indications for use may otherwise be limited, which could restrict the commercial value of the product. Further, the FDA may require that certain contraindications, warnings or precautions be included in the product labeling or may condition the approval of the BLA on other changes to the proposed labeling, development of adequate controls and specifications, or a commitment to conduct post-market testing or clinical trials and surveillance to monitor the effects of approved products. For example, the FDA may require Phase 4 testing which involves clinical trials designed to further assess the product's safety and effectiveness and may require testing and surveillance programs to monitor the safety of approved products that have been commercialized. The FDA may also place other conditions on approvals including the requirement for a Risk Evaluation and Mitigation Strategy, or REMS, to assure the safe use of the product. If the FDA concludes a REMS is needed, the sponsor of the BLA must submit a proposed REMS. The FDA will not approve the BLA without an approved REMS, if required. A REMS could include medication guides, physician communication plans, or elements to assure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. Any of these limitations on approval or marketing could restrict the commercial promotion, distribution, prescription or dispensing of products. Product approvals may be withdrawn for non-compliance with regulatory standards or based on the results of post-market studies or surveillance programs. Additionally, post-approval, many types of changes to the approved product, such as adding new indications, changing manufacturing processes and adding labeling claims, are subject to further testing requirements and FDA review and approval. Such post-approval requirements can be costly and time-consuming and can affect the potential market and profitability of the product.

Orphan Designation and Exclusivity

Under the Orphan Drug Act, the FDA may grant orphan designation to a drug or biological product intended to treat a rare disease or condition, which is generally a disease or condition that affects fewer than 200,000 individuals in the United States, or more than 200,000 individuals in the United States and for which there is no reasonable expectation that the cost of developing and making the product available in the United States for this type of disease or condition will be recovered from sales of the product.

Orphan drug designation must be requested before submitting an NDA or BLA. After the FDA grants orphan drug designation, the identity of the therapeutic agent and its potential orphan use are disclosed publicly by the FDA. Orphan drug designation does not convey any advantage in or shorten the duration of the regulatory review and approval process.

If a product that has orphan drug designation subsequently receives the first FDA approval for the disease or condition for which it has such designation, the product is entitled to orphan drug exclusivity, which means that the FDA may not approve any other applications to market the same drug or biologic for the same indication for seven years from the date of such approval, except in limited circumstances, such as a showing of clinical superiority to the product with orphan exclusivity on the basis of greater effectiveness or safety or providing a

major contribution to patient care or in instances of drug supply issues. Competitors, however, may receive approval of either a different product for the same indication or the same product for a different indication but that could be used off-label in the orphan indication. Orphan drug exclusivity also could block the approval of one of our products for seven years if a competitor obtains approval before we do for the same product, as defined by the FDA, for the same indication we are seeking approval, or if our product is determined to be contained within the scope of the competitor's product for the same indication or disease. If we pursue marketing approval for an indication broader than the orphan drug designation we have received, we may not be entitled to orphan drug exclusivity. Orphan drug status in the European Union has similar, but not identical, requirements and benefits.

Expedited Development and Review Programs

The FDA has a Fast Track program that is intended to expedite or facilitate the process for reviewing new drugs and biological products that meet certain criteria. Specifically, new drugs and biological products are eligible for Fast Track designation if they are intended to treat a serious or life-threatening condition and nonclinical or clinical data demonstrate the potential to address unmet medical needs for the condition. Fast Track designation applies to the combination of the product and the specific indication for which it is being studied. The sponsor of a new drug or biologic may request the FDA to designate the drug or biologic as a Fast Track product concurrently with, or at any time after, submission of an IND, and the FDA must determine if the product qualifies for Fast Track designation within 60 days of receipt of the sponsor's request. Unique to a Fast Track product, the FDA may consider for review sections of the marketing application on a rolling basis before the complete application is submitted, if the sponsor provides a schedule for the submission of the sections of the application, the FDA agrees to accept sections of the application and determines that the schedule is acceptable, and the sponsor pays any required user fees upon submission of the first section of the application.

Any product submitted to the FDA for marketing, including under a Fast Track program, may be eligible for other types of FDA programs intended to expedite development and review, such as priority review and accelerated approval. Any product is eligible for priority review, or review within a six-month timeframe from the date a complete BLA is accepted for filing, if it has the potential to provide a significant improvement in safety and effectiveness compared to available therapies. The FDA will attempt to direct additional resources to the evaluation of an application for a new drug or biological product designated for priority review in an effort to facilitate the review.

Additionally, a product may be eligible for accelerated approval. An investigational drug may obtain accelerated approval if it treats a serious or life-threatening condition and generally provides a meaningful advantage over available therapies and demonstrates an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit or on a clinical endpoint that can be measured earlier than irreversible morbidity or mortality, or IMM, that is reasonably likely to predict an effect on IMM or other clinical benefit. As a condition of approval, the FDA may require that a sponsor of a drug or biological product receiving accelerated approval perform adequate and well-controlled post-marketing clinical trials. If the FDA concludes that a drug shown to be effective can be safely used only if distribution or use is restricted, it will require such post-marketing restrictions as it deems necessary to assure safe use of the drug, such as:

- distribution restricted to certain facilities or physicians with special training or experience; or
- distribution conditioned on the performance of specified medical procedures.

The limitations imposed would be commensurate with the specific safety concerns presented by the product. In addition, the FDA currently requires as a condition for accelerated approval pre-approval of promotional materials, which could adversely impact the timing of the commercial launch of the product. Fast Track designation, priority review and accelerated approval do not change the standards for approval but may expedite the development or approval process.

Breakthrough Designation

A product can be designated as a breakthrough therapy if it is intended to treat a serious or life-threatening condition and preliminary clinical evidence indicates that it may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints. A sponsor may request that a drug product candidate be designated as a breakthrough therapy concurrently with, or at any time after, the submission of an IND, and the FDA must determine if the drug product candidate qualifies for breakthrough therapy designation within 60 days of receipt of the sponsor's request. If so designated, the FDA shall act to expedite the development and review of the product's marketing application, including by meeting with the sponsor throughout the product's development, providing timely advice to the sponsor to ensure that the development program to gather preclinical and clinical data is as efficient as practicable, involving senior managers and experienced review staff in a cross-disciplinary review, assigning a cross-disciplinary project lead for the FDA review team to facilitate an efficient review of the development program and to serve as a scientific liaison between the review team and the sponsor, and taking steps to ensure that the design of the clinical trials is as efficient as practicable.

Accelerated Approval for Regenerative Advanced Therapies

As part of the 21st Century Cures Act, Congress amended the FD&C Act to create an accelerated approval program for regenerative advanced therapies, which include cell therapies, therapeutic tissue engineering products, human cell and tissue products, and combination products using any such therapies or products. Regenerative advanced therapies do not include those human cells, tissues, and cellular and tissue-based products regulated solely under section 361 of the Public Health Service Act and 21 CFR Part 1271. The new program is intended to facilitate efficient development and expedite review of regenerative advanced therapies, which are intended to treat, modify, reverse, or cure a serious or life-threatening disease or condition. A drug sponsor may request that FDA designate a drug as a regenerative advanced therapy concurrently with or at any time after submission of an IND. FDA has 60 calendar days to determine whether the drug meets the criteria, including whether there is preliminary clinical evidence indicating that the drug has the potential to address unmet medical needs for a serious or life-threatening disease or condition. A new drug application or BLA for a regenerative advanced therapy may be eligible for priority review or accelerated approval through (1) surrogate or intermediate endpoints reasonably likely to predict long-term clinical benefit or (2) reliance upon data obtained from a meaningful number of sites. Benefits of such designation also include early interactions with FDA to discuss any potential surrogate or intermediate endpoint to be used to support accelerated approval. A regenerative advanced therapy that is granted accelerated approval and is subject to postapproval requirements may fulfill such requirements through the submission of clinical evidence, clinical studies, patient registries, or other sources of real world evidence, such as electronic health records; the collection of larger confirmatory data sets; or postapproval monitoring of all patients treated with such therapy prior to its approval.

Pediatric Trials

Under the Pediatric Research Equity Act, or PREA, a BLA or supplement to a BLA must contain data to assess the safety and efficacy of the product for the claimed indications in all relevant pediatric subpopulations and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDCA requires that a sponsor who is planning to submit a marketing application for a drug or biological product that includes a new active ingredient, new indication, new dosage form, new dosing regimen or new route of administration submit an initial Pediatric Study Plan, or PSP, within sixty days of an end-of-Phase 2 meeting or as may be agreed between the sponsor and FDA. The initial PSP must include an outline of the pediatric study or studies that the sponsor plans to conduct, including study objectives and design, age groups, relevant endpoints and statistical approach, or a justification for not including such detailed information, and any request for a deferral of pediatric assessments or a full or partial waiver of the requirement to provide data from pediatric studies along with supporting information. The FDA and the sponsor must reach agreement on the PSP. A sponsor can submit amendments to an agreed-upon initial PSP at any time if changes to

the pediatric plan need to be considered based on data collected from nonclinical studies, early phase clinical trials, and/or other clinical development programs. The FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of data or full or partial waivers.

Post-Marketing Requirements

Following approval of a new product, a manufacturer and the approved product are subject to continuing regulation by the FDA, including, among other things, monitoring and recordkeeping activities, reporting to the applicable regulatory authorities of adverse experiences with the product, providing the regulatory authorities with updated safety and efficacy information, product sampling and distribution requirements, and complying with promotion and advertising requirements, which include, among others, standards for direct-to-consumer advertising, restrictions on promoting products for uses or in patient populations that are not described in the product's approved labeling (known as "off-label use"), limitations on industry-sponsored scientific and educational activities, and requirements for promotional activities involving the internet. Although physicians may prescribe legally available drugs and biologics for off-label uses, manufacturers may not market or promote such off-label uses.

Modifications or enhancements to the product or its labeling or changes of the site of manufacture are often subject to the approval of the FDA and other regulators, which may or may not be received or may result in a lengthy review process. Prescription drug promotional materials must be submitted to the FDA in conjunction with their first use. Any distribution of prescription drug products and pharmaceutical samples must comply with the U.S. Prescription Drug Marketing Act, or the PDMA, a part of the FDCA.

In the United States, once a product is approved, its manufacture is subject to comprehensive and continuing regulation by the FDA. The FDA regulations require that products be manufactured in specific approved facilities and in accordance with cGMPs. We rely, and expect to continue to rely, on third parties for the production of clinical and commercial quantities of our products in accordance with cGMP regulations. cGMP regulations require, among other things, quality control and quality assurance as well as the corresponding maintenance of records and documentation and the obligation to investigate and correct any deviations from cGMP. Manufacturers and other entities involved in the manufacture and distribution of approved products are required to register their establishments with the FDA and certain state agencies, and are subject to periodic unannounced inspections by the FDA and certain state agencies for compliance with cGMP and other laws. Accordingly, manufacturers must continue to expend time, money, and effort in the area of production and quality control to maintain cGMP compliance. These regulations also impose certain organizational, procedural and documentation requirements with respect to manufacturing and quality assurance activities. BLA holders using contract manufacturers, laboratories or packagers are responsible for the selection and monitoring of qualified firms, and, in certain circumstances, qualified suppliers to these firms. These firms and, where applicable, their suppliers are subject to inspections by the FDA at any time, and the discovery of violative conditions, including failure to conform to cGMP, could result in enforcement actions that interrupt the operation of any such facilities or the ability to distribute products manufactured, processed or tested by them. Discovery of problems with a product after approval may result in restrictions on a product, manufacturer, or holder of an approved BLA, including, among other things, recall or withdrawal of the product from the market.

The FDA also may require post-approval testing, sometimes referred to as Phase 4 testing, REMS and post-marketing surveillance to monitor the effects of an approved product or place conditions on an approval that could restrict the distribution or use of the product. Discovery of previously unknown problems with a product or the failure to comply with applicable FDA requirements can have negative consequences, including adverse publicity, judicial or administrative enforcement, untitled or warning letters from the FDA, mandated corrective advertising or communications with doctors, and civil or criminal penalties, among others. Newly discovered or developed safety or effectiveness data may require changes to a product's approved labeling, including the addition of new warnings and contraindications, and also may require the implementation of other risk management measures. Also, new government requirements, including those resulting from new legislation, may

be established, or the FDA's policies may change, which could delay or prevent regulatory approval of our products under development.

Other Regulatory Matters

Manufacturing, sales, promotion and other activities following product approval are also subject to regulation by numerous regulatory authorities in addition to the FDA, including, in the United States, the Centers for Medicare & Medicaid Services, or CMS, other divisions of the Department of Health and Human Services (e.g., the Office of Inspector General, or OIG, and Office for Civil Rights), the Drug Enforcement Administration, the Consumer Product Safety Commission, the Federal Trade Commission, the Occupational Safety & Health Administration, the Environmental Protection Agency and state and local governments. In the United States, sales, marketing and scientific/educational programs must also comply with federal and state fraud and abuse laws, data privacy and security laws, transparency laws, and pricing and reimbursement requirements in connection with governmental payor programs, among others. The handling of any controlled substances must comply with the U.S. Controlled Substances Act and Controlled Substances Import and Export Act. Products must meet applicable child-resistant packaging requirements under the U.S. Poison Prevention Packaging Act. Manufacturing, sales, promotion and other activities are also potentially subject to federal and state consumer protection and unfair competition laws.

The distribution of pharmaceutical products is subject to additional requirements and regulations, including extensive record-keeping, licensing, storage and security requirements intended to prevent the unauthorized sale of pharmaceutical products.

The failure to comply with regulatory requirements subjects firms to possible legal or regulatory action. Depending on the circumstances, failure to meet applicable regulatory requirements can result in criminal prosecution, fines or other penalties, injunctions, recall or seizure of products, total or partial suspension of production, denial or withdrawal of product approvals, or refusal to allow a firm to enter into supply contracts, including government contracts. In addition, even if a firm complies with FDA and other requirements, new information regarding the safety or efficacy of a product could lead the FDA to modify or withdraw product approval. Prohibitions or restrictions on sales or withdrawal of future products marketed by us could materially affect our business in an adverse way.

Changes in regulations, statutes or the interpretation of existing regulations could impact our business in the future by requiring, for example: (i) changes to our manufacturing arrangements; (ii) additions or modifications to product labeling; (iii) the recall or discontinuation of our products; or (iv) additional record-keeping requirements. If any such changes were to be imposed, they could adversely affect the operation of our business.

U.S. Patent Term Restoration and Marketing Exclusivity

Depending upon the timing, duration and specifics of the FDA approval of our drug product candidates, some of our U.S. patents may be eligible for limited patent term extension under the Drug Price Competition and Patent Term Restoration Act of 1984, commonly referred to as the Hatch-Waxman Amendments. The Hatch-Waxman Amendments permit a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. However, patent term restoration cannot extend the remaining term of a patent beyond a total of 14 years from the product's approval date. The patent term restoration period is generally one-half the time between the effective date of an IND and the submission date of a BLA plus the time between the submission date of a BLA and the approval of that application, except that the review period is reduced by any time during which the applicant failed to exercise due diligence. Only one patent applicable to an approved drug is eligible for the extension and the application for the extension must be submitted prior to the expiration of the patent. The U.S. PTO, in consultation with the FDA, reviews and approves the application for any patent term extension or restoration. In the future, we may apply for restoration of patent term for our currently owned or licensed patents to add patent life beyond its current expiration date,

depending on the expected length of the clinical trials and other factors involved in the filing of the relevant BLA.

An abbreviated approval pathway for biological products shown to be biosimilar to, or interchangeable with, anFDA-licensed reference biological product was created by the Biologics Price Competition and Innovation Act of 2009, or BPCI Act, which was part of the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, or collectively the ACA. This amendment to the PHSA attempts to minimize duplicative testing. Biosimilarity, which requires that the biological product be highly similar to the reference product notwithstanding minor differences in clinically inactive components and that there be no clinically meaningful differences between the product and the reference product in terms of safety, purity, and potency, can be shown through analytical studies, animal studies, and a clinical trial or trials. Interchangeability requires that a biological product be biosimilar to the reference product and that the product can be expected to produce the same clinical results as the reference product in any given patient and, for products administered multiple times, that the product and the reference product may be switched after one has been previously administered without increasing safety risks or risks of diminished efficacy relative to exclusive use of the reference biological product. However, complexities associated with the larger, and often more complex, structure of biological products as compared to small molecule drugs, as well as the processes by which such products are manufactured, pose significant hurdles to implementation that are still being worked out by the FDA.

A reference biological product is granted twelve years of exclusivity from the time of first licensure of the product, and the FDA will not accept an application for a biosimilar or interchangeable product based on the reference biological product until four years after first licensure. “First licensure” typically means the initial date the particular product at issue was licensed in the United States. This does not include a supplement for the biological product or a subsequent application by the same sponsor or manufacturer of the biological product (or licensor, predecessor in interest, or other related entity) for a change that results in a new indication, route of administration, dosing schedule, dosage form, delivery system, delivery device, or strength, unless that change is a modification to the structure of the biological product and such modification changes its safety, purity, or potency. Whether a subsequent application, if approved, warrants exclusivity as the “first licensure” of a biological product is determined on a case-by-case basis with data submitted by the sponsor.

Pediatric exclusivity is another type of regulatory market exclusivity in the United States. Pediatric exclusivity, if granted, adds six months to existing exclusivity periods and patent terms. This six-month exclusivity, which attaches to the twelve-year exclusivity period for reference biologics, may be granted based on the voluntary completion of a pediatric trial in accordance with an FDA-issued “Written Request” for such a trial.

Pricing and Reimbursement

United States

Sales of our products will depend, in part, on the extent to which our products, once approved, will be covered and reimbursed by third-party payors, such as government health programs, commercial insurance and managed healthcare organizations. These third-party payors are increasingly reducing reimbursements for medical products and services. The process for determining whether a third-party payor will provide coverage for a drug product, including a biologic, typically is separate from the process for setting the price of a drug product or for establishing the reimbursement rate that a payor will pay for the drug product once coverage is approved. Third-party payors may limit coverage to specific drug products on an approved list, also known as a formulary, which might not include all of the approved drugs for a particular indication.

In order to secure coverage and reimbursement for any drug product candidate that might be approved for sale, we may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of the drug product candidate, in addition to the costs required to obtain FDA or other

comparable regulatory approvals. Whether or not we conduct such studies, our drug product candidates may not be considered medically necessary or cost-effective. A third-party payor's decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved. Third party reimbursement may not be sufficient to enable us to maintain price levels high enough to realize an appropriate return on our investment in product development. In the United States, the principal decisions about reimbursement for new drug products are typically made by the U.S. Centers for Medicare and Medicaid Services, or CMS, an agency within the U.S. Department of Health and Human Services, or HHS. CMS decides whether and to what extent a new drug product will be covered and reimbursed under Medicare, and private payors tend to follow CMS to a substantial degree. However, no uniform policy of coverage and reimbursement for drug products exists among third-party payors and coverage and reimbursement levels for drug products can differ significantly from payor to payor.

The containment of healthcare costs has become a priority of federal and state governments, and the prices of drugs, including biologics, have been a focus in this effort. The U.S. government, state legislatures and foreign governments have shown significant interest in implementing cost-containment programs, including price controls, restrictions on reimbursement and requirements for substitution of generic products. In many countries, the prices of drug products are subject to varying price control mechanisms as part of national health systems. In general, the prices of drug products under such systems are substantially lower than in the United States. Other countries allow companies to fix their own prices for drug products, but monitor and control company profits. Accordingly, in markets outside the United States, the reimbursement for drug products may be reduced compared with the United States. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit our net revenue and results. Decreases in third-party reimbursement for our drug product candidate or a decision by a third-party payor to not cover our drug product candidate could reduce physician usage of the drug product candidate and have a material adverse effect on our sales, results of operations and financial condition.

Outside of the United States, the pricing of pharmaceutical products is subject to governmental control in many countries. For example, in the European Union, pricing and reimbursement schemes vary widely from country to country. Some countries provide that products may be marketed only after a reimbursement price has been approved. Some countries may require the completion of additional studies that compare the cost effectiveness of a particular therapy to currently available therapies or so-called health technology assessments, in order to obtain reimbursement or pricing approval. Other countries may allow companies to fix their own prices for products, but monitor and control product volumes and issue guidance to physicians to limit prescriptions. Efforts to control prices and utilization of pharmaceutical products will likely continue as countries attempt to manage healthcare expenditures.

Other Healthcare Laws and Compliance Requirements

Healthcare providers, physicians, and third party payors will play a primary role in the recommendation and prescription of any products for which we obtain marketing approval. Our business operations in the United States and our current and future arrangements with clinical investigators, healthcare providers, consultants, third-party payors and patients may expose us to broadly applicable federal and state fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell and distribute any drugs for which we obtain marketing approval. In the United States, these laws include: the federal Anti-Kickback Statute, the False Claims Act, and HIPAA. The Anti-Kickback Statute makes it illegal for any person, including a prescription drug manufacturer (or a party acting on its behalf), to knowingly and willfully solicit, receive, offer or pay any remuneration, directly or indirectly, in cash or in kind, that is intended to induce or reward referrals, including the purchase, recommendation, order or prescription of a particular drug, for which payment may be made under a federal healthcare program, such as Medicare or Medicaid. Violations of this law are punishable by imprisonment, criminal fines, administrative civil money penalties and exclusion from participation in federal healthcare programs. In addition, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it. Moreover, the ACA provides

that the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the federal civil False Claims Act.

Although we would not submit claims directly to payors, drug manufacturers can be held liable under the federal civil False Claims Act, which imposes civil penalties, including through civil whistleblower or qui tam actions, against individuals or entities (including manufacturers) for, among other things, knowingly presenting, or causing to be presented to federal programs (including Medicare and Medicaid) claims for items or services, including drugs, that are false or fraudulent, claims for items or services not provided as claimed, or claims for medically unnecessary items or services. Penalties for a False Claims Act violation include three times the actual damages sustained by the government, plus mandatory civil penalties for each separate false claim, the potential for exclusion from participation in federal healthcare programs and, although the federal False Claims Act is a civil statute, conduct that results in a False Claims Act violation may also implicate various federal criminal statutes. The government may deem manufacturers to have "caused" the submission of false or fraudulent claims by, for example, providing inaccurate billing or coding information to customers or promoting a product off- label. Claims which include items or services resulting from a violation of the federal Anti-Kickback Statute are false or fraudulent claims for purposes of the False Claims Act. Our future marketing and activities relating to the reporting of wholesaler or estimated retail prices for our products, if approved, the reporting of prices used to calculate Medicaid rebate information and other information affecting federal, state and third-party reimbursement for our products, and the sale and marketing of our product candidates, are subject to scrutiny under this law.

HIPAA created new federal criminal statutes that prohibit among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud or to obtain, by means of false or fraudulent pretenses, representations or promises, any money or property owned by, or under the control or custody of, any healthcare benefit program, including private third party payors, knowingly and willfully embezzling or stealing from a healthcare benefit program, willfully obstructing a criminal investigation of a healthcare offense, and knowingly and willfully falsifying, concealing or covering up by trick, scheme or device, a material fact or making any materially false, fictitious or fraudulent statement in connection with the delivery of or payment for healthcare benefits, items or services. Like the federal Anti-Kickback Statute a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation.

The civil monetary penalties statute imposes penalties against any person or entity that, among other things, is determined to have presented or caused to be presented a claim to a federal health program that the person knows or should know is for an item or service that was not provided as claimed or is false or fraudulent.

We may be subject to data privacy and security regulations by both the federal government and the states in which we conduct our business. HIPAA, as amended by HITECH, and their implementing regulations, mandates, among other things, the adoption of uniform standards for the electronic exchange of information in common healthcare transactions, as well as standards relating to the privacy and security of individually identifiable health information, which require the adoption of administrative, physical and technical safeguards to protect such information. Among other things, HITECH makes HIPAA's security standards directly applicable to business associates, defined as independent contractors or agents of covered entities, which include certain health care providers, health plans, and healthcare clearinghouses, that create, receive or obtain protected health information in connection with providing a service for or on behalf of a covered entity. HITECH also increased the civil and criminal penalties that may be imposed against covered entities and business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorney's fees and costs associated with pursuing federal civil actions. In addition, certain state laws govern the privacy and security of health information in certain circumstances, some of which are more stringent than HIPAA and many of which differ from each other in significant ways and may not have the same effect, thus complicating compliance efforts. Failure to comply with these laws, where applicable, can result in the imposition of significant civil and criminal penalties.

Additionally, the federal Physician Payments Sunshine Act, or the Sunshine Act, within the ACA, and its implementing regulations, require that certain manufacturers of drugs, devices, biological and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program (with certain exceptions) report annually to CMS information related to certain payments or other transfers of value made or distributed to physicians and teaching hospitals, or to entities or individuals at the request of, or designated on behalf of, physicians, certain other healthcare professionals, and teaching hospitals and to report annually certain ownership and investment interests held by physicians, certain other healthcare professionals, and their immediate family members. In addition, many states also govern the reporting of payments or other transfers of value, many of which differ from each other in significant ways, are often not pre-empted, and may have a more prohibitive effect than the Sunshine Act, thus further complicating compliance efforts.

Similar federal, state and foreign fraud and abuse laws and regulations, such as state anti-kickback and false claims laws, may apply to sales or marketing arrangements and claims involving healthcare items or services. Such laws are generally broad and are enforced by various state agencies and private actions. Also, many states have similar fraud and abuse statutes or regulations that may be broader in scope and may apply regardless of payor, in addition to items and services reimbursed under Medicaid and other state programs. Some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant federal government compliance guidance, and require drug manufacturers to report information related to payments and other transfers of value to physicians and other healthcare providers or marketing expenditures.

In order to distribute products commercially, we must comply with state laws that require the registration of manufacturers and wholesale distributors of drug and biological products in a state, including, in certain states, manufacturers and distributors who ship products into the state even if such manufacturers or distributors have no place of business within the state. Some states also impose requirements on manufacturers and distributors to establish the pedigree of product in the chain of distribution, including some states that require manufacturers and others to adopt new technology capable of tracking and tracing product as it moves through the distribution chain. Several states have enacted legislation requiring pharmaceutical and biotechnology companies to establish marketing compliance programs, file periodic reports with the state, make periodic public disclosures on sales, marketing, pricing, clinical trials and other activities, and/or register their sales representatives, as well as to prohibit pharmacies and other healthcare entities from providing certain physician prescribing data to pharmaceutical and biotechnology companies for use in sales and marketing, and to prohibit certain other sales and marketing practices. All of our activities are potentially subject to federal and state consumer protection and unfair competition laws.

The scope and enforcement of each of these laws is uncertain and subject to rapid change in the current environment of healthcare reform, especially in light of the lack of applicable precedent and regulations. Federal and state enforcement bodies have recently increased their scrutiny of interactions between healthcare companies and healthcare providers, which has led to a number of investigations, prosecutions, convictions and settlements in the healthcare industry. It is possible that governmental authorities will conclude that our business practices may not comply with current or future statutes, regulations or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, disgorgement, contractual damages, reputational harm, diminished profits and future earnings, individual imprisonment, exclusion of drugs from government funded healthcare programs, such as Medicare and Medicaid, and the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our financial results. If any of the physicians or other healthcare providers or entities with whom we expect to do business is found to be not in compliance with applicable laws, they may be subject to criminal, civil or administrative sanctions, including exclusions from government funded healthcare programs. Ensuring business arrangements comply with applicable healthcare laws, as well as responding to possible investigations by government authorities, can be time- and resource- consuming and can divert a company's attention from the business.

Current and Future Legislation

In the United States and some foreign jurisdictions, there have been, and likely will continue to be, a number of legislative and regulatory changes and proposed changes regarding the healthcare system directed at broadening the availability of healthcare, improving the quality of healthcare, and containing or lowering the cost of healthcare.

For example, in March 2010, the ACA was enacted in the United States. The ACA includes measures that have significantly changed, and are expected to continue to significantly change, the way healthcare is financed by both governmental and private insurers. Among the provisions of the ACA of greatest importance to the pharmaceutical industry are that the ACA:

1. made several changes to the Medicaid Drug Rebate Program, including increasing pharmaceutical manufacturers' rebate liability by raising the minimum basic Medicaid rebate on most branded prescription drugs to 23.1% of average manufacturer price, or AMP, and adding a new rebate calculation for "line extensions" (*i.e.*, new formulations, such as extended release formulations) of solid oral dosage forms of branded products, as well as potentially impacting their rebate liability by modifying the statutory definition of AMP;
2. imposed a requirement on manufacturers of branded drugs to provide a 70% point-of-sale discount off the negotiated price of branded drugs dispensed to Medicare Part D beneficiaries in the coverage gap (*i.e.*, "donut hole") as a condition for a manufacturer's outpatient drugs being covered under Medicare Part D;
3. extended a manufacturer's Medicaid rebate liability to covered drugs dispensed to individuals who are enrolled in Medicaid managed care organizations;
4. expanded the entities eligible for discounts under the 340B Drug Discount Program;
5. established a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted, or injected;
6. imposed an annual, nondeductible fee on any entity that manufactures or imports certain branded prescription drugs, apportioned among these entities according to their market share in certain government healthcare programs, and
7. established a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research. The research conducted by the Patient-Centered Outcomes Research Institute may affect the market for certain pharmaceutical products. The ACA established the Center for Medicare and Medicaid Innovation within CMS to test innovative payment and service delivery models to lower Medicare and Medicaid spending, potentially including prescription drug spending. Funding has been allocated to support the mission of the Center for Medicare and Medicaid Innovation through 2019.

Some of the provisions of the ACA have yet to be fully implemented, while certain provisions have been subject to judicial and Congressional challenges. Further, on January 20, 2017, President Trump signed an Executive Order directing federal agencies with authorities and responsibilities under the ACA waive, defer, grant exemptions from, or delay the implementation of any provision of the ACA that would impose a fiscal burden on states or a cost, fee, tax, penalty or regulatory burden on individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices. In addition, CMS has recently finalized regulations that would give states greater flexibility in setting benchmarks for insurers in the individual and small group marketplaces, which may have the effect of relaxing the essential health benefits required under the ACA for plans sold through such marketplaces. The Tax Cuts and Jobs Act of 2017, or Tax Act, includes a provision repealing, effective January 1, 2019, the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the "individual mandate." Additionally, on January 22, 2018, President Trump signed a continuing resolution

on appropriations for fiscal year 2018 that delayed the implementation of certain ACA-mandated fees, including the so-called "Cadillac" tax on certain high cost employer-sponsored insurance plan, the annual fee imposed on certain high cost employer- sponsored insurance plans, the annual fee imposed on certain health insurance providers based on market share, and the medical device exercise tax on non-exempt medical devices. Further, the Bipartisan Budget Act of 2018, or the BBA, among other things, amends the ACA, effective January 1, 2019, to reduce the coverage gap in most Medicare drug plans, commonly referred to as the "donut hole." In July 2018, CMS announced that it is suspending further collections and payments to and from certain ACA qualified health plans and health insurance issuers under the ACA risk adjustment program pending the outcome of federal district court litigation regarding the method CMS uses to determine this risk adjustment. On December 14, 2018, a U.S. District Court Judge in the Northern District of Texas, or the Texas District Court Judge, ruled that the individual mandate is a critical and inseverable feature of the ACA, and therefore, because it was repealed as part of the Tax Act, the remaining provisions of the ACA are invalid as well. The Texas District Court Judge, as well as the Trump Administration and CMS, have stated that the ruling will have no immediate effect, and on December 30, 2018 the Texas District Court Judge issued an order staying the judgment pending appeal. On July 9, 2019, a Fifth Circuit U.S. Court of Appeals hearing was held to determine whether certain states and the House of Representatives have standing to appeal the lower court decision, but it is unclear when a Court will render its decision on this hearing and what effect it will have on the status of the ACA. Litigation and legislation related to the ACA are likely to continue, with unpredictable and uncertain results. We will continue to evaluate the effect that the ACA and its possible repeal and replacement has on our business.

Congress also could consider additional legislation to repeal, replace, or further modify elements of the ACA. Thus, the full impact of the ACA, or any law replacing elements of it, and the political uncertainty regarding any repeal and replacement on the ACA, on our business remains unclear. Many of the details regarding the implementation of the ACA are yet to be determined, and at this time, it remains unclear the full effect that the ACA would have on our business. There have been judicial and Congressional challenges to the ACA, and we expect such challenges and amendments to continue in the future.

Moreover, in May 2018, the Trump administration released its "Blueprint to Lower Drug Prices and ReduceOut-of-Pocket Costs," or the Blueprint. The Blueprint contains several potential regulatory actions and legislative recommendations aimed at lowering prescription drug prices, including measures to promote innovation and competition for biologics, changes to Medicare Part D to give plan sponsors more leverage when negotiating prices with manufacturers, and updating the Medicare drug-pricing dashboard to make price increases and generic competition more transparent. In addition, the Department of HHS released a Request for Information, or RFI, soliciting public input on ways to lower drug pricing. Together, the recommendations in the Blueprint and RFI, if enacted by Congress and HHS, could lead to changes to Medicare Parts B and D, including the transition of certain drugs covered under Part B to Part D or the offering of alternative purchasing options under the Competitive Acquisition Program that currently applies to selected drugs and biologics covered under Part B. In September 2018, CMS announced that it will allow Medicare Advantage Plans the option to use step therapy for Part B drugs beginning January 1, 2019. While most of the proposed measures will require authorization through additional legislation to become effective, Congress and the Trump administration have each indicated that it will continue to seek new legislative, administrative and/or additional measures to control drug costs.

Other legislative changes have been proposed and adopted in the United States since the ACA was enacted. In August 2011, the Budget Control Act of 2011, among other things, created measures for spending reductions by Congress. A Joint Select Committee on Deficit Reduction, tasked with recommending a targeted deficit reduction of at least $1.2 trillion for the years 2013 through 2021, was unable to reach required goals, thereby triggering the legislation's automatic reduction to several government programs. This includes aggregate reductions of Medicare payments to providers up to 2% per fiscal year, which went into effect in April 2013, following passage of the Bipartisan Budget Act of 2013, and will remain in effect through 2027 unless additional congressional action is taken. Further, in January 2013, President Obama signed into law the American Taxpayer Relief Act of 2012, which, among other things, further reduced Medicare payments to several providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period

for the government to recover overpayments to providers from three to five years. Any reduction in reimbursement from Medicare or other government programs may result in a similar reduction in payments from private payors, which may adversely affect our future profitability. Additionally, there has been increasing legislative and enforcement interest in the United States with respect to specialty drug pricing practices.

On May 30, 2018, the Trickett Wendler, Frank Mongiello, Jordan McLinn, and Matthew Bellina Right to Try Act of 2017, or the Right to Try Act, was signed into law. The law, among other things, provides a federal framework for certain patients to request access to certain investigational new drug products that have completed a Phase I clinical trial and that are undergoing investigation for FDA approval. There is no obligation for a pharmaceutical manufacturer to make its drug products available to eligible patients as a result of the Right to Try Act.

We cannot predict what healthcare reform initiatives may be adopted in the future. Further federal, state and foreign legislative and regulatory developments are likely, and we expect ongoing initiatives to increase pressure on drug pricing. Such reforms could have an adverse effect on anticipated revenues from product candidates and may affect our overall financial condition and ability to develop product candidates.

The Foreign Corrupt Practices Act

The FCPA prohibits any U.S. individual or business from paying, offering, or authorizing payment or offering of anything of value, directly or indirectly, to any foreign official, political party or candidate for the purpose of influencing any act or decision of the foreign entity in order to assist the individual or business in obtaining or retaining business. The FCPA also obligates companies whose securities are listed in the United States to comply with accounting provisions requiring the company to maintain books and records that accurately and fairly reflect all transactions of the corporation, including international subsidiaries, and to devise and maintain an adequate system of internal accounting controls for international operations.

Additional Regulation

In addition to the foregoing, state and federal laws regarding environmental protection and hazardous substances, including the Occupational Safety and Health Act, the Resource Conservancy and Recovery Act and the Toxic Substances Control Act, affect our business. These and other laws govern our use, handling and disposal of various biological, chemical and radioactive substances used in, and wastes generated by, our operations. If our operations result in contamination of the environment or expose individuals to hazardous substances, we could be liable for damages and governmental fines. We believe that we are in material compliance with applicable environmental laws and that continued compliance therewith will not have a material adverse effect on our business. We cannot predict, however, how changes in these laws may affect our future operations.

Europe / Rest of World Government Regulation

In addition to regulations in the United States, we will be subject to a variety of regulations in other jurisdictions governing, among other things, clinical trials and any commercial sales and distribution of our products. Whether or not we obtain FDA approval of a product, we must obtain the requisite approvals from regulatory authorities in foreign countries prior to the commencement of clinical trials or marketing of the product in those countries. Certain countries outside of the United States have a similar process that requires the submission of a clinical trial application much like the IND prior to the commencement of human clinical trials. In the EU, for example, a clinical trial application must be submitted to each country's national health authority and an independent ethics committee, much like the FDA and IRB, respectively. Once the clinical trial application is approved in accordance with a country's requirements, clinical trial development may proceed. Because biologically sourced raw materials are subject to unique contamination risks, their use may be restricted in some countries.

The requirements and process governing the conduct of clinical trials, product licensing, pricing and reimbursement vary from country to country. In all cases, the clinical trials must be conducted in accordance with GCP and the applicable regulatory requirements and the ethical principles that have their origin in the Declaration of Helsinki.

To obtain regulatory approval of an investigational drug or biological product under EU regulatory systems, we must submit an MAA. The application used to file the BLA in the United States is similar to that required in the EU, with the exception of, among other things, country-specific document requirements.

For other countries outside of the EU, such as countries in Eastern Europe, Latin America or Asia, the requirements governing the conduct of clinical trials, product licensing, pricing and reimbursement vary from country to country. In all cases, again, the clinical trials must be conducted in accordance with GCP and the applicable regulatory requirements and the ethical principles that have their origin in the Declaration of Helsinki.

If we or our potential collaborators fail to comply with applicable foreign regulatory requirements, we may be subject to, among other things, fines, suspension or withdrawal of regulatory approvals, product recalls, seizure of products, operating restrictions and criminal prosecution.

European Union General Data Protection Regulation

In addition to EU regulations related to the approval and commercialization of our products, we may be subject to the EU's General Data Protection Regulation, or GDPR. The GDPR imposes stringent requirements for controllers and processors of personal data of persons in the EU, including, for example, more robust disclosures to individuals and a strengthened individual data rights regime, shortened timelines for data breach notifications, limitations on retention of information, increased requirements pertaining to special categories of data, such as health data, and additional obligations when we contract with third-party processors in connection with the processing of the personal data. The GDPR also imposes strict rules on the transfer of personal data out of the European Union to the United States and other third countries. In addition, the GDPR provides that EU member states may make their own further laws and regulations limiting the processing of personal data, including genetic, biometric or health data.

The GDPR applies extraterritorially, and we may be subject to the GDPR because of our data processing activities that involve the personal data of individuals located in the European Union, such as in connection with our EU clinical trials. Failure to comply with the requirements of the GDPR and the applicable national data protection laws of the EU member states may result in fines of up to €20,000,000 or up to 4% of the total worldwide annual turnover of the preceding financial year, whichever is higher, and other administrative penalties. GDPR regulations may impose additional responsibility and liability in relation to the personal data that we process and we may be required to put in place additional mechanisms to ensure compliance with the new data protection rules.

Employees

As of June 30, 2019, we had 12 employees, all of whom were full-time. Of those, nine were engaged in research and development activities. All company employees are located in Philadelphia, PA, or the surrounding area. We do not have any employees that are represented by a labor union or covered under a collective bargaining agreement. We consider our relationship with our employees to be good.

Facilities

Our corporate headquarters are located in Philadelphia, PA, where we lease 7,672 square feet of office, research and development space subject to a lease agreement that is in effect through 2022. We expect to expand

to a new space in 2022 that will both be adequate for near-term needs in addition to providing additional space to grow. We feel that suitable additional research and development, laboratory and manufacturing space should be available in the region on commercially reasonable terms.

Legal Proceedings

From time to time, our company may become involved in litigation or legal proceedings. At present, we are not involved in any material litigation or legal proceedings.

MANAGEMENT

The following table sets forth information about each of our executive officers and directors as of July 31, 2019:

NAME	AGE	POSITION
Executive Officers		
Steven Nichtberger, M.D.	58	President, Chief Executive Officer and Director
Anup Marda, MBA	42	Chief Financial Officer
Gwendolyn Binder, Ph.D.	44	Executive Vice President, Science & Technology
David J. Chang, M.D., M.P.H.	56	Chief Medical Officer
Non-Employee Directors		
Catherine Bollard, M.D.(2)	51	Director
Brian Daniels, M.D.(1)(2)	60	Director
Richard Henriques, MBA(1)(3)	63	Director
Mark Simon(1)(2)(3)	57	Director

(1) Member of the audit committee
(2) Member of the compensation committee
(3) Member of the nominating and corporate governance committee

Executive Officers

Steven Nichtberger, M.D. Dr. Nichtberger has served as our Chief Executive Officer, President and a member of our Board of Directors since its founding in 2017. Dr. Nichtberger also serves as managing partner of GBF Advisors, LLC, a company that provides advisory services to healthcare companies, investors, and leading academic scientists, and is an adjunct professor at The Wharton School at the University of Pennsylvania. He is the chairman of the board of directors of ControlRad, Inc., a medical device company developing products to reduce radiation exposure associated with medical procedures, a member of the board of directors of the BioAdvance Greenhouse Fund, which provides funding to startup life sciences companies in southeastern Pennsylvania, and a member of the board of governors of Main Line Health, a not-for-profit health system. Dr. Nichtberger is also a venture advisor for the Israel Biotech Fund. Previously, he was the president, chief executive officer, and a member of the board of directors of Tengion, Inc. from 2004 to 2011 Earlier in his career, Dr. Nichtberger served in various commercial leadership positions at Merck from 1995 to 2003. He has previously served as a member of the boards of directors of the Alliance for Regenerative Medicine (as a founding member), Pennsylvania Bio including as chairman, and Biotechnology Industry Organization. He was also a member of the board of overseers for the School of Arts & Sciences at the University of Pennsylvania for over a decade. Dr. Nichtberger received his M.D. from the State University of New York at Buffalo, his B.S. from The Wharton School at the University of Pennsylvania and his B.A. from the University of Pennsylvania. He completed an internship, residency and fellowship in the Department of Medicine and the Division of Cardiology of the Mount Sinai Medical Center. We believe Dr. Nichtberger is qualified to serve as a member of our board of directors because of his scientific background and corporate leadership experience.

Anup Marda, MBA. Mr. Marda joined our company in January 2019 as our Chief Financial Officer. From April 2001 to January 2019, Mr. Marda held positions at Bristol-Myers Squibb, including, most recently, as Vice President, Head of Global Corporate Financial Planning & Analysis, and previously as Head of Finance, R&D Operations and Head of Finance, R&D Portfolio Management and Global Medical from 2014 to 2018. Prior to this, Mr. Marda held the role of Executive Director, U.S. Pharmaceuticals from 2012 to 2014 and Assistant Treasurer, Capital Markets from 2008 to 2012. Mr. Marda received his MBA from the Krannert School of Business of Purdue University and his B.Tech in Chemical Engineering from the Indian Institute of Technology Bombay.

Gwendolyn Binder, Ph.D. Dr. Binder joined our company in February 2019 as our Executive Vice President, Science and Technology. Prior to joining Cabaletta, Dr. Binder was the Chief Technology Officer of Adaptimmune Therapeutics Plc, where she initially established and led capabilities in manufacturing, correlative science, compliance, regulatory and clinical operations, to enable the transfer of certain T cell receptor clinical programs from the Translational Research Program at the University of Pennsylvania and vector and cell manufacturing. She later went on to establish the internal translational sciences, and manufacturing and quality teams and oversaw the planning and execution of an onsite manufacturing facility. Once the manufacturing was secure, she assumed leadership of the research organization. Earlier in her career, Dr. Binder served as Director of Operations for the Translational Research Program at the University of Pennsylvania, where she participated in multiple engineered T cell therapy clinical programs in HIV and oncology including the data generation and IND drafting for CART 19 under the leadership of Drs. Carl June and Michael Milone. Prior to that, she was the director of scientific affairs at VIRxSYS Corporation. Dr. Binder received her Ph.D. from the Johns Hopkins University School of Medicine and her B.A. from Wells College.

David J. Chang, M.D., M.P.H. Dr. Chang joined our company in June 2019 as our Chief Medical Officer. From June 2015 to May 2019, he was Senior Vice President and Head, Inflammation, Autoimmunity & Neuroscience, or IA&NS, Global Medicines Development at AstraZeneca Pharmaceuticals LP, where he oversaw development projects of both biologics and small molecules in a variety of indications and led the late-stage clinical development organization for IA&NS. From October 2007 to June 2015, Dr. Chang served in various positions at GlaxoSmithKline plc, including VP and Head, Immuno-Inflammation, Clinical Development. Dr. Chang is an adjunct associate professor in the Division of Rheumatology at the Perelman School of Medicine of the University of Pennsylvania. He received his M.D. from New York University School of Medicine, his M.P.H. from Emory University and his B.S. from Yale University. Dr. Chang completed his internship and residency in internal medicine at the New York Hospital—Cornell University Medical Center and fellowship in rheumatology at the Hospital for Special Surgery—Cornell University Medical Center.

Non-Employee Directors

Catherine Bollard, M.D. Dr. Bollard joined our board of directors in April 2019. She is the director of the Center for Cancer and Immunology Research at the Children's Research Institute and the director of the Program for Cell Enhancement and Technologies for Immunotherapy at the Children's National Health System, or CNHS. She is also a member of the Division of the Blood and Marrow Transplantation of CNHS. Since 2013, Dr. Bollard also serves as Professor of Pediatrics and Microbiology, Immunology and Tropical Medicine at the George Washington University and is the associate center director for translational research and innovation within the George Washington Cancer Center. Prior to her move in 2013, Dr. Bollard was Professor of Pediatrics, Medicine and Immunology at Baylor College of Medicine. She is the immediate past president of the International Society for Cell Therapy, and she served on the Cellular, Tissues and Gene Therapy Advisory Committee of the FDA until 2019. Dr. Bollard has chaired the Non-Hodgkin's Lymphoma Committee of the Children's Oncology Group since 2012 and previously served as a member of the board of directors of the Foundation for the Accreditation of Cellular Therapy. Dr. Bollard received her medical degree from University of Otago Medical School in New Zealand. We believe Dr. Bollard is qualified to serve as a member of our board of directors because of her scientific background and significant experience in clinical and research efforts.

Brian Daniels, M.D. Dr. Daniels joined our board of directors in October 2018. Since 2018, he has been a partner at 5AM Ventures, where he was previously a venture partner from 2014 to 2018. From 2004 to 2014, Dr. Daniels held positions at Bristol-Myers Squibb, serving as senior vice president, global development and medical affairs from 2004 to 2014. Dr. Daniels also serves on the boards of directors of Spyryx Biosciences, Inc., Nohla Therapeutics Inc., RareCyte, Inc. and Novo Nordisk A/S and on the clinical advisory board of Aprea Therapeutics AB. He previously served on the board of directors of IDEAYA Biosciences, Inc. Dr. Daniels received his M.D. from Washington University in St. Louis and his B.S. and M.S. from Massachusetts Institute of Technology. He completed his residency in internal medicine at New York Hospital and a fellowship in rheumatology and immunology at University of California, San Francisco. We believe that Dr. Daniels is

qualified to serve as a member of our board of directors because of his scientific background, experience in the venture capital industry, and corporate leadership experience at numerous biopharmaceutical companies.

Richard Henriques, MBA. Mr. Henriques joined our board of directors in February 2019. Since 2015, he has been a senior fellow at the Center for High Impact Philanthropy at the University of Pennsylvania, with a focus on impact investing. From 2010 to 2014, Mr. Henriques was the chief financial officer of the Bill & Melinda Gates Foundation, where he was responsible for finance and accounting, financial planning and analysis, strategic planning, measurement and evaluation, program related investments and information technology. From 1981 to 2008, Mr. Henriques held positions at Merck & Co., Inc., including as Senior Vice President of Finance for Global Human Health, Vice President and Corporate Controller, and Principal Accounting Officer. Mr. Henriques also serves on the boards of directors of EMulate Therapeutics Inc. (formerly Nativis Inc.), Arbutus Biopharma Corporation, the Pennsylvania chapter of the Nature Conservancy and Episcopal Community Services, and on the board of trustees of the Franklin Institute. We believe that Mr. Henriques is qualified to serve as a member of our board of directors because of his extensive corporate leadership experience and expertise in finance and investment management.

Mark Simon, MBA. Mr. Simon joined our board of directors in October 2018. He is a partner andco-founder of Torreya Partners, LLC, a global investment banking firm serving companies in the life sciences industry. Prior to co-founding Torreya, Mr. Simon was a managing director and head of life sciences investment banking at Citigroup from 2002 to 2005, and a senior biotechnology research analyst at Robertson Stephens from 1989 to 2002. He began his career at Kidder Peabody. Mr. Simon serves on the boards of directors of ControlRad, Inc. and Sun Pharma Advanced Research Company Limited. He received his MBA from Harvard Business School and his B.A. from Columbia College. We believe that Mr. Simon is qualified to serve on our board of directors because of his extensive experience of over 30 years in the life sciences industry and biotechnology and specialty pharma transactions.

Composition of Our Board of Directors

Our board of directors currently consists of five members, each of whom is a member pursuant to the board composition provisions of our current certificate of incorporation and agreements with our stockholders. These board composition provisions will terminate upon the completion of this offering. Upon the termination of these provisions, there will be no further contractual obligations regarding the election of our directors. Our board of directors may therefore consider a broad range of factors relating to the qualifications and background of nominees. Our board of directors' priority in selecting board members is identification of persons who will further the interests of our stockholders through their established record of professional accomplishment, the ability to contribute positively to the collaborative culture among board members, knowledge of our business, understanding of the competitive landscape, professional and personal experiences and expertise relevant to our growth strategy. Our directors hold office until their successors have been elected and qualified or until the earlier of their resignation or removal. Our amended and restated certificate of incorporation and amended and restated bylaws that will become effective upon the closing of this offering also provide that our directors may be removed only for cause by the affirmative vote of the holders of at least 75% of the votes that all our stockholders would be entitled to cast in an annual election of directors, and that any vacancy on our board of directors, including a vacancy resulting from an enlargement of our board of directors, may be filled only by vote of a majority of our directors then in office.

Director Independence

We intend to apply to list our common stock on The Nasdaq Global Market. Under the Nasdaq listing rules, independent directors must comprise a majority of a listed company's board of directors within twelve months from the date of listing. In addition, the Nasdaq listing rules require that, subject to specified exceptions, each member of a listed company's audit, compensation and nominating and governance committees be independent within twelve months from the date of listing. Audit committee members must also satisfy additional

independence criteria, including those set forth in Rule 10A-3 under the Securities Exchange Act of 1934, as amended, or the Exchange Act, and compensation committee members must also satisfy the independence criteria set forth in Rule 10C-1 under the Exchange Act. Under Nasdaq listing rules, a director will only qualify as an "independent director" if, in the opinion of that company's board of directors, that person does not have a relationship that would interfere with the exercise of independent judgment in carrying out the responsibilities of a director. In order to be considered independent for purposes of Rule 10A-3 under the Exchange Act, a member of an audit committee of a listed company may not, other than in his or her capacity as a member of the audit committee, the board of directors or any other board committee: (1) accept, directly or indirectly, any consulting, advisory or other compensatory fee from the listed company or any of its subsidiaries, other than compensation for board service; or (2) be an affiliated person of the listed company or any of its subsidiaries. In order to be considered independent for purposes of Rule 10C-1, the board of directors must consider, for each member of a compensation committee of a listed company, all factors specifically relevant to determining whether a director has a relationship to such company which is material to that director's ability to be independent from management in connection with the duties of a compensation committee member, including, but not limited to: the source of compensation of the director, including any consulting advisory or other compensatory fee paid by such company to the director, and whether the director is affiliated with the company or any of its subsidiaries or affiliates.

In , 2019, our board of directors undertook a review of the composition of our board of directors and its committees and the independence of each director. Based upon information requested from and provided by each director concerning his background, employment and affiliations, including family relationships, our board of directors has determined that all members of our board of directors, except Steven Nichtberger, are independent directors, including for purposes of Nasdaq and SEC rules. In making that determination, our board of directors considered the relationships that each director has with us and all other facts and circumstances the board of directors deemed relevant in determining independence, including the potential deemed beneficial ownership of our capital stock by each director, including non-employee directors that are affiliated with certain of our major stockholders. Upon the completion of this offering, we expect that the composition and functioning of our board of directors and each of our committees will comply with all applicable requirements of Nasdaq and the rules and regulations of the SEC. There are no family relationships among any of our directors or executive officers.

We intend to adopt a policy, subject to and effective upon the effectiveness of the registration statement of which this prospectus forms a part, that outlines a process for our securityholders to send communications to the board of directors.

Staggered Board

In accordance with the terms of our amended and restated certificate of incorporation and amended and restated bylaws that will become effective upon the closing of this offering, our board of directors will be divided into three staggered classes of directors and each will be assigned to one of the three classes. At each annual meeting of the stockholders, a class of directors will be elected for a three-year term to succeed the directors of the same class whose terms are then expiring. The terms of the directors will expire upon the election and qualification of successor directors at the annual meeting of stockholders to be held during the years 2020 for Class I directors, 2021 for Class II directors and 2022 for Class III directors.

- Our Class I directors will be ;
- Our Class II directors will be ; and
- Our Class III directors will be .

Our amended and restated certificate of incorporation and amended and restated bylaws that will become effective upon the closing of this offering will provide that the number of our directors shall be fixed from time to time by a resolution of the majority of our board of directors.

The division of our board of directors into three classes with staggered three-year terms may delay or prevent stockholder efforts to effect a change of our management or a change in control. We expect that additional directorships resulting from an increase in the number of directors, if any, will be distributed among the three classes so that, as nearly as possible, each class shall consist of one third of the board of directors.

Board's Role in Risk Oversight

Risk is inherent with every business, and how well a business manages risk can ultimately determine its success. We face a number of risks, including risks relating to our financial condition, development and commercialization activities, operations, strategic direction and intellectual property as more fully discussed in the section entitled "Risk Factors" appearing elsewhere in this prospectus. Management is responsible for the day-to-day management of risks we face, while our board of directors, as a whole and through its committees, has responsibility for the oversight of risk management. In its risk oversight role, our board of directors has the responsibility to satisfy itself that the risk management processes designed and implemented by management are adequate and functioning as designed.

The role of the board of directors in overseeing the management of our risks is conducted primarily through committees of the board of directors, as disclosed in the descriptions of each of the committees below and in the charters of each of the committees. The full board of directors (or the appropriate board committee in the case of risks that are under the purview of a particular committee) discusses with management our major risk exposures, their potential impact on us, and the steps we take to manage them. When a board committee is responsible for evaluating and overseeing the management of a particular risk or risks, the chairman of the relevant committee reports on the discussion to the full board of directors during the committee reports portion of the next board meeting. This enables the board of directors and its committees to coordinate the risk oversight role, particularly with respect to risk interrelationships.

Committees of Our Board of Directors

Our board of directors has established an audit committee, a compensation committee and a nominating and corporate governance committee, each of which will operate pursuant to a charter to be adopted by our board of directors and will be effective upon the effectiveness of the registration statement of which this prospectus is a part. Upon the effectiveness of the registration statement of which this prospectus is a part, the composition and functioning of all of our committees will comply with all applicable requirements of the Sarbanes-Oxley Act of 2002, Nasdaq and SEC rules and regulations.

Following the consummation of this offering, the full text of our audit committee charter, compensation committee charter, and nominating and corporate governance charter will be posted on the investor relations portion of our website at www.cabalettabio.com. We do not incorporate the information contained on, or accessible through, our corporate website into this prospectus, and you should not consider it a part of this prospectus.

Audit Committee

Upon completion of this offering, Richard Henriques, Brian Daniels and Mark Simon will serve on the audit committee, which will be chaired by Mr. Henriques. The audit committee's responsibilities include:

- appointing, approving the compensation of, and assessing the independence of our independent registered public accounting firm;
- pre-approving auditing and permissible non-audit services, and the terms of such services, to be provided by our independent registered public accounting firm;
- reviewing the overall audit plan with our independent registered public accounting firm and members of management responsible for preparing our financial statements;

- reviewing and discussing with management and our independent registered public accounting firm our annual and quarterly financial statements and related disclosures as well as critical accounting policies and practices used by us;
- coordinating the oversight and reviewing the adequacy of our internal control over financial reporting;
- establishing policies and procedures for the receipt and retention of accounting-related complaints and concerns;
- recommending based upon the audit committee's review and discussions with management and our independent registered public accounting firm whether our audited financial statements shall be included in our Annual Report on Form 10-K;
- monitoring the integrity of our financial statements and our compliance with legal and regulatory requirements as they relate to our financial statements and accounting matters;
- preparing the audit committee report required by SEC rules to be included in our annual proxy statement;
- reviewing all related person transactions for potential conflict of interest situations and approving all such transactions; and
- reviewing quarterly earnings releases.

All audit and non-audit services, other than *de minimis* non-audit services, to be provided to us by our independent registered public accounting firm must be approved in advance by our audit committee.

All members of our audit committee will meet the requirements for financial literacy under the applicable rules and regulations of the SEC and the Nasdaq listing rules. Our board of directors has determined that qualifies as an "audit committee financial expert" within the meaning of applicable SEC regulations. In making this determination, our board of directors considered the nature and scope of experience that has previously had with public reporting companies, including service as . Our board of directors has determined that all of the directors that will become members of our audit committee upon the effectiveness of the registration statement of which this prospectus forms a part satisfy the relevant independence requirements for service on the audit committee set forth in the rules of the SEC and the Nasdaq listing rules. Both our independent registered public accounting firm and management will periodically meet privately with our audit committee.

Compensation Committee

Upon completion of this offering, Catherine Bollard, Brian Daniels and Mark Simon will serve on the compensation committee, which will be chaired by Dr. Daniels. The compensation committee's responsibilities include:

- annually reviewing and recommending to the board of directors the corporate goals and objectives relevant to the compensation of our Chief Executive Officer;
- evaluating the performance of our Chief Executive Officer in light of such corporate goals and objectives and based on such evaluation (i) recommending to the board of directors the cash compensation of our Chief Executive Officer and (ii) reviewing and approving grants and awards to our Chief Executive Officer under equity-based plans;
- reviewing and approving the cash compensation of our other executive officers;
- reviewing and establishing our overall management compensation, philosophy and policy;
- overseeing and administering our compensation and similar plans;

- evaluating and assessing potential and current compensation advisors in accordance with the independence standards identified in the applicable Nasdaq rules;
- reviewing and approving our policies and procedures for the grant of equity-based awards;
- reviewing and recommending to the board of directors the compensation of our directors;
- preparing our compensation committee report if and when required by SEC rules;
- reviewing and discussing annually with management our "Compensation Discussion and Analysis," if and when required, to be included in our annual proxy statement; and
- reviewing and approving the retention or termination of any consulting firm or outside advisor to assist in the evaluation of compensation matters.

Our board of directors has determined that each member of the compensation committee is "independent" as defined in the applicable Nasdaq rules. Each member of our compensation committee will be a non-employee director, as defined in Rule 16b-3 promulgated under the Exchange Act, and an outside director, as defined pursuant to Section 162(m) of the Internal Revenue Code of 1986, as amended.

Nominating and Corporate Governance Committee

Upon completion of this offering, Richard Henriques and Mark Simon will serve on the nominating and corporate governance committee, which will be chaired by Mr. Simon. The nominating and corporate governance committee's responsibilities include:

- developing and recommending to the board of directors criteria for board and committee membership;
- establishing procedures for identifying and evaluating board of director candidates, including nominees recommended by stockholders;
- reviewing the composition of the board of directors to ensure that it is composed of members containing the appropriate skills and expertise to advise us;
- identifying individuals qualified to become members of the board of directors;
- recommending to the board of directors the persons to be nominated for election as directors and to each of the board's committees;
- developing and recommending to the board of directors a code of business conduct and ethics and a set of corporate governance guidelines; and
- overseeing the evaluation of our board of directors and management.

Our board of directors may from time to time establish other committees.

Compensation Committee Interlocks and Insider Participation

None of the members of our compensation committee are, or has at any time during the prior three years been, one of our officers or employees. None of our executive officers currently serve, or in the past fiscal year have served, as a member of the board of directors or compensation committee of any entity that has one or more executive officers serving on our board of directors or compensation committee.

Corporate Governance

Prior to the effectiveness of the registration statement of which this prospectus is a part, we will adopt a written code of business conduct and ethics that applies to our directors, officers and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. Following the effectiveness of the registration statement of which this prospectus is a part, a current copy of the code will be posted on the investor relations section of our website, which is located at www.cabalettabio.com. If we make any substantive amendments to, or grant any waivers from, the code of business conduct and ethics for any officer or director, we will disclose the nature of such amendment or waiver on our website or in a Current Report on Form 8-K.

EXECUTIVE COMPENSATION

Executive Compensation Overview

As an emerging growth company, we have opted to comply with the executive compensation disclosure rules applicable to "smaller reporting companies," as such term is defined in the rules promulgated under the Securities Act. This section provides an overview of the compensation awarded to, earned by, or paid to our principal executive officer for fiscal year 2018, and our next most highly compensated executive officer in respect of their service to our company for our fiscal year ended December 31, 2018. We refer to these individuals as our named executive officers. We did not have any other executive officers serving in 2018. Our named executive officers are:

- Steven Nichtberger, M.D., our Chief Executive Officer and President; and
- Daniel E. Geffken, our former Interim Chief Financial Officer.

Our executive compensation program is based on a pay-for-performance philosophy. Compensation for our executive officers is composed primarily of the following main components: base salary; bonus; and equity incentives in the form of stock options. Our executive officers, like all full-time employees, are eligible to participate in our health and welfare benefit plans. As we transition from a private company to a publicly traded company, we intend to evaluate our compensation values and philosophy and compensation plans and arrangements as circumstances require.

2018 Summary Compensation Table

The following table sets forth information regarding compensation awarded to, earned by, or paid to our named executive officers for services rendered to us in all capacities during the fiscal year ended December 31, 2018.

NAME AND PRINCIPAL POSITION	YEAR	SALARY ($)	BONUS ($)	STOCK AWARDS ($)(1)	OPTION AWARDS ($)(1)	ALL OTHER COMPENSATION ($)	TOTAL ($)
Steven Nichtberger, M.D., *Chief Executive Officer and President*	2018	213,204(2)	98,466	531,399	1,062,079	8,527	1,913,675
Daniel E. Geffken, *Interim CFO*(3)	2018	—	—	—	25,000	186,017	211,017

(1) Amounts reflect the grant date fair value of stock and option awards granted or modified in 2018 in accordance with the Financial Accounting Standards Board's Accounting Standards Codification Topic 718, or ASC 718. Such grant date fair value does not take into account any estimated forfeitures related to service-vesting conditions. For information regarding assumptions underlying the valuation of equity awards, see Note 8 to our financial statements and the discussion under "Management's Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies and Significant Judgments and Estimates—Stock-based Compensation" included elsewhere in this prospectus. These amounts do not correspond to the actual value that may be recognized by the 2018 Named Executive Officers upon vesting of applicable awards.

(2) Dr. Nichtberger entered into a consulting agreement with us in August 2017 and became an employee on October 11, 2018. The 2018 salary reported reflects the compensation Dr. Nichtberger received both as a consultant and as an employee in 2018. Dr. Nichtberger also serves as a member of our board of directors but does not receive any additional compensation for his service as a director.

(3) Mr. Geffken was appointed to serve as our Interim Chief Financial Officer on August 21, 2018 and resigned effective as of February 12, 2019. Mr. Geffken was compensated for his services in this position pursuant to a Consulting Agreement, as amended, effective as of May 7, 2018, that we entered with Danforth Advisors,

LLC, or Danforth. Mr. Geffken is a founder and managing director at Danforth and is paid a salary by Danforth. We paid an aggregate amount of $186,017 to Danforth during 2018 pursuant to the terms of the Consulting Agreement. In addition, on November 16, 2018, we granted 20,000 options to Mr. Geffken, which vest in eight equal quarterly installments over a two-year period commencing on November 16, 2018.

Narrative to the 2018 Summary Compensation Table

Base Salary

We use base salaries to recognize the experience, skills, knowledge and responsibilities required of all our employees, including our executive officers. Base salaries are reviewed annually, typically in connection with our annual performance review process, and adjusted from time to time to realign salaries with market levels after taking into account individual responsibilities, performance and experience.

Annual Bonus

All employees participate in our annual performance-based bonus plan. Our employment agreements with our named executive officers define a target bonus percentage of the executive's base salary, as described further below under the section entitled "Employment Arrangements and with our Named Executive Officers". Bonus targets may be modified up or down based on our board's assessment of company performance vs our annual goals, and further modified based on individual performance vs annual objectives and assessed behaviors. The 2018 target bonus amount, expressed as a percentage of annual base salary, for Dr. Nichtberger was 40%. With respect to 2018 performance, our board of directors awarded a bonus of $98,466 to Dr. Nichtberger.

Equity Compensation

Although we do not have a formal policy with respect to the grant of equity incentive awards to our executive officers, or any formal equity ownership guidelines applicable to them, we believe that equity grants provide our executives with a strong link to our long-term performance, create an ownership culture and help to align the interests of our executives and our stockholders. In addition, we believe that equity grants with a time-based vesting feature promote executive retention because this feature incentivizes our executive officers to remain in our employment during the vesting period. Accordingly, our board of directors periodically reviews the equity incentive compensation of our named executive officers and from time to time may grant equity incentive awards to them in the form of stock options.

We typically grant stock option awards at the start of employment to each executive and our other employees. We award our stock options on the date our board of directors approves the grant. We set the option exercise price and grant date fair value based on our per-share estimated valuation on the date of grant. For grants in connection with initial employment, vesting begins on the initial date of employment. To date, we have not maintained a practice of granting additional equity on an annual basis, but we have retained discretion to provide additional targeted grants in certain circumstances.

Employment Arrangements with our Named Executive Officers

We have entered into an offer letter with our Chief Executive Officer and President, Steven Nichtberger, M.D., which was amended on January 2, 2019, and a consulting agreement with Danforth, an entity controlled by Mr. Geffken. The terms and conditions of these agreements are summarized below.

Steven Nichtberger, M.D.

We entered into an offer letter with Steven Nichtberger, M.D., our Chief Executive Officer and President, on October 10, 2018, which was amended in January 2019. Dr. Nichtberger's offer letter sets forth the initial

terms and conditions of his employment with us, including base salary, target annual bonus opportunity and standard employee benefit plan participation. Dr. Nichtberger's offer letter provides for "at will" employment. Under the terms of his offer letter, Dr. Nichtberger is entitled to receive an annual base salary of $425,000 and an annual target bonus of 40% of his annual base salary based upon our board of directors' assessment of Dr. Nichtberger performance and our attainment of targeted goals as set by the board of directors in their sole discretion. Pursuant to his offer letter, Dr. Nichtberger also entered into an Employee Restrictive Covenant Agreement with us, pursuant to which he agreed to certain non-competition, non-solicitation, confidentiality and invention assignment terms.

Dr. Nichtberger's offer letter provides that, in the event that his employment is terminated by us without "cause" or by Dr. Nichtberger with "good reason" (as defined in Dr. Nichtberger's offer letter), subject to the execution and effectiveness of a separation agreement and release, he will be entitled to receive (i) continuation of his base salary for twelve (12) months, and (ii) reimbursement of COBRA premiums for health benefit coverage, up to an amount equal to the monthly employer contribution that we would have made to provide health insurance to Dr. Nichtberger had he remained employed with us for up to twelve (12) months (the "Termination Benefits"). In addition, in the event that Dr. Nichtberger terminates his employment with "good reason" within six months of a "chairperson designation" (as defined in the offer letter), other than during the period commencing 60 days prior to and ending 12 months following a "change in control" (as defined in the offer letter), subject to the execution and effectiveness of a separation agreement and release, all stock options and other stock-based awards held by Dr. Nichtberger shall accelerate and become fully exercisable or non-forfeitable as of the date of termination.

In the event that Dr. Nichtberger's employment is terminated by us without "cause" or by Dr. Nichtberger with "good reason" during the period commencing 60 days prior to and ending 12 months following a "change in control", subject to the execution and effectiveness of a separation agreement and release, he will be entitled to receive the Termination Benefits and all stock options and other stock-based awards held by Dr. Nichtberger shall accelerate and become fully exercisable or non-forfeitable as of the date of termination.

Danforth Advisors, LLC Consulting Agreement

In May 2018, we entered into a consulting agreement with Danforth, which was amended in May 2019, pursuant to which we have engaged Danforth as an independent consultant to provide us with certain strategic and financial advice and support services. Mr. Geffken, who was appointed to serve as our interim chief financial officer on August 21, 2018 and served in that capacity until he resigned effective as of February 12, 2019, is a founder and managing director at Danforth. We paid Danforth approximately $186,017 during 2018. In addition, on November 16, 2018, we granted an option to purchase 20,000 shares of common stock to Mr. Geffken, which vests in eight equal quarterly installments over a two-year period commencing on November 16, 2018. The consulting agreement may be terminated by either party thereto with or without cause upon thirty days' prior written notice and will expire on May 7, 2020.

Outstanding Equity Awards at 2018 Fiscal Year-End

The following table sets forth information concerning outstanding equity awards held by our named executive officers as of December 31, 2018. All equity awards set forth in the table below were granted under our Amended and Restated Stock Option and Grant Plan.

	OPTION AWARDS					STOCK AWARDS	
NAME	NUMBER OF SECURITIES UNDERLYING UNEXERCISED OPTIONS (#) EXERCISABLE	NUMBER OF SECURITIES UNDERLYING UNEXERCISED OPTIONS (#) UNEXERCISABLE	EQUITY INCENTIVE PLAN AWARDS: NUMBER OF SECURITIES UNDERLYING UNEXERCISED UNEARNED OPTIONS (#)	OPTION EXERCISE PRICE ($)	OPTION EXPIRATION DATE	NUMBER OF SHARES OR UNITS OF STOCK THAT HAVE NOT VESTED (#)	MARKET VALUE OF SHARES OR UNITS OF STOCK THAT HAVE NOT VESTED ($)(1)
Steven Nichtberger, *Chief Executive Officer*	—	419,515(2)	—	0.67	October 28, 2028		—
	—	—	419,515(3)	0.67	October 28, 2028	—	—
	—	—	—			1,089,000(4)	—
Daniel E. Geffken, *Interim CFO*	—	20,000(5)	—	0.67	November 16, 2028	—	—

(1) The market price of our common stock is based on an assumed initial public offering price of $ per share, the midpoint of the price range set forth on the cover page of this prospectus.

(2) This option vests over four years, with 25% vesting on October 11, 2019, and the remaining shares vesting in 36 equal monthly installments thereafter, subject to a continued service relationship with us.

(3) 139,839 of the shares subject to this option will vest on the date that the first patient is dosed in a PV Phase 1 clinical trial, 139,839 of the shares subject to this option will vest upon our first underwritten public offering of our common stock with gross proceeds to us of at least $50 million and a price per share equal to or greater than $8.10, and 139,837 of the shares will vest upon affirmative approval by our board of directors of a clinical candidate for treatment of MG with *in vivo* proof-of-concept to support a decision to move forward with IND-enabling development of such clinical candidate.

(4) 174,240 of the shares subject to this stock award vested on May 4, 2019 and the remaining shares vest in eight quarterly installments over the two years following May 4, 2019.

(5) This option vests over two years in eight equal quarterly installments commencing on November 16, 2018.

Compensation Risk Assessment

We believe that although a portion of the compensation provided to our executive officers and other employees is performance-based, our executive compensation program does not encourage excessive or unnecessary risk taking. This is primarily due to the fact that our compensation programs are designed to encourage our executive officers and other employees to remain focused on both short-term and long-term strategic goals. As a result, we do not believe that our compensation programs are reasonably likely to have a material adverse effect on us.

Employee Benefit and Equity Compensation Plans

2018 Stock Option and Grant Plan

Our 2018 Plan was approved by our board of directors and our stockholders on September 7, 2018. Under the 2018 Plan, as amended through the date hereof, we have reserved for issuance an aggregate of 3,870,680 shares of our common

stock. The number of shares of common stock reserved for issuance is subject to adjustment in the event of any merger, consolidation, sale of all or substantially all of our assets, reorganization, recapitalization, reclassification, stock dividend, stock split, reverse stock split or other similar transaction.

The shares of common stock underlying awards that are forfeited, canceled, reacquired by us prior to vesting, satisfied without the issuance of stock or otherwise terminated (other than by exercise) and shares of common stock that are withheld upon exercise of an option or settlement of an award to cover the exercise price or tax withholding are added back to the shares of common stock available for issuance under the 2018 Plan.

Our board of directors has acted as administrator of the 2018 Plan. The administrator has full power to select, from among the individuals eligible for awards, the individuals to whom awards will be granted, and to determine the specific terms and conditions of each award, subject to the provisions of the 2018 Plan. Persons eligible to participate in the 2018 Plan are those employees, officers and directors of, and consultants and advisors to, our company as selected from time to time by the administrator in its discretion.

The 2018 Plan permits the granting of (1) options to purchase common stock intended to qualify as incentive stock options under Section 422 of the Internal Revenue Code of 1986, as amended, or the Code and (2) options that do not so qualify. The per share option exercise price of each option will be determined by the administrator but may not be less than 100% of the fair market value of the common stock on the date of grant. The term of each option will be fixed by the administrator. The administrator will determine at what time or times each option may be exercised. In addition, the 2018 Plan permits the granting of restricted shares of common stock, unrestricted shares of common stock, and restricted stock units.

The 2018 Plan provides that upon the occurrence of a "sale event," as defined in the 2018 Plan, our board of directors may take one or more of the following actions as to some or all awards outstanding under the 2018 Plan: (i) provide that outstanding options awards will be assumed or substituted by the acquiring or successor corporation, (ii) provide that all unexercised options will terminate immediately prior to the consummation of the sale event unless exercised by the optionee (to the extent exercisable) within a specified period prior to the consummation of the sale event, (iii) make or provide for a cash payment to the optionees equal to the difference between the per share cash consideration in the sale event and the per share exercise price of the outstanding award, (iv) provide that all restricted stock and unvested restricted stock unit awards (other than those becoming vested as a result of the sale event) will be assumed or substituted by the acquiring or successor corporation (v) provide that all restricted stock and unvested restricted stock unit awards (other than those becoming vested as a result of the sale event) will terminate immediately prior to the effective time of any sale event unless repurchased at a price per share equal to the lower of the original per share purchase price paid by the holder (subject to adjustment) or the current fair market value of such shares, determined immediately prior to the effective time of the sale event, (vi) make or provide for a cash payment to the holders of restricted stock or restricted stock unit awards in an amount equal to the consideration payable per share of stock pursuant to the sale event times the number of shares subject to such award. We may also make or provide for a cash payment to participants holding options in an amount equal to the difference between the per share cash consideration payable to stockholders in the sale event and the exercise price of the options (to the extent then exercisable).

The administrator may amend or discontinue the 2018 Plan at any time, subject to stockholder approval where such approval is required by applicable law. The administrator of the 2018 Plan may also amend or cancel any outstanding award, provided that no amendment to an award may adversely affect a participant's rights without his or her consent.

The 2018 Plan will terminate automatically upon the earlier of 10 years from the date on which the 2018 Plan was adopted by our board of directors or 10 years from the date the 2018 Plan is approved by our stockholders. As of June 30, 2019, options to purchase 2,435,545 shares of common stock were outstanding under the 2018 Plan. Our board of directors has determined not to make any further awards under the 2018 Plan following the closing of this offering.

2019 Stock Option and Incentive Plan

Our 2019 Plan was adopted by our board of directors on , 2019 and approved by our stockholders on , 2019 and will become effective upon the effectiveness of the registration statement of which this prospectus is part. The 2019 Plan will replace the 2018 Plan as our board of directors has determined not to make additional awards under the 2018 Plan following the closing of our initial public offering. The 2019 Plan allows the compensation committee to make equity-based and cash-based incentive awards to our officers, employees, directors and other key persons (including consultants).

We have initially reserved shares of our common stock, or the Initial Limit, for the issuance of awards under the 2019 Plan, plus the shares of common stock remaining available for issuance under our 2018 Plan. The 2019 Plan provides that the number of shares reserved and available for issuance under the plan will automatically increase each January 1, beginning on January 1, 2020, by % of the outstanding number of shares of our common stock on the immediately preceding December 31, or such lesser number of shares as determined by our compensation committee, or the Annual Increase. This number is subject to adjustment in the event of a stock split, stock dividend or other change in our capitalization.

The shares we issue under the 2019 Plan will be authorized but unissued shares or shares that we reacquire. The shares of common stock underlying any awards that are forfeited, cancelled, held back upon exercise or settlement of an award to satisfy the exercise price or tax withholding, reacquired by us prior to vesting, satisfied without any issuance of stock, expire or are otherwise terminated (other than by exercise) under the 2019 Plan and the 2018 Plan will be added back to the shares of common stock available for issuance under the 2019 Plan.

Stock options and stock appreciation rights with respect to no more than shares of stock may be granted to any one individual in any one calendar year. The maximum aggregate number of shares that may be issued in the form of incentive stock options shall not exceed the Initial Limit cumulatively increased on January 1, 2020 and on each January 1 thereafter by the lesser of the Annual Increase for such year or shares of common stock.

The 2019 Plan will be administered by our compensation committee. Our compensation committee has full power to select, from among the individuals eligible for awards, the individuals to whom awards will be granted, to make any combination of awards to participants, and to determine the specific terms and conditions of each award, subject to the provisions of the 2019 Plan. Persons eligible to participate in the 2019 Plan will be those full or part-time officers, employees, non-employee directors and other key persons (including consultants) as selected from time to time by our compensation committee in its discretion.

The 2019 Plan permits the granting of both options to purchase common stock intended to qualify as incentive stock options under Section 422 of the Code, and options that do not so qualify. The option exercise price of each option will be determined by our compensation committee but may not be less than 100% of the fair market value of our common stock on the date of grant. The term of each option will be fixed by our compensation committee and may not exceed 10 years from the date of grant. Our compensation committee will determine at what time or times each option may be exercised.

Our compensation committee may award stock appreciation rights subject to such conditions and restrictions as it may determine. Stock appreciation rights entitle the recipient to shares of common stock, or cash, equal to the value of the appreciation in our stock price over the exercise price. The exercise price of each stock appreciation right may not be less than 100% of the fair market value of the common stock on the date of grant.

Our compensation committee may award restricted shares of common stock and restricted stock units to participants subject to such conditions and restrictions as it may determine. These conditions and restrictions may include the achievement of certain performance goals and/or continued employment with us through a specified

vesting period. Our compensation committee may also grant shares of common stock that are free from any restrictions under the 2019 Plan. Unrestricted stock may be granted to participants in recognition of past services or other valid consideration and may be issued in lieu of cash compensation due to such participant. Our compensation committee may grant cash bonuses under the 2019 Plan to participants, subject to the achievement of certain performance goals.

The 2019 Plan provides that in the case of, and subject to, the consummation of a "sale event" as defined in the 2019 Plan, all outstanding awards may be assumed, substituted or otherwise continued by the successor entity. To the extent that the successor entity does not assume, substitute or otherwise continue such awards, then (i) all stock options and stock appreciation rights will automatically become fully exercisable and the restrictions and conditions on all other awards with time-based conditions will automatically be deemed waived, and awards with conditions and restrictions relating to the attainment of performance goals may become vested and non-forfeitable in connection with a sale event in the compensation committee's discretion and (ii) upon the effectiveness of the sale event, the 2019 Plan and all awards will automatically terminate. In the event of such termination, (i) individuals holding options and stock appreciation rights will be permitted to exercise such options and stock appreciation rights (to the extent exercisable) prior to the sale event; or (ii) we may make or provide for a cash payment to participants holding options and stock appreciation rights equal to the difference between the per share cash consideration payable to stockholders in the sale event and the exercise price of the options or stock appreciation rights (to the extent then exercisable).

Our board of directors may amend or discontinue the 2019 Plan and our compensation committee may amend the exercise price of options and amend or cancel outstanding awards for purposes of satisfying changes in law or any other lawful purpose but no such action may adversely affect rights under an award without the holder's consent. Certain amendments to the 2019 Plan require the approval of our stockholders. No awards may be granted under the 2019 Plan after the date that is 10 years from the date of stockholder approval. No awards under the 2019 Plan have been made prior to the date of this prospectus.

2019 Employee Stock Purchase Plan

In , 2019, our board of directors adopted the 2019 Employee Stock Purchase Plan, or 2019 ESPP, and in , 2019, our stockholders approved the 2019 ESPP. The 2019 ESPP is intended to qualify as an "employee stock purchase plan" within the meaning of Section 423 of the Code. The 2019 ESPP initially reserves and authorizes the issuance of up to a total of shares of common stock to participating employees. The ESPP provides that the number of shares reserved and available for issuance will automatically increase each January 1, beginning on January 1, 2020 through January 1, 2029, by the lesser of (i) shares of common stock, (ii) % of the outstanding number of shares of our common stock on the immediately preceding December 31 or (iii) such lesser number of shares as determined by the 2019 ESPP administrator. The number of shares reserved under the 2019 ESPP is subject to adjustment in the event of a stock split, stock dividend or other change in our capitalization.

All employees whose customary employment is for more than 20 hours per week are eligible to participate in the ESPP. However, any participating employee who would own 5% or more of the total combined voting power or value of all classes of stock after an option were granted under the ESPP would not be eligible to purchase shares under the 2019 ESPP.

We will make one or more offerings each year to our employees to purchase shares under the ESPP. Offerings will usually begin on each January 1 and July 1 and will continue for six-month periods, referred to as offering periods. Each eligible employee may elect to participate in any offering by submitting an enrollment form at least 15 business days before the relevant offering date.

Each employee who is a participant in the 2019 ESPP may purchase shares by authorizing payroll deductions of up to % of his or her base compensation during an offering period. Unless the participating

employee has previously withdrawn from the offering, his or her accumulated payroll deductions will be used to purchase shares on the last business day of the offering period at a price equal to 85% of the fair market value of the shares on the first business day or the last business day of the offering period, whichever is lower. Under applicable tax rules, an employee may purchase no more than $25,000 worth of shares of common stock, valued at the start of the purchase period, under the ESPP in any calendar year.

The accumulated payroll deductions of any employee who is not a participant on the last day of an offering period will be refunded. An employee's rights under the 2019 ESPP terminate upon voluntary withdrawal from the plan or when the employee ceases employment with us for any reason.

The 2019 ESPP may be terminated or amended by our board of directors at any time. An amendment that increases the number of shares of common stock authorized under the ESPP and certain other amendments require the approval of our stockholders.

Senior Executive Cash Incentive Bonus Plan

On , 2019, our board of directors adopted the Senior Executive Cash Incentive Bonus Plan, or the Bonus Plan. The Bonus Plan provides for annual cash bonus payments based upon company and individual performance. Each executive has an annual bonus target expressed as a percentage of their base salary. This target may be adjusted up or down. Company performance is assessed by our compensation committee based on our achievement of Annual Company Objectives. Individual performance is assessed by the executive's manager, and approved by the compensation committee, based on achievement of individual objectives and an assessment of Team Focused Behaviors, including Team First Approach, and Proactively Seek and Constructively Act Upon Feedback.

Each executive officer will have a target bonus opportunity set for an annual performance period. The Annual Company Objectives will be measured at the end of each year after our financial reports have been published or such other appropriate time as the compensation committee determines. All bonus targets will be adjusted based on company performance following a defined leverage curve, with a 150% maximum payment for 150% and above company achievement, and no payment at 50% or lower achievement. Individual bonus payments may be further modified based on individual performance, adjusted based on a defined leverage curve, with a 150% maximum payment, and no payment at 75% or lower individual achievement. Bonus payments will be made as soon as practicable following the end of each performance period. The Bonus Plan also permits the compensation committee to approve additional bonuses to executive officers in its sole discretion.

401(k) Plan

We participate in a retirement savings plan, or 401(k) plan, that is intended to qualify for favorable tax treatment under Section 401(a) of the Code, and contains a cash or deferred feature that is intended to meet the requirements of Section 401(k) of the Code. U.S. employees who are at least 21 years of age are generally eligible to participate in the 401(k) plan, subject to certain criteria. Participants may make pre-tax and certain after-tax (Roth) salary deferral contributions to the plan from their eligible earnings up to the statutorily prescribed annual limit under the Code. Participants who are 50 years of age or older may contribute additional amounts based on the statutory limits for catch-up contributions. Participant contributions are held in trust as required by law. An employee's interest in his or her salary deferral contributions is 100% vested when contributed. We have the ability to make discretionary contributions under the plan and contributed in 2019 based on 3% of salary earned in 2018. Effective for the 2019 plan year, all eligible employees will receive an Employer Safe Harbor nonelective contribution equal to 3% of eligible pay for the plan year.

Limitations on Liability and Indemnification Agreements

As permitted by Delaware law, provisions in our amended and restated certificate of incorporation and amended and restated bylaws, both of which will become effective upon the closing of this offering, limit or

eliminate the personal liability of directors for a breach of their fiduciary duty of care as a director. The duty of care generally requires that, when acting on behalf of the corporation, a director exercise an informed business judgment based on all material information reasonably available to him or her. Consequently, a director will not be personally liable to us or our stockholders for monetary damages or breach of fiduciary duty as a director, except for liability for:

- any breach of the director's duty of loyalty to us or our stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- any act related to unlawful stock repurchases, redemptions or other distributions or payments of dividends; or
- any transaction from which the director derived an improper personal benefit.

These limitations of liability do not limit or eliminate our rights or any stockholder's rights to seeknon-monetary relief, such as injunctive relief or rescission. These provisions will not alter a director's liability under other laws, such as the federal securities laws or other state or federal laws. Our amended and restated certificate of incorporation that will become effective upon the closing of this offering also authorizes us to indemnify our directors to the fullest extent permitted under Delaware law.

As permitted by Delaware law, our amended and restated bylaws to be effective upon the closing of this offering will provide that:

- we will indemnify our directors, officers, employees and other agents to the fullest extent permitted by law;
- we must advance expenses to our directors and officers, and may advance expenses to our employees and other agents, in connection with a legal proceeding to the fullest extent permitted by law; and
- the rights provided in our amended and restated bylaws are not exclusive.

If Delaware law is amended to authorize corporate action further eliminating or limiting the personal liability of a director or officer, then the liability of our directors or officers will be so eliminated or limited to the fullest extent permitted by Delaware law, as so amended. Our amended and restated bylaws will also permit us to secure insurance on behalf of any officer, director, employee or other agent for any liability arising out of his or her actions in connection with their services to us, regardless of whether our bylaws permit such indemnification. We have obtained such insurance.

In addition to the indemnification that will be provided for in our amended and restated certificate of incorporation and amended and restated bylaws, we plan to enter into separate indemnification agreements with each of our directors and executive officers, which may be broader than the specific indemnification provisions contained in the Delaware General Corporation Law. These indemnification agreements may require us, among other things, to indemnify our directors and executive officers for some expenses, including attorneys' fees, expenses, judgments, fines and settlement amounts incurred by a director or executive officer in any action or proceeding arising out of his service as one of our directors or executive officers or any other company or enterprise to which the person provides services at our request. We believe that these provisions and agreements are necessary to attract and retain qualified individuals to serve as directors and executive officers.

This description of the indemnification provisions of our amended and restated certificate of incorporation, our amended and restated bylaws and our indemnification agreements is qualified in its entirety by reference to these documents, each of which is attached as an exhibit to the registration statement of which this prospectus forms a part.

Insofar as indemnification for liabilities arising under the Securities Act of 1933, as amended, or the Securities Act, may be permitted to our directors, officers and controlling persons pursuant to the foregoing

provisions, or otherwise, we have been advised that, in the opinion of the SEC, such indemnification is against public policy as expressed in the Securities Act, and is, therefore, unenforceable.

There is no pending litigation or proceeding naming any of our directors or officers as to which indemnification is being sought, nor are we aware of any pending or threatened litigation that may result in claims for indemnification by any director or officer.

DIRECTOR COMPENSATION

The following table presents the total compensation for each person who served as a non-employee member of our board of directors and received compensation for such service during the fiscal year ended December 31, 2018. Other than as set forth in the table and described more fully below, we did not pay any compensation, make any equity awards or non-equity awards to, or pay any other compensation to any of the non-employee members of our board of directors in 2018. We reimburse members of our board of directors for reasonable travel expenses. Dr. Nichtberger, our Chief Executive Officer and President, did not receive any compensation for his service as a member of our board of directors in 2018. Dr. Nichtberger's compensation for service as an employee for fiscal year 2018 is presented in "Executive Compensation—2018 Summary Compensation Table."

NAME	FEES EARNED OR PAID IN CASH ($)	OPTION AWARDS ($)(1)	TOTAL ($)
Mark Simon(2)	—	52,661	52,661
Brian Daniels	—	—	—

(1) Amounts reflect the aggregate grant date fair value of option awards granted in 2018 in accordance with the Financial Accounting Standards Board's Accounting Standards Codification Topic 718, or ASC 718. Such grant date fair value does not take into account any estimated forfeitures related to service-vesting conditions. For information regarding assumptions underlying the valuation of equity awards, see Notes 8 to our financial statements and the discussion under "Management's Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies and Significant Judgments and Estimates—Stock-based Compensation" included elsewhere in this prospectus.

(2) As of December 31, 2018, Mr. Simon held an unvested option to purchase 41,951 shares of our common stock.

Non-Employee Director Compensation Policy

Our board of directors expects to adopt a non-employee director compensation policy, effective upon effectiveness of the registration statement of which this prospectus forms a part, that is designed to enable us to attract and retain, on a long-term basis, highly qualified non-employee directors. Under the policy, each director who is not an employee will be paid cash compensation from and after the completion of this offering, as set forth below:

	MEMBER ANNUAL FEE ($)	CHAIRMAN ADDITIONAL ANNUAL FEE ($)
Board of Directors		
Audit Committee		
Compensation Committee		
Nominating and Corporate Governance Committee		

In addition, each non-employee director serving on our board of directors upon completion of this offering and each non-employee director elected or appointed to our board of directors following the completing of this offering will be granted on the date of such director's election or appointment to the board of directors, which will vest in the following manner, subject to continued service through such vesting date(s): . On the date of each annual meeting of stockholders of our company, each non-employee director will be granted , which will vest in the following manner, subject to continued service as a director through such vesting date(s): .

CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS

Other than the compensation agreements and other arrangements described under "Executive Compensation" and "Director Compensation" in this prospectus and the transactions described below, since our incorporation on April 3, 2017, there has not been and there is not currently proposed, any transaction or series of similar transactions to which we were, or will be, a party in which the amount involved exceeded, or will exceed, $120,000 and in which any director, executive officer, holder of five percent or more of any class of our capital stock or any member of the immediate family of, or entities affiliated with, any of the foregoing persons, had, or will have, a direct or indirect material interest.

Private Placements of Securities

Series A/A-1/A-2 Preferred Stock Financing

In October 2018, we sold an aggregate of 3,146,551 shares of our Series A preferred stock at a purchase price of $4.05 per share, 7,372,719 shares of our Series A-1 preferred stock at a purchase price of $2.76 per share and 1,873,777 shares of our SeriesA-2 preferred stock at a purchase price of $2.76 per share. The Series A-1 preferred stock and Series A-2 preferred stock was purchased with a mix of cash and the conversion of certain of our outstanding convertible promissory notes. The following table summarizes purchases of our Series A and A-1 preferred stock by related persons:

STOCKHOLDER	SHARES OF SERIES A / A-1 PREFERRED STOCK	TOTAL PURCHASE PRICE
5AM Ventures V, LP(1)	3,146,551	$ 12,743,531.55
Steven Nichtberger(2)	90,725	$ 250,401.00
Adage Capital Partners, LP(3)	3,605,408	$ 9,950,926.08
Baker Brothers Life Sciences, L.P.(3)	3,330,917	$ 9,193,330.92

(1) Brian Daniels serves as a member of our board of directors and is a partner at 5AM Ventures V, LP. 5AM Ventures V, LP holds more than 5% of our voting securities.
(2) Steven Nichtberger is our chief executive officer and a member of our board of directors.
(3) This entity holds, in the aggregate, more than 5% of our voting securities.

Series B Preferred Stock Financing

In January 2019, we sold an aggregate of 6,963,788 shares of our Series B preferred stock at a purchase price of $7.18 per share. In addition, we issued a further 1,405,332 shares of Series B Preferred Stock in exchange for 1,405,332 shares of Series A-2 Preferred Stock. The following table summarizes purchases of our Series B preferred stock by related persons:

STOCKHOLDER	SHARES OF SERIES B PREFERRED STOCK	TOTAL PURCHASE PRICE
5AM Ventures V, LP(1)	1,248,594	$ 8,964,904.92
Adage Capital Partners, LP(2)	712,539	$ 5,116,030.02
Baker Brothers Life Sciences, L.P.(2)	658,291	$ 4,726,529.38

(1) Brian Daniels serves as a member of our board of directors and is a partner at 5AM Ventures V, LP. 5AM Ventures V, LP holds more than 5% of our voting securities.
(2) This entity holds, in the aggregate, more than 5% of our voting securities.

Agreements with Stockholders

In connection with our Series A/A-1/A-2 preferred stock financing and our Series B preferred stock financing, we entered into investors' rights, voting and right of first refusal and co-sale agreements containing registration rights, information rights, voting rights and rights of first refusal, among other things, with certain holders of our preferred stock and certain holders of our common stock. These stockholder agreements will terminate upon the closing of this offering, except for the registration rights granted under our investors' rights agreement, as more fully described in "Description of Capital Stock—Registration Rights." In connection with these financings, we also entered into a side letter with certain investors containing rights to participate in this offering. For more information regarding certain rights relating to this offering granted under our stockholder agreements and the side letter, see the section of this prospectus titled "Principal Stockholders."

Danforth Advisors

In May 2018, we engaged Danforth Advisors, LLC, or Danforth, a consulting firm specializing in providing financial and strategic support to life sciences companies and a controlled affiliate of Daniel Geffken, who served as our interim Chief Financial Officer from August 2018 to February 2019. Pursuant to a consulting agreement effective May 2018, which was amended in May 2019, we paid professional fees to Danforth of $186,017 in 2018 and $279,995 through June 30, 2019. Mr. Geffken was granted options with an aggregate grant date fair value of $25,000, as computed in accordance with ASC Topic 718.

Indemnification Agreements

In connection with this offering, we intend to enter into new agreements to indemnify our directors and executive officers. These agreements will, among other things, require us to indemnify these individuals for certain expenses (including attorneys' fees), judgments, fines and settlement amounts reasonably incurred by such person in any action or proceeding, including any action by or in our right, on account of any services undertaken by such person on behalf of our company or that person's status as a member of our board of directors to the maximum extent allowed under Delaware law.

Policies for Approval of Related Party Transactions

Our board of directors reviews and approves transactions with directors, officers and holders of five percent or more of our voting securities and their affiliates, each a related party. Prior to this offering, the material facts as to the related party's relationship or interest in the transaction are disclosed to our board of directors prior to their consideration of such transaction, and the transaction is not considered approved by our board of directors unless a majority of the directors who are not interested in the transaction approve the transaction. Further, when our stockholders are entitled to vote on a transaction with a related party, the material facts of the related party's relationship or interest in the transaction are disclosed to the stockholders, who must approve the transaction in good faith.

In connection with this offering, we expect to adopt a written related party transactions policy that such transactions must be approved by our audit committee. This policy will become effective on the date on which the registration statement of which this prospectus is part is declared effective by the SEC. Pursuant to this policy, the audit committee has the primary responsibility for reviewing and approving or disapproving "related party transactions," which are transactions between us and related persons in which the aggregate amount involved exceeds or may be expected to exceed $120,000 and in which a related person has or will have a direct or indirect material interest. For purposes of this policy, a related person will be defined as a director, executive officer, nominee for director, or greater than 5% beneficial owner of our common stock, in each case since the beginning of the most recently completed year, and their immediate family members.

PRINCIPAL STOCKHOLDERS

The following table sets forth certain information known to us regarding beneficial ownership of our common stock as of June 30, 2019 by:

- each person or group of affiliated persons known by us to be the beneficial owner of more than five percent of our capital stock;
- each of our named executive officers;
- each of our directors; and
- all of our executive officers and directors as a group.

The column entitled "Percentage of Shares Beneficially Owned—Before Offering" is calculated based on 25,129,319 shares of common stock outstanding as of June 30, 2019, assuming the automatic conversion of all outstanding shares of our preferred stock into an aggregate of 19,356,835 shares of our common stock upon the completion of this offering. The column entitled "Percentage of Shares Beneficially Owned—After Offering" is based on shares of our common stock to be outstanding after this offering, including the shares of our common stock that we are selling in this offering, but not including any additional shares issuable upon exercise of outstanding options.

We have determined beneficial ownership in accordance with the rules of the SEC, and the information is not necessarily indicative of beneficial ownership for any other purpose. These rules generally attribute beneficial ownership of securities to persons who possess sole or shared voting power or investment power with respect to those securities as well as any shares of common stock that the person has the right to acquire within 60 days of June 30, 2019 through the exercise of stock options or other rights. These shares are deemed to be outstanding and beneficially owned by the person holding those options for the purpose of computing the percentage ownership of that person, but they are not treated as outstanding for the purpose of computing the percentage ownership of any other person. Unless otherwise indicated, the persons or entities identified in this table have sole voting and investment power with respect to all shares shown as beneficially owned by them.

Stockholder Rights In Connection With This Offering

Pursuant to a side letter that we entered into in connection with our Series A/SeriesA-1/Series A-2 preferred stock financing, we must use commercially reasonable efforts to cause the underwriters of this offering to provide each of Baker Brothers Life Sciences, L.P., 667, L.P., 5AM Ventures V, L.P. and Adage Capital Partners, LP, or the Series A/A-1 investors, the opportunity to participate in this offering in an amount equal to such investor's pro rata share of an aggregate of 32% of the total number shares of common stock being offered by us. Despite our commercially reasonable efforts, the underwriters may, in their sole discretion, determine that the Series A/A-1 investors' participation in such proportion is not advisable and designate a reduced number of, or no, shares for purchase by the Series A/A-1 investors.

Upon the closing of this offering, each outstanding share of our Series A, Series A-1, Series A-2 and Series B preferred stock, or our preferred stock, will automatically convert into shares of common stock in accordance with the provisions of our second amended and restated certificate of incorporation, or our current charter. Our current charter provides that upon thirty days' written notice to us prior to the closing of this offering, if a holder of our preferred stock, together with its affiliates, would beneficially own shares of our common stock in excess of 4.99% following such conversion, such holder may elect to instead convert part or all of its shares of preferred stock into shares of a new class of common stock that will be non-voting but otherwise have the same rights and preferences as our common stock. Any holder of shares of non-voting common stock may convert these shares into shares of our common stock, unless, immediately prior to or following such conversion, the holder and its affiliates beneficially own, or would beneficially own, more than 4.99% of our issued and outstanding shares of common stock. Any such holder of shares of our preferred stock has the right to increase or decrease this beneficial ownership limitation, in its sole discretion, by providing us with 61 days' prior written notice.

Except as otherwise noted below, the address for persons listed in the table is c/o Cabaletta Bio, Inc., 2929 Arch Street, Suite 600, Philadelphia, PA 19104.

NAME AND ADDRESS OF BENEFICIAL OWNER	NUMBER OF SHARES BENEFICIALLY OWNED PRIOR TO OFFERING	PERCENTAGE OF SHARES BENEFICIALLY OWNED	
		BEFORE OFFERING (%)	AFTER OFFERING (%)
5% or Greater Stockholders:			
5AM Ventures V, L.P.(1)	4,822,083	19.19%	
Adage Capital Partners, LP(2)	4,807,144	19.13%	
Baker Bros. Advisors LP(3)	4,807,143	19.13%	
Aimee Payne, M.D., Ph.D.(4)	1,633,500	6.50%	
Michael Milone, M.D., Ph.D.(5)	1,633,500	6.50%	
Entities affiliated with Boxer Capital, LLC(6)	1,392,758	5.54%	
Entities affiliated with Deerfield Management(7)	1,392,758	5.54%	
Named Executive Officers, Other Officers, and Directors:			
Steven Nichtberger, M.D.(8)	1,724,225	6.86%	
Gwendolyn Binder, Ph.D.	—	*	
David J. Chang, M.D., M.P.H.	—	*	
Anup Marda	—	*	
Catherine Bollard, M.D.(9)	8,705	*	
Brian Daniels, M.D.	—	*	
Richard Henriques, MBA (10)	17,410	*	
Mark Simon (11)	49,870	*	
All executive officers and directors as a group (8 persons)(12)	1,800,210	7.15%	

* Less than 1%

(1) Consists of 3,146,551 shares of common stock issuable upon conversion of shares of Series A preferred stock and 1,675,532 shares of common stock issuable upon conversion of shares of Series B preferred stock, in each case held by 5AM Ventures V, L.P. 5AM Partners V, LLC is the general partner of 5AM Ventures V, L.P. and may be deemed to have sole investment and voting power over the shares held by 5AM Ventures V, L.P. Andrew Schwab, Kush Parmar and Scott Rocklage are the managing members of 5AM Partners V, LLC, and may be deemed to share voting and dispositive power over the shares held by 5AM Ventures V, L.P. Dr. Brian Daniels is a member of our board of directors and a partner at 5AM Venture Management, LLC. However, Dr. Daniels does not have or share voting or dispositive power over the shares owned by 5AM Ventures V, L.P. The address of the above persons and entities is 501 2nd Street, Suite 350, San Francisco, CA 94107.

(2) Consists of 3,605,408 shares of common stock issuable upon conversion of shares of Series A preferred stock and 1,201,736 shares of common stock issuable upon conversion of shares of Series B preferred stock, in each case held by Adage Capital Partners, L.P. Adage Capital Advisors, L.L.C. is the managing member of Adage Capital Partners GP, L.L.C., the general partner of Adage Capital Partners, L.P. As managing members of Adage Capital Advisors, L.L.C., managing members of Adage Capital Partners GP, L.L.C. and general partners of Adage Capital Partners, L.P., Robert Atchinson and Phillip Gross may be deemed beneficial holders with shared voting and dispositive power over the shares held by Adage Capital Partners, L.P. The address of Adage Capital Partners L.P. is 200 Clarendon Street, Boston, Massachusetts 02110.

(3) Consists of (i) 3,330,917 shares of common stock issuable upon conversion of shares of SeriesA-1 preferred stock and 1,110,244 shares of common stock issuable upon conversion of shares of Series B preferred stock, in each case held by Baker Brothers Life Sciences, L.P. (“BBLS”) and (ii) 274,490 shares of common stock issuable upon conversion of shares of Series A-1 preferred stock and 91,492 shares of common stock issuable upon conversion of shares of Series B preferred stock, in each case held by 667, L.P.

(together with BBLS, the "BBA Funds"). Baker Bros. Advisors LP ("BBA"), is the management company and investment adviser to the BBA Funds and has sole voting and investment power with respect to the shares held by the BBA Funds. Baker Bros. Advisors (GP) LLC ("BBA-GP"), is the sole general partner of BBA. The managing members of BBA-GP are Julian C. Baker and Felix J. Baker. The address for BBA,BBA-GP and the BBA Funds is 860 Washington Street, 3rd Floor, New York, NY 10014.

(4) Consists of 1,633,500 shares of common stock.

(5) Consists of 1,633,500 shares of common stock.

(6) Consists of (i) 1,258,636 shares of common stock issuable upon conversion of shares of Series B preferred stock held by Boxer Capital, LLC ("Boxer Capital") and (ii) 134,122 shares of common stock issuable upon conversion of shares of Series B preferred stock held by MVA Investors, LLC ("MVA"). Boxer Management is the managing member and majority owner of Boxer Capital. Joseph Lewis is the sole indirect owner and controls Boxer Management. MVA is the independent, personal investment vehicle of certain employees of Boxer Capital and Tavistock Life Sciences Company, which is a Delaware corporation and an affiliate of Boxer Capital. The principal business address of Boxer Capital and MVA is 440 Stevens Avenue, Suite 100, Solana Beach, CA 92075. The principal business address of both Boxer Management and Joseph Lewis is c/o Cay House P.O. Box N-7776 E.P. Taylor Drive Lyford Cay, New Providence, Bahamas.

(7) Consists of (i) 696,379 shares of common stock issuable upon conversion of shares of Series B preferred stock held by Deerfield Private Design Fund IV, LP and (ii) 696,379 shares of common stock issuable upon conversion of shares of Series B preferred stock held by Deerfield Special Situations Fund, L.P. Deerfield Mgmt, L.P. is the general partner of Deerfield Special Situations Fund, L.P., and Deerfield Mgmt IV, L.P. is the general partner of Deerfield Private Design Fund IV, L.P. (together with Deerfield Special Situations Fund, L.P., the "Deerfield Funds"). Deerfield Management Company, L.P. is the investment manager of each of the Deerfield Funds. Mr. James E. Flynn is the sole member of the general partner of each of Deerfield Mgmt, L.P., Deerfield Mgmt IV, L.P., Deerfield Management Company, L.P., Deerfield Mgmt, L.P., and Deerfield Management Company, L.P. Mr. James E. Flynn may be deemed to beneficially own the securities held by Deerfield Special Situations Fund, L.P. Deerfield Mgmt IV, L.P., Deerfield Management Company, L.P. and Mr. James E. Flynn may be deemed to beneficially own the securities held by Deerfield Private Design Fund IV, L.P. The address of the Deerfield Funds is 780 Third Avenue, 37th Floor, New York, NY 10017.

(8) Consists of (i) 1,089,000 shares of common stock, (ii) 90,725 shares of common stock issuable upon conversion of shares of Series A-2 preferred stock, and (iii) 544,500 shares of common stock held by the 2017 Nichtberger Family Trust (the "Trust Shares"). Dr. Nichtberger may be deemed to beneficially own the Trust Shares. Dr. Nichtberger disclaims beneficial ownership of the Trust Shares and this shall not be deemed an admission that he is the beneficial owner of the Trust Shares.

(9) Consists of 8,705 shares of common stock underlying options exercisable within 60 days of June 30, 2019.

(10) Consists of 17,410 shares of common stock underlying options exercisable within 60 days of June 30, 2019.

(11) Consists of (i) 27,217 shares of common stock issuable upon conversion of shares of Series A-1 preferred stock and (ii) 22,653 shares of common stock underlying options exercisable within 60 days of June 30, 2019.

(12) Includes an aggregate of 48,768 shares of common stock underlying options exercisable within 60 days of June 30, 2019 held by three current directors.

DESCRIPTION OF CAPITAL STOCK

The following descriptions are summaries of the material terms of our amended and restated certificate of incorporation and amended and restated bylaws, which will be effective upon the closing of this offering. The descriptions of the common stock and preferred stock give effect to changes to our capital structure that will occur upon the completion of this offering. We refer in this section to our amended and restated certificate of incorporation as our certificate of incorporation, and we refer to our amended and restated bylaws as our bylaws.

General

Upon completion of this offering, our authorized capital stock will consist of shares of common stock, par value $0.00001 per share, and shares of preferred stock, par value $0.00001 per share, all of which shares of preferred stock will be undesignated.

As of June 30, 2019, 5,772,484 shares of our common stock, 3,146,551 shares of Series A preferred stock, 7,372,719 shares of Series A-1 preferred stock, 468,445 shares of Series A-2 preferred stock and 8,369,120 shares of Series B preferred stock were issued and outstanding and held by 25 stockholders of record. This amount does not take into account the conversion of all outstanding shares of our preferred stock into common stock upon the completion of this offering.

Common Stock

The holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of our stockholders. The holders of our common stock do not have any cumulative voting rights. Holders of our common stock are entitled to receive ratably any dividends declared by our board of directors out of funds legally available for that purpose, subject to any preferential dividend rights of any outstanding preferred stock. Our common stock has no preemptive rights, conversion rights or other subscription rights or redemption or sinking fund provisions.

In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in all assets remaining after payment of all debts and other liabilities and any liquidation preference of any outstanding preferred stock. The shares to be issued by us in this offering will be, when issued and paid for, validly issued, fully paid and non-assessable.

Preferred Stock

Upon the completion of this offering, all outstanding shares of our preferred stock will be converted into shares of our common stock. Upon the consummation of this offering, our board of directors will have the authority, without further action by our stockholders, to issue up to shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences, sinking fund terms and the number of shares constituting, or the designation of, such series, any or all of which may be greater than the rights of common stock. The issuance of our preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon our liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change in control of our company or other corporate action. Immediately after consummation of this offering, no shares of preferred stock will be outstanding, and we have no present plan to issue any shares of preferred stock.

Stock Options

As of June 30, 2019, there were outstanding options to purchase an aggregate of 2,435,545 shares of our common stock.

Registration Rights

Upon the completion of this offering, the holders of shares of our common stock, including those issuable upon the conversion of preferred stock, will be entitled to rights with respect to the registration of these securities under the Securities Act. These rights are provided under the terms of an investors' rights agreement between us, holders of our preferred stock. The investors' rights agreement includes demand registration rights, short-form registration rights and piggyback registration rights. All fees, costs and expenses of underwritten registrations under this agreement will be borne by us and all selling expenses, including underwriting discounts and selling commissions, will be borne by the holders of the shares being registered.

Demand Registration Rights

Beginning 180 days after the effective date of this registration statement, the holders of shares of our common stock, including those issuable upon the conversion of preferred stock upon the completion of this offering, are entitled to demand registration rights. Under the terms of the investors' rights agreement, we will be required, upon the written request of holders of at least 40% of these securities, to file a registration statement and use commercially reasonable efforts to effect the registration of all or a portion of these shares for public resale. We are required to effect only two registrations pursuant to this provision of the investors' rights agreement.

Short-Form Registration Rights

Pursuant to the investors' rights agreement, if we are eligible to file a registration statement on Form S-3, upon the written request of holders of at least 20% of these securities at an aggregate offer price of at least $5.0 million, we will be required to use commercially reasonable efforts to effect a registration of such shares. We are required to effect only two registrations in any twelve month period pursuant to this provision of the investors' rights agreement. The right to have such shares registered on Form S-3 is further subject to other specified conditions and limitations.

Piggyback Registration Rights

Pursuant to the investors' rights agreement, if we register any of our securities either for our own account or for the account of other security holders, the holders of these shares are entitled to include their shares in the registration. Subject to certain exceptions contained in the investors' rights agreement, we and the underwriters may limit the number of shares included in the underwritten offering to the number of shares which we and the underwriters determine in our sole discretion will not jeopardize the success of the offering.

Indemnification

Our investors' rights agreement contains customary cross-indemnification provisions, under which we are obligated to indemnify holders of registrable securities in the event of material misstatements or omissions in the registration statement attributable to us, and they are obligated to indemnify us for material misstatements or omissions attributable to them.

Expiration of Registration Rights

The demand registration rights and short form registration rights granted under the investors' rights agreement will terminate on the earliest of (i) a deemed liquidation event, as defined in the investors' rights agreement, (ii) the fifth anniversary of the completion of this offering and (iii) at such time after this offering when the holders' shares may be sold without restriction pursuant to Rule 144 within a three month period.

Anti-Takeover Effects of our Certificate of Incorporation and Bylaws and Delaware Law

Our amended and restated certificate of incorporation and bylaws that will be in effect on the completion of this offering will include a number of provisions that may have the effect of delaying, deferring or preventing

another party from acquiring control of us and encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Board Composition and Filling Vacancies

Our amended and restated certificate of incorporation will provide for the division of our board of directors into three classes serving staggered three-year terms, with one class being elected each year. Our amended and restated certificate of incorporation will also provide that directors may be removed only for cause and then only by the affirmative vote of the holders of 75% or more of the outstanding shares then entitled to vote at an election of directors. Furthermore, any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of our board, may only be filled by the affirmative vote of a majority of our directors then in office even if less than a quorum. The classification of directors, together with the limitations on removal of directors and treatment of vacancies, has the effect of making it more difficult for stockholders to change the composition of our board of directors.

No Written Consent of Stockholders

Our amended and restated certificate of incorporation will provide that all stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting, and that stockholders may not take any action by written consent in lieu of a meeting. This limit may lengthen the amount of time required to take stockholder actions and would prevent the amendment of our bylaws or removal of directors by our stockholders without holding a meeting of stockholders.

Meetings of Stockholders

Our amended and restated certificate of incorporation and bylaws will provide that only a majority of the members of our board of directors then in office may call special meetings of stockholders and only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of stockholders. Our bylaws will limit the business that may be conducted at an annual meeting of stockholders to those matters properly brought before the meeting.

Advance Notice Requirements

Our bylaws will establish advance notice procedures with regard to stockholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our stockholders. These procedures provide that notice of stockholder proposals must be timely given in writing to our corporate secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary date of the annual meeting for the preceding year. Our bylaws specify the requirements as to form and content of all stockholders' notices. These requirements may preclude stockholders from bringing matters before the stockholders at an annual or special meeting.

Amendment to Certificate of Incorporation and Bylaws

Any amendment of our amended and restated certificate of incorporation must first be approved by a majority of our board of directors, and if required by law or our amended and restated certificate of incorporation, must thereafter be approved by a majority of the outstanding shares entitled to vote on the amendment and a majority of the outstanding shares of each class entitled to vote thereon as a class, except that the amendment of the provisions relating to stockholder action, board composition, limitation of liability and the amendment of our bylaws and certificate of incorporation must be approved by not less than 75% of the outstanding shares entitled to vote on the amendment, and not less than 75% of the outstanding shares of each

class entitled to vote thereon as a class. Our bylaws may be amended by the affirmative vote of a majority of the directors then in office, subject to any limitations set forth in the bylaws; and may also be amended by the affirmative vote of at least 75% of the outstanding shares entitled to vote on the amendment, or, if our board of directors recommends that the stockholders approve the amendment, by the affirmative vote of the majority of the outstanding shares entitled to vote on the amendment, in each case voting together as a single class.

Undesignated Preferred Stock

Our amended and restated certificate of incorporation will provide for authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of our stockholders, our board of directors could cause shares of preferred stock to be issued without stockholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent stockholder or stockholder group. In this regard, our certificate of incorporation grants our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Choice of forum

Our amended and restated bylaws that will become effective upon the closing of this offering will provide that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for any state law claim for: (1) any derivative action or proceeding brought on our behalf; (2) any action asserting a claim of breach of a fiduciary duty or other wrongdoing by any of our directors, officers, employees or agents to us or our stockholders; (3) any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law or our certificate of incorporation or bylaws; (4) any action to interpret, apply, enforce or determine the validity of our certificate of incorporation or bylaws or (5) any action asserting a claim governed by the internal affairs doctrine. The choice of forum provision does not apply to any actions arising under the Securities Act or the Exchange Act.

Section 203 of the Delaware General Corporation Law

Upon completion of this offering, we will be subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions:

- before the stockholder became interested, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances, but not the outstanding voting stock owned by the interested stockholder; or
- at or after the time the stockholder became interested, the business combination was approved by our board of directors and authorized at an annual or special meeting of the stockholders by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Section 203 defines a business combination to include:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, lease, pledge or other disposition involving the interested stockholder of 10% or more of the assets of the corporation;
- subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;
- subject to exceptions, any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder; and
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

In general, Section 203 defines an interested stockholder as any entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by the entity or person.

Nasdaq Global Market Listing

We intend to apply to list our common stock on The Nasdaq Global Market under the trading symbol “CABA.”

Transfer Agent and Registrar

The transfer agent and registrar for our common stock will be .

SHARES ELIGIBLE FOR FUTURE SALE

Prior to this offering, there has been no public market for our shares. Future sales of our common stock in the public market, or the availability of such shares for sale in the public market, could adversely affect market prices prevailing from time to time. As described below, only a limited number of shares will be available for sale shortly after this offering due to contractual and legal restrictions on resale. Nevertheless, sales of our common stock in the public market after such restrictions lapse, or the perception that those sales may occur, could adversely affect the prevailing market price at such time and our ability to raise equity capital in the future.

Based on the number of shares outstanding as of June 30, 2019, upon the completion of this offering, shares of our common stock will be outstanding, assuming no exercise of the underwriters' option to purchase additional shares and no exercise of outstanding options. Of the outstanding shares, all of the shares sold in this offering will be freely tradable, except that any shares held by our affiliates, as that term is defined in Rule 144 under the Securities Act, may only be sold in compliance with the limitations described below, and shares of our common stock are restricted shares of common stock subject to time-based vesting terms. All remaining shares of common stock held by existing stockholders immediately prior to the completion of this offering will be "restricted securities" as such term is defined in Rule 144. These restricted securities were issued and sold by us, or will be issued and sold by us, in private transactions and are eligible for public sale only if registered under the Securities Act or if they qualify for an exemption from registration under the Securities Act, including the exemptions provided by Rule 144 or Rule 701, summarized below.

Rule 144

In general, a person who has beneficially owned restricted stock for at least six months would be entitled to sell their securities provided that (i) such person is not deemed to have been one of our affiliates at the time of, or at any time during the 90 days preceding, a sale and (ii) we are subject to the Securities Exchange Act of 1934, as amended, or the Exchange Act, periodic reporting requirements for at least 90 days before the sale. Persons who have beneficially owned restricted shares for at least six months but who are our affiliates at the time of, or any time during the 90 days preceding, a sale, would be subject to additional restrictions, by which such person would be entitled to sell within any three-month period only a number of securities that does not exceed the greater of either of the following:

- 1% of the number of shares then outstanding, which will equal approximately shares immediately after this offering, assuming no exercise of the underwriters' option to purchase additional shares, based on the number of shares outstanding as of June 30, 2019; or
- the average weekly trading volume of our common stock on The Nasdaq Global Market during the four calendar weeks preceding the filing of a notice on Form 144 with respect to the sale;

provided, in each case, that we are subject to the Exchange Act periodic reporting requirements for at least 90 days before the sale. Such sales both by affiliates and by non-affiliates must also comply with the manner of sale, current public information and notice provisions of Rule 144.

Upon waiver or expiration of the 180-day lock-up period described below, approximately shares of our common stock will be eligible for sale under Rule 144. We cannot estimate the number of shares of our common stock that our existing stockholders will elect to sell under Rule 144.

Rule 701

Rule 701 under the Securities Act, as in effect on the date of this prospectus, permits resales of shares in reliance upon Rule 144 but without compliance with certain restrictions of Rule 144, including the holding period requirement. Most of our employees, executive officers or directors who purchased shares under a written compensatory plan or contract may be entitled to rely on the resale provisions of Rule 701, but all holders of Rule 701 shares are required to wait until 90 days after the date of this prospectus before selling their shares.

However, substantially all Rule 701 shares are subject to lock-up agreements as described below and under the section titled "Underwriters" included elsewhere in this prospectus and will become eligible for sale upon the expiration of the restrictions set forth in those agreements.

Lock-Up Agreements

We and each of our directors and executive officers and substantially all of our stockholders have signed a lock-up agreement that prevents them from selling any of our common stock or any securities convertible into or exercisable or exchangeable for common stock for a period of not less than 180 days from the date of this prospectus without the prior written consent of the representatives, subject to certain exceptions. See the section entitled "Underwriters" appearing elsewhere in this prospectus for more information.

Registration Rights

Beginning 180 days after the closing of this offering, certain holders of our securities will be entitled to various rights with respect to registration of their shares under the Securities Act. Registration of these shares under the Securities Act would result in these shares becoming fully tradable without restriction under the Securities Act immediately upon the effectiveness of the registration. See the section entitled "Description of Capital Stock—Registration Rights" appearing elsewhere in this prospectus for more information.

Equity Incentive Plans

We intend to file one or more registration statements on Form S-8 under the Securities Act to register our shares issued or reserved for issuance under our equity incentive plans. The first such registration statement is expected to be filed soon after the date of this prospectus and will automatically become effective upon filing with the SEC. Accordingly, shares registered under such registration statement will be available for sale in the open market, unless such shares are subject to vesting restrictions with us or the lock-up restrictions described above. As of the date of this prospectus, we estimate that such registration statement on Form S-8 will cover approximately shares.

MATERIAL U.S. FEDERAL INCOME TAX CONSIDERATIONS FOR NON-U.S. HOLDERS OF COMMON STOCK

The following discussion is a summary of the material U.S. federal income tax considerations applicable tonon-U.S. holders (as defined below) with respect to their ownership and disposition of shares of our common stock issued pursuant to this offering. For purposes of this discussion, a non-U.S. holder means a beneficial owner of our common stock that is for U.S. federal income tax purposes:

- a non-resident alien individual;
- a foreign corporation or any other foreign organization taxable as a corporation for U.S. federal income tax purposes; or
- a foreign estate or trust, the income of which is not subject to U.S. federal income tax on a net income basis.

This discussion does not address the tax treatment of partnerships or other entities that are pass-through entities for U.S. federal income tax purposes or persons that hold their common stock through partnerships or other pass-through entities. A partner in a partnership or other pass-through entity that will hold our common stock should consult his, her or its tax advisor regarding the tax consequences of acquiring, holding and disposing of our common stock through a partnership or other pass-through entity, as applicable.

This discussion is based on current provisions of the U.S. Internal Revenue Code of 1986, as amended, which we refer to as the Code, existing and proposed U.S. Treasury Regulations promulgated thereunder, current administrative rulings and judicial decisions, all as in effect as of the date of this prospectus and, all of which are subject to change or to differing interpretation, possibly with retroactive effect. Any such change or differing interpretation could alter the tax consequences to non-U.S. holders described in this prospectus. There can be no assurance that the Internal Revenue Service, which we refer to as the IRS, will not challenge one or more of the tax consequences described herein. We assume in this discussion that a non-U.S. holder holds shares of our common stock as a capital asset within the meaning of Section 1221 of the Code, generally property held for investment.

This discussion does not address all aspects of U.S. federal income taxation that may be relevant to a particulamon-U.S. holder in light of that non-U.S. holder's individual circumstances nor does it address any aspects of any U.S. federal tax other than the income tax, U.S. state, local omon-U.S. taxes, the alternative minimum tax, rules regarding qualified small business stock within the meaning of Section 1202 of the Code or the Medicare tax on net investment income. This discussion also does not consider any specific facts or circumstances that may apply to a non-U.S. holder and does not address the special tax rules applicable to particular non-U.S. holders, such as:

- insurance companies;
- tax-exempt or governmental organizations;
- financial institutions;
- brokers or dealers in securities;
- regulated investment companies;
- pension plans;
- "controlled foreign corporations," "passive foreign investment companies," and corporations that accumulate earnings to avoid U.S. federal income tax;
- "qualified foreign pension funds," or entities wholly owned by a "qualified foreign pension fund";
- persons that have a functional currency other than the U.S. dollar;

- persons deemed to sell our common stock under the constructive sale provisions of the Code;
- persons that hold our common stock as part of a straddle, hedge, conversion transaction, synthetic security or other integrated investment;
- persons who hold or receive our common stock pursuant to the exercise of any employee stock option or otherwise as compensation; and
- certain U.S. expatriates.

This discussion is for general information only and is not tax advice. Accordingly, all prospectivenon-U.S. holders of our common stock should consult their tax advisors with respect to the U.S. federal, state, local and non-U.S. tax consequences of the purchase, ownership and disposition of our common stock.

Distributions on Our Common Stock

Distributions, if any, on our common stock will constitute dividends for U.S. federal income tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. If a distribution exceeds our current and accumulated earnings and profits, the excess will be treated as a tax-free return of the non-U.S. holder's investment, up to such holder's tax basis in the common stock. Any remaining excess will be treated as capital gain, subject to the tax treatment described below in "Gain on Sale or Other Taxable Disposition of Our Common Stock." Any such distributions will also be subject to the discussions below under the sections titled "Backup Withholding and Information Reporting" and "Withholding and Information Reporting Requirements—FATCA."

Subject to the discussion in the following two paragraphs in this section, dividends paid to anon-U.S. holder generally will be subject to withholding of U.S. federal income tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence.

Dividends that are treated as effectively connected with a trade or business conducted by anon-U.S. holder within the United States and, if an applicable income tax treaty so provides, that are attributable to a permanent establishment or a fixed base maintained by the non-U.S. holder within the United States, are generally exempt from the 30% withholding tax if the non-U.S. holder satisfies applicable certification and disclosure requirements. However, such U.S. effectively connected income, net of specified deductions and credits, is taxed at the same graduated U.S. federal income tax rates applicable to United States persons (as defined in the Code). Any U.S. effectively connected income received by a non-U.S. holder that is a corporation may also, under certain circumstances, be subject to an additional "branch profits tax" at a 30% rate or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence.

A non-U.S. holder of our common stock who claims the benefit of an applicable income tax treaty between the United States and such holder's country of residence generally will be required to provide a properly executed IRS Form W-8BEN or W-8BEN-E (or successor form) to the applicable withholding agent and satisfy applicable certification and other requirements. Non-U.S. holders are urged to consult their tax advisors regarding their entitlement to benefits under a relevant income tax treaty. A non-U.S. holder that is eligible for a reduced rate of U.S. withholding tax under an income tax treaty may obtain a refund or credit of any excess amounts withheld by timely filing a U.S. tax return with the IRS.

Gain on Sale or Other Taxable Disposition of Our Common Stock

Subject to the discussions below under "Backup Withholding and Information Reporting" and "Withholding and Information Reporting Requirements—FATCA," a non-U.S. holder generally will not be subject to any U.S. federal income tax on any gain realized upon such holder's sale or other taxable disposition of shares of our common stock unless:

- the gain is effectively connected with the non-U.S. holder's conduct of a U.S. trade or business and, if an applicable income tax treaty so provides, is attributable to a permanent establishment or a fixed-base

maintained by such non-U.S. holder in the United States, in which case thenon-U.S. holder generally will be taxed on a net income basis at the graduated U.S. federal income tax rates applicable to United States persons (as defined in the Code) and, if the non-U.S. holder is a foreign corporation, the branch profits tax described above in "Distributions on Our Common Stock" also may apply;

- the non-U.S. holder is a nonresident alien individual who is present in the United States for 183 days or more in the taxable year of the disposition and certain other conditions are met, in which case the non-U.S. holder will be subject to a 30% tax (or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence) on the net gain derived from the disposition, which may be offset by certain U.S. source capital losses of the non-U.S. holder, if any (even though the individual is not considered a resident of the United States), provided that the non-U.S. holder has timely filed U.S. federal income tax returns with respect to such losses; or
- we are, or have been, at any time during the five-year period preceding such sale of other taxable disposition (or thenon-U.S. holder's holding period, if shorter) a "U.S. real property holding corporation," unless our common stock is regularly traded on an established securities market and the non-U.S. holder holds no more than 5% of our outstanding common stock, directly or indirectly, actually or constructively, during the shorter of the 5-year period ending on the date of the disposition or the period that thenon-U.S. holder held our common stock. Generally, a corporation is a U.S. real property holding corporation only if the fair market value of its U.S. real property interests equals or exceeds 50% of the sum of the fair market value of its worldwide real property interests plus its other assets used or held for use in a trade or business. Although there can be no assurance, we do not believe that we are, or have been, a U.S. real property holding corporation, or that we are likely to become one in the future. No assurance can be provided that our common stock will be regularly traded on an established securities market for purposes of the rules described above.

Backup Withholding and Information Reporting

We must report annually to the IRS and to eachnon-U.S. holder the gross amount of the distributions on our common stock paid to such holder and the tax withheld, if any, with respect to such distributions. Non-U.S. holders may have to comply with specific certification procedures to establish that the holder is not a United States person (as defined in the Code) in order to avoid backup withholding at the applicable rate with respect to dividends on our common stock. Dividends paid to non-U.S. holders subject to withholding of U.S. federal income tax, as described above in "Distributions on Our Common Stock," generally will be exempt from U.S. backup withholding.

Information reporting and backup withholding will generally apply to the proceeds of a disposition of our common stock by anon-U.S. holder effected by or through the U.S. office of any broker, U.S. or foreign, unless the holder certifies its status as a non-U.S. holder and satisfies certain other requirements, or otherwise establishes an exemption. Generally, information reporting and backup withholding will not apply to a payment of disposition proceeds to a non-U.S. holder where the transaction is effected outside the United States through anon-U.S. office of a broker. However, for information reporting purposes, dispositions effected through a non-U.S. office of a broker with substantial U.S. ownership or operations generally will be treated in a manner similar to dispositions effected through a U.S. office of a broker. Non-U.S. holders should consult their tax advisors regarding the application of the information reporting and backup withholding rules to them. Copies of information returns may be made available to the tax authorities of the country in which the non-U.S. holder resides or is incorporated under the provisions of a specific treaty or agreement. Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules from a payment to a non-U.S. holder can be refunded or credited against thenon-U.S. holder's U.S. federal income tax liability, if any, provided that an appropriate claim is filed with the IRS in a timely manner.

Withholding and Information Reporting Requirements—FATCA

The Foreign Account Tax Compliance Act, or FATCA, generally imposes a U.S. federal withholding tax at a rate of 30% on payments of dividends on, or gross proceeds from the sale or other disposition of, our common stock paid to a foreign entity unless (i) if the foreign entity is a "foreign financial institution," such foreign entity undertakes certain due diligence, reporting, withholding, and certification obligations, (ii) if the foreign entity is not a "foreign financial institution," such foreign entity identifies certain of its U.S. investors, if any, or (iii) the foreign entity is otherwise exempt under FATCA. Under applicable U.S. Treasury regulations, withholding under FATCA currently applies to payments of dividends on our common stock, but will only apply to payments of gross proceeds from a sale or other disposition of our common stock made after December 31, 2018. Under certain circumstances, a non-U.S. holder may be eligible for refunds or credits of this withholding tax. An intergovernmental agreement between the United States and an applicable foreign country may modify the requirements described in this paragraph. Non-U.S. holders should consult their tax advisors regarding the possible implications of this legislation on their investment in our common stock and the entities through which they hold our common stock, including, without limitation, the process and deadlines for meeting the applicable requirements to prevent the imposition of the 30% withholding tax under FATCA.

UNDERWRITERS

Under the terms and subject to the conditions in an underwriting agreement dated the date of this prospectus, the underwriters named below, for whom Morgan Stanley & Co. LLC, Cowen and Company, LLC and Evercore Group L.L.C. are acting as representatives, have severally agreed to purchase, and we have agreed to sell to them, severally, the number of shares indicated below:

Name	Number of Shares
Morgan Stanley & Co. LLC	
Cowen and Company, LLC	
Evercore Group L.L.C.	
Total:	

The underwriters and the representatives are collectively referred to as the "underwriters" and the "representatives," respectively. The underwriters are offering the shares of common stock subject to their acceptance of the shares from us and subject to prior sale. The underwriting agreement provides that the obligations of the several underwriters to pay for and accept delivery of the shares of common stock offered by this prospectus are subject to the approval of certain legal matters by their counsel and to certain other conditions. The underwriters are obligated to take and pay for all of the shares of common stock offered by this prospectus if any such shares are taken. However, the underwriters are not required to take or pay for the shares covered by the underwriters' over-allotment option described below.

The underwriters initially propose to offer part of the shares of common stock directly to the public at the offering price listed on the cover page of this prospectus and part to certain dealers at a price that represents a concession not in excess of $ per share under the public offering price. After the initial offering of the shares of common stock, the offering price and other selling terms may from time to time be varied by the representatives. The offering of the shares by the underwriters is subject to receipt and acceptance and subject to the underwriters' right to reject any order in whole or in part.

We have granted to the underwriters an option, exercisable for 30 days from the date of this prospectus, to purchase up to additional shares of common stock at the public offering price listed on the cover page of this prospectus, less underwriting discounts and commissions. The underwriters may exercise this option solely for the purpose of covering over-allotments, if any, made in connection with the offering of the shares of common stock offered by this prospectus. To the extent the option is exercised, each underwriter will become obligated, subject to certain conditions, to purchase about the same percentage of the additional shares of common stock as the number listed next to the underwriter's name in the preceding table bears to the total number of shares of common stock listed next to the names of all underwriters in the preceding table.

The following table shows the per share and total public offering price, underwriting discounts and commissions, and proceeds before expenses to us. These amounts are shown assuming both no exercise and full exercise of the underwriters' over-allotment option to purchase up to an additional shares of common stock.

	Per Share	Total	
		No Exercise	Full Exercise
Public offering price	$	$	$
Underwriting discounts and commissions to be paid by us	$	$	$
Proceeds, before expenses, to us	$	$	$

The estimated offering expenses payable by us, exclusive of the underwriting discounts and commissions, are approximately $. We have agreed to reimburse the underwriters for expenses relating to clearance of this offering with the Financial Industry Regulatory Authority up to $.

The underwriters have informed us that they do not intend sales to discretionary accounts to exceed 5% of the total number of shares of common stock offered by them.

We intend to apply to list our common stock on The Nasdaq Global Market under the symbol "CABA."

We and all of our directors and executive officers and the holders of substantially all of our outstanding stock and stock options have entered into lock-up agreements with the underwriters under which they have agreed that, without the prior written consent of Morgan Stanley & Co. LLC, Cowen and Company, LLC and Evercore Group L.L.C., on behalf of the underwriters, we and they will not, during the period ending 180 days after the date of this prospectus (the "restricted period"):

- offer, pledge, sell, contract to sell, sell any option or contract to purchase, purchase any option or contract to sell, grant any option, right or warrant to purchase, lend or otherwise transfer or dispose of, directly or indirectly, any shares of common stock or any securities convertible into or exercisable or exchangeable for shares of common stock;
- file any registration statement with the Securities and Exchange Commission relating to the offering of any shares of common stock or any securities convertible into or exercisable or exchangeable for common stock; or
- enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of the common stock;

whether any such transaction described above is to be settled by delivery of common stock or such other securities, in cash or otherwise. In addition, we and each such person agrees that, without the prior written consent of Morgan Stanley & Co. LLC, Cowen and Company, LLC and Evercore Group L.L.C., on behalf of the underwriters, we or such other person will not, during the restricted period, make any demand for, or exercise any right with respect to, the registration of any shares of common stock or any security convertible into or exercisable or exchangeable for common stock.

The restrictions described in the immediately preceding paragraph do not apply to:

a) transactions relating to shares of common stock or other securities acquired in this offering or in open market transactions after this offering;

b) transfers of shares of common stock or any security convertible into or exercisable or exchangeable for common stock as a bona fide gift or to a charitable organization or educational institution in a transaction not involving a disposition for value;

c) if the signatory is an entity, distributions of shares of common stock or any security convertible into or exercisable or exchangeable for common stock to limited partners, general partners, members, stockholders or trust beneficiaries of the signatory or the signatory's affiliates or to any investment fund or other entity controlled or managed by the signatory;

d) transfers or dispositions of shares of common stock or any security convertible into or exercisable or exchangeable for shares of common stock by will or other testamentary document or by intestacy to the legal representative, heir, beneficiary or a member of the immediate family of the signatory upon the death of the signatory;

e) transfers or dispositions of shares of common stock or any security convertible into or exercisable or exchangeable for shares of common stock to any trust for the direct or indirect benefit of the signatory or the immediate family of the signatory in a transaction not involving a disposition for value;

f) the exercise of options to purchase shares of common stock granted under a stock incentive plan or stock purchase plan described in this prospectus and outstanding as of the date of this prospectus or the exercise of warrants to purchase shares of common stock described in the prospectus and outstanding as of the date of the prospectus, provided that the underlying common stock continues to be subject to the restrictions set forth in the lock-up agreement and, provided further that no filing under Section 16(a) of the Exchange Act reporting a reduction in beneficial ownership of shares of common stock shall be required or shall be voluntarily made during the restricted period (other than a filing on a Form 4 that reports such disposition under the transaction code "F", in which case the filing or announcement shall clearly indicate in the footnotes thereto or comments section thereof that the filing relates to the exercise of a stock option or warrant, as the case may be, that no shares of common stock were sold by the reporting person and that the shares of common stock received upon exercise of the stock option or warrant are subject to a lock-up agreement with the underwriters of the this offering);

g) transfers of shares of common stock or any security convertible into or exercisable or exchangeable for shares of common stock that occur solely by operation of law pursuant to a qualified domestic order or in connection with a divorce settlement;

h) transfers or dispositions of shares of common stock or any security convertible into or exercisable or exchangeable for shares of common stock to the company pursuant to any contractual arrangement disclosed to the underwriters that provides for the repurchase of the signatory's shares of common stock or such other securities by the company solely in connection with the termination of the signatory's employment with or service to the company provided that the repurchase price for any such shares or securities shall not exceed the original purchase price (subject to appropriate adjustment in the event of any stock dividend, stock split, combination or other similar recapitalization) paid by the signatory to the company for such shares or securities and, provided further, that no filing under Section 16(a) of the Exchange Act reporting a reduction in beneficial ownership of shares of common stock shall be required or shall be voluntarily made during the restricted period in connection with any such transfers or dispositions (other than any Form 4 or Form 5 required to be filed under the Exchange Act if the signatory is subject to Section 16 reporting with respect to the company under the Exchange Act and indicating by footnote disclosure or otherwise that such transfer or disposition was made solely to the company pursuant to the circumstances described in this clause);

i) the establishment of a trading plan pursuant to Rule 10b5-1 under the Exchange Act for the transfer of shares of common stock, provided that such plan does not provide for the transfer of shares of common stock during the restricted period and provided further that to the extent a public announcement or filing under the Exchange Act, if any, is required of or voluntarily made by or on behalf of the signatory or the company regarding the establishment of such plan, such announcement or filing shall include a statement to the effect that no transfer of common stock may be made under such plan during the restricted period; or

j) transfers of shares of common stock or securities convertible into or exercisable or exchangeable for common stock pursuant to a bona fide tender offer for shares of our capital stock, merger, consolidation or other similar transaction made to all holders of the company's securities involving a change of control of the company (including without limitation, the entering into of any lock-up, voting or similar agreement pursuant to which the holder may agree to transfer, sell, tender or otherwise dispose of shares or other securities in connection with such transaction) that has been approved by our board of directors; *provided* that, in the event that such change of control transaction is not consummated, these requirements shall not be applicable and the holder's shares and other securities shall remain subject to the restrictions contained in the lock-up agreement.

provided that, in the case of any transfer or distribution as described in (b)-(e) and (g) above, (i) the transferee, donee or distributee shall sign and deliver a lock-up agreement to the underwriters and (ii) no public announcement or public filing under Section 16(a) of the Exchange Act relating to such transfer or distribution shall be required or shall be voluntarily made during the restricted period.

Morgan Stanley & Co. LLC, Cowen and Company, LLC and Evercore Group L.L.C., in their sole discretion, may release the shares of common stock and other securities subject to the lock-up agreements described above in whole or in part at any time.

In order to facilitate the offering of the common stock, the underwriters may engage in transactions that stabilize, maintain or otherwise affect the price of the common stock. Specifically, the underwriters may sell more shares than they are obligated to purchase under the underwriting agreement, creating a short position. A short sale is covered if the short position is no greater than the number of shares available for purchase by the underwriters under the over-allotment option. The underwriters can close out a covered short sale by exercising the over-allotment option or purchasing shares in the open market. In determining the source of shares to close out a covered short sale, the underwriters will consider, among other things, the open market price of shares compared to the price available under the over-allotment option. The underwriters may also sell shares in excess of the over-allotment option, creating a naked short position. The underwriters must close out any naked short position by purchasing shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that there may be downward pressure on the price of the common stock in the open market after pricing that could adversely affect investors who purchase in this offering. As an additional means of facilitating this offering, the underwriters may bid for, and purchase, shares of common stock in the open market to stabilize the price of the common stock. These activities may raise or maintain the market price of the common stock above independent market levels or prevent or retard a decline in the market price of the common stock. The underwriters are not required to engage in these activities and may end any of these activities at any time.

We and the underwriters have agreed to indemnify each other against certain liabilities, including liabilities under the Securities Act.

A prospectus in electronic format may be made available on websites maintained by one or more underwriters, or selling group members, if any, participating in this offering. The representatives may agree to allocate a number of shares of common stock to underwriters for sale to their online brokerage account holders. Internet distributions will be allocated by the representatives to underwriters that may make Internet distributions on the same basis as other allocations.

The underwriters and their respective affiliates are full service financial institutions engaged in various activities, which may include securities trading, commercial and investment banking, financial advisory, investment management, investment research, principal investment, hedging, financing and brokerage activities. Certain of the underwriters and their respective affiliates may, from time to time, perform various financial advisory and investment banking services for us, for which they will receive customary fees and expenses.

In addition, in the ordinary course of their various business activities, the underwriters and their respective affiliates may make or hold a broad array of investments and actively trade debt and equity securities (or related derivative securities) and financial instruments (including bank loans) for their own account and for the accounts of their customers and may at any time hold long and short positions in such securities and instruments. Such investment and securities activities may involve our securities and instruments. The underwriters and their respective affiliates may also make investment recommendations or publish or express independent research views in respect of such securities or instruments and may at any time hold, or recommend to clients that they acquire, long or short positions in such securities and instruments.

Pricing of the Offering

Prior to this offering, there has been no public market for our common stock. The initial public offering price will be determined by negotiations between us and the representatives. Among the factors to be considered in determining the initial public offering price are our future prospects and those of our industry in general, our sales, earnings and certain other financial and operating information in recent periods, and the price-earnings

ratios, price-sales ratios, market prices of securities, and certain financial and operating information of companies engaged in activities similar to ours.

Selling Restrictions

Canada

Shares of our common stock may be sold only to purchasers purchasing, or deemed to be purchasing, as principal that are accredited investors, as defined in National Instrument 45-106 *Prospectus Exemptions* or subsection 73.3(1) of the *Securities Act* (Ontario), and are permitted clients, as defined in National Instrument 31-103 *Registration Requirements, Exemptions and Ongoing Registrant Obligations.* Any resale of shares of our common stock must be made in accordance with an exemption from, or in a transaction not subject to, the prospectus requirements of applicable securities laws.

Securities legislation in certain provinces or territories of Canada may provide a purchaser with remedies for rescission or damages if this prospectus (including any amendment thereto) contains a misrepresentation, provided that the remedies for rescission or damages are exercised by the purchaser within the time limit prescribed by the securities legislation of the purchaser's province or territory. The purchaser should refer to any applicable provisions of the securities legislation of the purchaser's province or territory for particulars of these rights or consult with a legal advisor.

Pursuant to section 3A.3 (or, in the case of securities issued or guaranteed by the government of a non-Canadian jurisdiction, section 3A.4) of National Instrument 33-105 Underwriting Conflicts (NI 33-105), the underwriters are not required to comply with the disclosure requirements of NI 33-105 regarding underwriter conflicts of interest in connection with this offering.

European Economic Area

In relation to each Member State of the European Economic Area (each a "Member State"), no shares of our common stock have been offered or will be offered to the public in that Member State prior to the publication of a prospectus which has been approved by the competent authority in that Member State or, where appropriate, approved in another Member State and notified to the competent authority in that Member State, all in accordance with the Prospectus Regulation, except that offers of shares of our common stock may be made to the public in that Member State at any time under the following exemptions under the Prospectus Regulation:

(a) to any legal entity which is a qualified investor as defined under the Prospectus Regulation;

(b) to fewer than 150 natural or legal persons (other than qualified investors as defined under the Prospectus Regulation), subject to obtaining the prior consent of the representatives for any such offer; or

(c) in any other circumstances falling within Article 1(4) of the Prospectus Regulation,

provided, that no such offer of shares of our common stock shall require the Company or any representative to publish a prospectus pursuant to Article 3 of the Prospectus Regulation or supplement a prospectus pursuant to Article 23 of the Prospectus Regulation.

For the purposes of this provision, an "offer to the public" in relation to any shares of our common stock in any Member State means the communication in any form and by any means of sufficient information on the terms of the offer and any shares of our common stock to be offered so as to enable an investor to decide to purchase or subscribe for any shares of our common stock, and "Prospectus Regulation" means Regulation (EU) 2017/1129.

United Kingdom

Each underwriter has represented and agreed that:

(a) it has only communicated or caused to be communicated and will only communicate or cause to be communicated an invitation or inducement to engage in investment activity (within the meaning of Section 21 of the Financial Services and Markets Act 2000 ("FSMA") received by it in connection with the issue or sale of the shares of our common stock in circumstances in which Section 21(1) of the FSMA does not apply to us; and

(b) it has complied and will comply with all applicable provisions of the FSMA with respect to anything done by it in relation to the shares of our common stock in, from or otherwise involving the United Kingdom.

LEGAL MATTERS

The validity of the shares of common stock offered by this prospectus will be passed upon for us by Goodwin Procter LLP, Boston, Massachusetts. Certain partners of Goodwin Procter LLP have an interest in an aggregate of less than 1% of our capital stock. Certain legal matters relating to this offering will be passed upon for the underwriters by Ropes & Gray LLP, Boston, Massachusetts.

EXPERTS

The financial statements of Cabaletta Bio, Inc. at December 31, 2018 and 2017, and for the year ended December 31, 2018 and for the period from April 3, 2017 (inception) to December 31, 2017, appearing in this Prospectus and Registration Statement have been audited by Ernst & Young LLP, independent registered public accounting firm, as set forth in their report thereon appearing elsewhere herein, and are included in reliance upon such report given on the authority of such firm as experts in accounting and auditing.

WHERE YOU CAN FIND MORE INFORMATION

We have filed with the SEC a registration statement on Form S-1 (File Number 333-) under the Securities Act with respect to the common stock we are offering by this prospectus. This prospectus does not contain all of the information included in the registration statement. For further information pertaining to us and our common stock, you should refer to the registration statement and to its exhibits. Whenever we make reference in this prospectus to any of our contracts, agreements or other documents, the references are not necessarily complete, and you should refer to the exhibits attached to the registration statement for copies of the actual contract, agreement or other document.

Upon the completion of the offering, we will be subject to the informational requirements of the Exchange Act and will file annual, quarterly and current reports, proxy statements and other information with the SEC. You can read our SEC filings, including the registration statement, at the SEC's website at www.sec.gov. We also maintain a website at www.cabalettabio.com. Upon completion of the offering, you may access, free of charge, our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and any amendments to those reports, as soon as reasonably practicable after such material is electronically filed with, or furnished to, the SEC.

CABALETTA BIO, INC.
INDEX TO FINANCIAL STATEMENTS

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Cabaletta Bio, Inc.

Opinion on the Financial Statements

We have audited the accompanying balance sheets of Cabaletta Bio, Inc. (the Company) as of December 31, 2018 and 2017, the related statements of operations, convertible preferred stock and stockholders' deficit and cash flows for the year ended December 31, 2018 and the period from April 3, 2017 (inception) to December 31, 2017, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2018 and 2017, and the results of its operations and its cash flows for the year ended December 31, 2018 and the period from April 3, 2017 (inception) to December 31, 2017 in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB and in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young

We have served as the Company's auditor since 2018.
Philadelphia, Pennsylvania
August 2, 2019

CABALETTA BIO, INC.
Balance Sheets
(in thousands, except share and per share amounts)

	December 31, 2017	December 31, 2018
Assets		
Current assets:		
Cash and cash equivalents	$ 1	$ 33,017
Prepaid expenses and other current assets	—	977
Total current assets	1	33,994
Deferred offering costs	—	180
Total Assets	$ 1	$ 34,174
Liabilities and stockholders' deficit		
Current liabilities:		
Accounts payable	$ 189	$ 603
Accrued and other current liabilities	61	340
Total current liabilities	250	943
Commitments and Contingencies (see Note 6)		
Convertible preferred stock:		
Series A, A-1 and A-2 convertible preferred stock, $0.00001 par value: no and 12,393,497 shares authorized as of December 31, 2017 and 2018, respectively; no and 12,393,047 shares issued and outstanding at December 31, 2017 and 2018 respectively; aggregate liquidation preference of $38,256 at December 31, 2018.	—	43,921
Stockholders' deficit:		
Common stock, $0.00001 par value: 10,000,000 and 21,147,115 shares authorized as of December 31, 2017 and 2018, respectively; 5,000,000 and 5,772,484 shares issued and outstanding at December 31, 2017 and 2018, respectively	—	—
Additional paid-in capital	1	1,762
Accumulated deficit	(250)	(12,452)
Total stockholders' deficit	(249)	(10,690)
Total liabilities convertible preferred stock and stockholders' deficit	$ 1	$ 34,174

The accompanying notes are an integral part of these financial statements.

CABALETTA BIO, INC.
Statements of Operations
(in thousands, except share and per share amounts)

	Period from April 3, 2017 (inception) to December 31, 2017	Year Ended December 31, 2018
Operating expenses:		
Research and development	$ —	$ 4,467
General and administrative	250	1,726
Total operating expenses	250	6,193
Loss from operations	(250)	(6,193)
Other income (expense):		
Interest income	—	235
Fair value adjustments on convertible notes	—	(6,244)
Net loss	$ (250)	$ (12,202)
Net loss per share, basic and diluted	$ (0.12)	$ (4.58)
Weighted-average number of shares used in computing net loss per share, basic and diluted	2,052,588	2,663,207
Pro forma net loss per share, basic and diluted (unaudited) (see Note 2)		$ (2.24)
Weighted-average number of shares used in computing pro forma net loss per share, basic and diluted (unaudited)		5,447,398

The accompanying notes are an integral part of these financial statements.

CABALETTA BIO, INC.
Statements of Convertible Preferred Stock and Stockholders' Deficit
(in thousands, except share and per share amounts)

	Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Total Stockholders' Deficit
	Shares	Amount	Shares	Amount			
Balance—April 3, 2017 (inception)	—	$ —	—	$ —	$ —	$ —	$ —
Issuance of common stock	—	—	5,000,000	—	1	—	1
Net loss	—	—	—	—	—	(250)	(250)
Balance—December 31, 2017	—	—	5,000,000	—	1	(250)	(249)
Issuance of common stock in connection with license agreement	—	—	721,978	—	1,155	—	1,155
Issuance of common stock	—	—	50,506	—	—	—	—
Issuance of convertible preferred stock upon conversion of convertible notes	4,693,044	15,910	—	—	—	—	—
Issuance of convertible preferred stock upon milestone closing of convertible notes	4,553,452	15,436	—	—	—	—	—
Issuance of convertible preferred stock, net of issuance costs of $169	3,146,551	12,575	—	—	—	—	—
Stock-based compensation	—	—	—	—	606	—	606
Net loss	—	—	—	—	—	(12,202)	(12,202)
Balance—December 31, 2018	12,393,047	$43,921	5,772,484	$ —	$ 1,762	$ (12,452)	$ (10,690)

The accompanying notes are an integral part of these financial statements.

CABALETTA BIO, INC.
Statements of Cash Flows
(in thousands)

	Period from April 3, 2017 (inception) to December 31, 2017	Year Ended December 31, 2018
Cash flows from operating activities:		
Net loss	$ (250)	$ (12,202)
Adjustments to reconcile net loss to net cash used in operating activities:		
Stock-based compensation	—	606
Change in fair value of convertible notes	—	6,244
Common stock issued for research and development	—	1,155
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	—	(977)
Accounts payable	189	234
Accrued and other current liabilities	61	279
Net cash used in operating activities	—	(4,661)
Cash flows from financing activities:		
Proceeds from issuance of common stock	1	—
Proceeds from issuance of convertible notes	—	12,535
Proceeds from issuance of convertible preferred stock on milestone closing of convertible notes	—	12,567
Proceeds from issuance of convertible preferred stock	—	12,744
Issuance costs of convertible preferred stock	—	(169)
Net cash provided by financing activities	1	37,677
Net increase in cash and cash equivalents	1	33,016
Cash and cash equivalents—beginning of period	—	1
Cash and cash equivalents—end of period	$ 1	$ 33,017
Supplemental disclosures of non-cash financing activities:		
Conversion of convertible notes into convertible preferred stock	$ —	$ 18,779
Deferred offering costs in accounts payable	$ —	$ 180

The accompanying notes are an integral part of these financial statements.

CABALETTA BIO, INC.

Notes to the Financial Statements
(in thousands, except share and per share amounts.)

1. Basis of Presentation

Cabaletta Bio, Inc. (the Company or Cabaletta) was incorporated in April 2017 in the State of Delaware as Tycho Therapeutics, Inc. and, in August 2018, changed its name to Cabaletta Bio, Inc. The Company is headquartered in Pennsylvania. Cabaletta is a biotechnology company focused on the discovery and development of engineered T cell therapies for B cell-mediated autoimmune diseases.

Principal operations commenced in April 2018, when the Company executed two sponsored research agreements with the Trustees of the University of Pennsylvania (Penn).

Risks and Uncertainties

The Company does not expect to generate revenue from sales of engineered T cell therapies for B cell-mediated autoimmune diseases or any other revenue unless and until the Company completes preclinical and clinical development and obtains regulatory approval for one or more product candidates. If the Company seeks to obtain regulatory approval for any of its product candidates, the Company expects to incur significant commercialization expenses.

The Company has sustained annual operating losses and expects to continue to generate operating losses for the foreseeable future. The Company's ultimate success depends on the outcome of its research and development activities. The Company had cash and cash equivalents of $33,017 as of December 31, 2018. Through December 31, 2018, the Company has incurred cumulative net losses of $12,452. Management expects to incur additional losses in the future as it continues its research and development and will need to raise additional capital to fully implement its business plan and to fund its operations.

The Company intends to raise such additional capital through a combination of public or private equity offerings, debt financings, government funding arrangements, strategic alliances or other sources. However, if such financing is not available at adequate levels and on a timely basis, or such agreements are not available on favorable terms, or at all, as and when needed, the Company will need to reevaluate its operating plan and may be required to delay or discontinue the development of one or more of its product candidates or operational initiatives. The Company expects that its cash and cash equivalents as of December 31, 2018, in addition to proceeds of $50,000 from the issuance of Series B convertible preferred stock (Series B Preferred) in January 2019 (Note 7), will be sufficient to fund its projected operations for at least 12 months following the date that these financial statements are issued.

The Company is subject to risks common to companies in the biotechnology industry including, but not limited to, new technological innovations, protection of proprietary technology, dependence on key personnel, compliance with government regulations and the need to obtain additional financing. As a result, the Company is unable to predict the timing or amount of increased expenses or when or if the Company will be able to achieve or maintain profitability. Further, the Company is currently dependent on Penn for much of its preclinical research, clinical research and development activities and expects to be dependent upon Penn for initial manufacturing activities (Note 6). Product candidates currently under development will require significant additional research and development efforts, including extensive preclinical and clinical testing and regulatory approval, prior to commercialization. Even if the Company is able to generate revenues from the sale of its product candidates, if approved, it may not become profitable. If the Company fails to become profitable or is unable to sustain profitability on a continuing basis, then it may be unable to continue its operations at planned levels and be forced to reduce its operations.

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies

Unaudited Pro Forma Information

In the accompanying statements of operations, the unaudited pro forma basic and diluted net loss per share for the year ended December 31, 2018 has been prepared to give effect to the automatic conversion of all outstanding shares of convertible preferred stock upon the closing of the proposed initial public offering into 12,393,047 shares of common stock as if the conversion had occurred on January 1, 2018 or, if later, the issuance date of the convertible preferred stock.

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America (GAAP) requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities as of the date of the financial statements and the reported amounts of expenses during the reporting period. Significant estimates and assumptions made in the accompanying financial statements include but are not limited to the fair value of common stock, stock-based compensation, the valuation allowance on the Company's deferred tax assets, and the fair value of convertible debt. The Company evaluates its estimates and assumptions on an ongoing basis using historical experience and other factors and adjusts those estimates and assumptions when facts and circumstances dictate. Actual results could differ from those estimates.

Cash and Cash Equivalents

The Company considers all highly liquid investments purchased with original maturities of three months or less from the purchase date to be cash equivalents. Cash equivalents consist primarily of amounts invested in money market accounts.

Deferred Offering Costs

The Company capitalizes certain legal, professional accounting and other third-party fees that are directly associated with in-process equity financings as deferred offering costs until such financings are consummated. After consummation of the equity financing, these costs are recorded in stockholders' deficit as a reduction of additional paid-in capital generated as a result of the offering. Should the in-process equity financing be abandoned, the deferred offering costs will be expensed immediately as a charge to operating expenses in the statements of operations.

Fair Value Measurement

Assets and liabilities recorded at fair value on a recurring basis in the balance sheets are categorized based upon the level of judgment associated with the inputs used to measure their fair values. Fair value is defined as the exchange price that would be received for an asset or an exit price that would be paid to transfer a liability in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date. Valuation techniques used to measure fair value must maximize the use of observable inputs and minimize the use of unobservable inputs. The authoritative guidance on fair value measurements establishes a three-tier fair value hierarchy for disclosure of fair value measurements as follows:

Level 1—Observable inputs such as unadjusted, quoted prices in active markets for identical assets or liabilities at the measurement date.

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies (continued)

Level 2—Inputs (other than quoted prices included in Level 1) that are either directly or indirectly observable for the asset or liability. These include quoted prices for similar assets or liabilities in active markets and quoted prices for identical or similar assets or liabilities in markets that are not active.

Level 3—Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities.

Accrued Research and Development Costs

The Company records accrued liabilities for estimated costs of research and development activities conducted by service providers, which include activities under the Penn Agreement (Note 6), the conduct of sponsored research, preclinical studies and contract manufacturing activities. The Company records the estimated costs of research and development activities based upon the estimated amount of services provided but not yet invoiced and includes these costs in accrued and other current liabilities in the accompanying balance sheets and within research and development expense in the accompanying statements of operations.

The Company accrues for these costs based on factors such as estimates of the work completed and in accordance with agreements established with service providers. The Company makes significant judgments and estimates in determining the accrued liabilities balance in each reporting period. As actual costs become known, the Company adjusts its accrued liabilities. The Company has not experienced any material differences between accrued costs and actual costs incurred since its inception.

Research and Development Expenses

Research and development costs include costs incurred for internal and external research and development activities and are expensed as incurred in the accompanying statements of operations. Research and development costs consist of salaries and benefits, including associated stock-based compensation, and laboratory supplies and facility costs, as well as fees paid to entities that conduct certain research and development activities on the Company's behalf.

Stock-based Compensation

The Company measures its stock-based awards granted to employees and non-employees based on the estimated fair values of the awards and recognizes the compensation over the requisite service period. The Company uses the Black-Scholes option-pricing model (Black-Scholes) to estimate the fair value of its stock-based awards. The Company uses the simplified method in accordance with guidance provided by the Securities and Exchange Commission and calculates the expected term as the midpoint between the vesting date and the contractual term for certain awards with service or performance conditions. Stock-based compensation is recognized using the straight-line method. As stock-based compensation is based on awards ultimately expected to vest, it is reduced by forfeitures. The Company accounts for forfeitures as they occur.

Income Taxes

The Company uses the asset and liability method of accounting for income taxes. Deferred tax assets and liabilities are recognized for the estimated future tax consequences attributable to temporary differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax base. Deferred tax assets and liabilities, which relate primarily to the carrying amount of the Company's property and equipment

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies (continued)

and its net operating loss carryforwards, are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. Deferred tax expense or benefit is the result of changes in the deferred tax assets and liabilities. Valuation allowances are established when necessary to reduce deferred tax assets where, based upon the available evidence, the Company concludes that it is more-likely-than-not that the deferred tax assets will not be realized. In evaluating its ability to recover deferred tax assets, the Company considers all available positive and negative evidence, including its operating results, ongoing tax planning and forecasts of future taxable income on a jurisdiction-by-jurisdiction basis. Because of the uncertainty of the realization of deferred tax assets, the Company has recorded a full valuation allowance against its deferred tax assets.

Reserves are provided for tax benefits for which realization is uncertain. Such benefits are only recognized when the underlying tax position is considered more-likely-than-not to be sustained on examination by a taxing authority, assuming they possess full knowledge of the position and facts. Interest and penalties related to uncertain tax positions are recognized in the provision of income taxes; however, the Company currently has no interest or penalties related to uncertain income tax benefits.

Net Loss Per Share

The Company calculates basic and diluted net loss per share attributable to common stockholders in conformity with thetwo-class method required for participating securities. The Company considers its convertible preferred stock to be participating securities as in the event a dividend is paid on common stock, the holders of convertible preferred stock would be entitled to receive dividends on a basis consistent with the common stockholders. Under the two-class method, the net loss attributable to common stockholders is not allocated to the convertible preferred stock as the holders of the convertible preferred stock do not have a contractual obligation to share in losses.

Under the two-class method, basic net loss per share attributable to common stockholders is computed by dividing the net loss attributable to common stockholders by the weighted average number of shares of common stock.

Segments

Operating segments are defined as components of an entity for which separate financial information is available and that is regularly reviewed by the Chief Operating Decision Maker (CODM) in deciding how to allocate resources to an individual segment and in assessing performance. The Company's CODM is its Chief Executive Officer. The Company has determined it operates in a single operating segment and has one reportable segment.

Related Party Transactions

The Company engages a firm controlled by an executive of the Company as of December 31, 2018 for professional services related to accounting, finance and other administrative functions. For the year ended December 31, 2018, the costs incurred under this arrangement totaled $186, which were recorded as general and administrative expense in the accompanying statements of operations. As of December 31, 2018, amounts owed under this arrangement totaled $50 and are included in accounts payable in the accompanying balance sheets.

The Company engaged the services of its current chief executive officer prior to his employment in October 2018. For the year ended December 31, 2018, the costs incurred under this arrangement totaled $180, which were

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies (continued)

recorded as general and administrative expense in the accompanying statements of operations. As of December 31, 2018, amounts owed under this arrangement totaled $60 and are included in accrued and other current liabilities in the accompanying balance sheets.

Emerging Growth Company Status

The Company is an emerging growth company, as defined in the Jumpstart Our Business Startups Act of 2012 (the JOBS Act). Under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards issued subsequent to the enactment of the JOBS Act, until such time as those standards apply to private companies. The Company has elected to use this extended transition period for complying with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date that it (i) is no longer an emerging growth company or (ii) affirmatively and irrevocably opts out of the extended transition period provided in the JOBS Act. As a result, these financial statements may not be comparable to companies that comply with the new or revised accounting pronouncements as of public company effective dates.

Recently Adopted Accounting Pronouncements

In May 2017, the FASB issued ASU2017-09, *Compensation—Stock Compensation* (Topic 718): "*Scope of Modification Accounting*," which provides guidance about which changes to the terms or conditions of a share-based payment award require an entity to apply modification accounting in Topic 718. The amendments in this ASU should be applied prospectively to an award modified on or after the adoption date. This guidance was effective for all entities for annual periods and interim periods within those annual periods, beginning after December 15, 2017. The Company adopted ASU 2017-09 effective January 1, 2018, which did not impact the Company's financial statements or financial statement disclosures.

Recently Issued Accounting Pronouncements

In February 2016, the FASB issued ASU2016-02, *Leases* (Topic 842), with guidance regarding the accounting for and disclosure of leases. The update requires lessees to recognize the liabilities related all leases, including operating leases, with a term greater than 12 months on the balance sheet. This update also requires lessees and lessors to disclose key information about their leasing transactions. This guidance will be effective for public companies for annual and interim periods beginning after December 15, 2018. For all other entities, this standard is effective for annual reporting periods beginning after December 15, 2019, and interim periods within annual periods beginning after December 15, 2020. Early adoption is permitted. The Company has yet to evaluate the effect that ASU 2016-02 will have on its financial statements or financial statement disclosures.

In July 2017, the FASB issued ASU2017-11, *Earnings Per Share* (Topic 260), Distinguishing Liabilities from Equity (Topic 480) and Derivatives and Hedging (Topic 815): *I. Accounting for Certain Financial Instruments with Down Round Features; II. Replacement of the Indefinite Deferral for Mandatorily Redeemable Financial Instruments of Certain Nonpublic Entities and Certain Mandatorily Redeemable Noncontrolling Interests with a Scope Exception*. Part I of this update addresses the complexity of accounting for certain financial instruments with down round features. Down round features are features of certain equity-linked instruments (or embedded features) that result in the strike price being reduced on the basis of the pricing of future equity offerings. Current accounting guidance creates cost and complexity for entities that issue financial instruments (such as warrants and convertible instruments) with down round features that require fair value measurement of the entire instrument or conversion option. Part II of this update addresses the difficulty of

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies (continued)

navigating Topic 480, *Distinguishing Liabilities from Equity*, because of the existence of extensive pending content in the FASB Accounting Standards Codification. This pending content is the result of the indefinite deferral of accounting requirements about mandatorily redeemable financial instruments of certain nonpublic entities and certain mandatorily redeemable noncontrolling interests. The amendments in Part II of this update do not have an accounting effect. For public business entities, the amendments in Part I of ASU 2017-11 are effective for fiscal years and interim periods within those years beginning after December 15, 2018. For all other entities, the amendments in Part I of this update are effective for fiscal years beginning after December 15, 2019, and interim periods within fiscal years beginning after December 15, 2020. Early adoption is permitted for all entities, including adoption in an interim period. The Company is currently assessing the potential impact of adopting ASU 2017-11 on its financial statements and financial statement disclosures.

3. Fair Value Measurements

There were no assets or liabilities carried at fair value on a recurring basis as of December 31, 2017. As of December 31, 2018, the Company had $33,017 of money market funds, which were valued by the Company based on quoted market prices, which represent a Level 1 measurement within the fair value hierarchy.

The following table presents a roll-forward of the aggregate fair values of the Company's convertible notes (Note 5) for which fair value is determined by Level 3 inputs:

Balance—January 1, 2018	$ —
Initial fair value	12,535
Fair value adjustments	6,244
Conversion into convertible preferred stock	(18,779)
Balance—December 31, 2018	$ —

There were no transfers among Level categories in the periods presented.

The carrying value of cash, cash equivalents, accounts payable and accrued expenses that are reported on the balance sheets approximate their fair value due to the short-term nature of these assets and liabilities.

4. Accrued and Other Current Liabilities

Accrued and other current liabilities consist of the following:

	December 31,	
	2017	2018
Consulting expenses	$ 49	$ 48
Manufacturing expenses	—	161
Compensation expense	—	121
Other	12	10
	$ 61	$ 340

CABALETTA BIO, INC.

Notes to the Financial Statements

5. Convertible Notes

In May 2018, the Company issued convertible notes (the Notes) with aggregate proceeds to the Company in an initial closing of $12,535, including $5,000 issued to Penn. The Notes carried a stated interest rate of 7.5% per annum. All unpaid principal, together with the then accrued interest, for the Notes was due and payable at the earlier of May 4, 2021 or upon an event of default. The terms of the Notes provided for an additional milestone-based closing of $12,567 upon the achievement of certain Company-specific events. The Notes contained a number of provisions addressing automatic and optional conversion, events of default and prepayment provisions.

The Notes were amended in September 2018 to adjust the terms of the automatic and optional conversion provisions. In October 2018, the Notes were amended again to reduce the qualified financing threshold, make a qualified financing a milestone event, revise the structure of a milestone-based closing and reallocate milestone closing purchase rights to new purchasers and the existing noteholders. On the same day, immediately following the amendment of the Notes, the Company completed a qualified financing, issuing 3,146,551 shares of Series A convertible preferred stock for gross proceeds of $12,744 (Note 7). At this time, the Company issued 4,553,452 shares of Series A-1 Preferred in connection with the milestone-based closing resulting in $12,567 of proceeds ($2.76 per share) and the Notes together with interest accrued thereon ($409) were converted into 2,819,267 shares of Series A-1 convertible preferred stock (Series A-1 Preferred) and 1,873,777 shares of Series A-2 convertible preferred stock (Series A-2 Preferred), reflecting a conversion price per share of $2.76.

On issuance, the Company elected to account for the Notes at fair value with any changes in fair value being recognized through the statements of operations until the Notes settled. In this connection, the Company's policy is to report a single non-operating income/(expense) line item to record fair value adjustments on convertible notes and does not report interest expense as a separate line item in the statements of operations. The fair value of the Notes was determined to be $12,535 on issuance. On issuance, total debt issuance costs of $53 were expensed and recognized as general and administrative expense in the accompanying statements of operations.

On issuance, the fair value of the Notes was determined to be equal to $12,535, which is the principal amount of the Notes. The fair value of the Notes upon settlement was determined based on the fair value of the Series A-1 Preferred and Series A-2 Preferred issued, which was determined to be $3.39 per share of Series A-1 Preferred and Series A-2 Preferred, using an option pricing method (OPM) framework and utilized the back-solve method for inferring and allocating the equity value predicated on the capital raise that transpired just prior to the valuation date. This method was selected as the Company concluded that the contemporaneous financing transaction was an arm's-length transaction. Application of the OPM back-solve method involves making assumptions for the expected time to liquidity, volatility and risk-free rate and then solving for the value of equity such that value for the most recent financing equals the amount paid. The OPM allocation of total equity value was determined with reference to a recent financing transaction and the Company assumed a 71% volatility rate, a 1.3-year estimated term and a probability weighted average discount for lack of marketability of 35%.

For the year ended December 31, 2018, the Company recognized $6,244 in in the accompanying statements of operations as other expense—fair value adjustments on the convertible notes, which reflects (i) the difference between the conversion price per share of the Series A-1 Preferred and Series A-2 Preferred ($2.76) into which the Notes were converted, and the fair value of such Series A-1 Preferred and Series A-2 Preferred, (ii) the difference between the price per share paid for the Series A-1 Preferred ($2.76) in the milestone-based closing and the fair market value of such Series A-1 Preferred and (iii) interest accrued on the Notes ($409).

CABALETTA BIO, INC.

Notes to the Financial Statements

6. Commitments and Contingencies

Operating Lease Agreement

In August 2018, the Company entered into an operating lease agreement for office space. The lease term expires in September 2019. The initial annual base rent is approximately $14. Rent expense incurred in 2018 was $7.

In February 2019, the Company entered into an operating lease agreement for new office space in Philadelphia, Pennsylvania. The lease term commenced in May 2019 and will expire in July 2022. The initial annual base rent is $261, and such amount will increase by 2% annually on each anniversary of the commencement date.

Research Service Agreement

In August 2018, the Company entered into a research service agreement with the Children's Hospital of Philadelphia for the manufacturing of preclinical study and clinical trial material, amounting to $543, expected to be incurred from August 2018 through April 2019. During the year ended December 31, 2018, the Company recognized research and development expense of $342 related to this agreement in the accompanying statements of operations.

License Agreement with the University of Pennsylvania

In August 2018, the Company entered into a license agreement with Penn (the Penn Agreement) and activated the license in October 2018 pursuant to which the Company obtained (a) a non-exclusive, non-sublicensable worldwide license to certain of Penn's intellectual property to conduct research, product development, clinical trials, cell manufacturing and other activities, and (b) an exclusive, worldwide, royalty-bearing right and license, with a right to sublicense, on a target-by-target basis, under certain of Penn's intellectual property to make, use, sell, offer for sale, import, and otherwise commercialize products for the treatment of autoimmune and alloimmune diseases.

Unless earlier terminated, the Penn Agreement expires on the expiration or abandonment or other termination of the last valid claim in Penn's intellectual property licensed by the Company. The Company may terminate the Penn Agreement at any time for convenience upon 60 days written notice. In the event of an uncured, material breach, Penn may terminate the Penn Agreement upon 60 days written notice.

Under the terms of the Penn Agreement, the Company issued 721,978 shares of common stock, with a value of $1,155, recorded as a research and development expense in the accompanying statements of operations for the year ended December 31, 2018.

The Company also reimbursed Penn for its priorout-of-pocket expenses with respect to the filing, prosecution and maintenance of Penn's intellectual property licensed by the Company. The payment, totaling $89, is included in general and administrative expense in the accompanying statements of operations for the year ended December 31, 2018. Under the terms of the Penn Agreement, Penn is obligated to pay $2,000 annually for three years beginning August 2018 for funding to the laboratories of each of Drs. Milone and Payne (see *Sponsored Research Agreements—Penn*). During the term of the Penn Agreement until the first commercial sale of the first product, the Company is obligated to pay Penn a non-refundable, non-creditable annual license maintenance fee of $10. The Company is required to pay certain milestone payments upon the achievement of specified clinical and commercial milestones. Milestone payments are reduced by a certain percentage for the

6. Commitments and Contingencies (continued)

second product that achieves a milestone, by an additional percentage for the third product that achieves a milestone, and so on, for each subsequent product that achieves a milestone. In the event that the Company is able to successfully develop and launch multiple products under the Penn Agreement, total milestone payments could approach $20,000. Penn is also eligible to receive tiered royalties at percentage rates in the low single-digits, subject to an annual minimum royalty, on annual worldwide net sales of any products that are commercialized by the Company or its sublicensees that contain or incorporate, or are covered by, the intellectual property licensed by the Company. To the extent the Company sublicenses its license rights under the Penn Agreement, Penn would be eligible to receive tiered sublicense income at percentage rates in the mid-single to low double-digits.

No amounts were due under the Penn Agreement as of December 31, 2018.

Sponsored Research Agreements

Penn

The Company has sponsored research agreements with two faculty members at Penn, who are also scientific co-founders of the Company and members of the Company's scientific advisory board. Under the agreements, the Company has committed to funding a defined research plan for three years through April 2021. The total estimated three-year cost of $8,524 under the two agreements satisfies the Company's annual obligation under the Penn Agreement (see *License Agreement with the University of Pennsylvania* above). For the year ended December 31, 2018, the Company recognized research and development expense of $1,957 related to these agreements in the accompanying statements of operations. No amounts were due under the sponsored research agreements as of December 31, 2018. However, $884 of advance payments are included in prepaid expenses and other current assets as of December 31, 2018 in the accompanying balance sheets.

The Regents of the University of California

In October 2018, the Company executed a research agreement with The Regents of the University of California. Under the agreement, the Company has committed to funding scientific research through October 2020. For the year ended December 31, 2018, the Company recognized research and development expense of $23 related to this agreement in the accompanying statements of operations.

Master Translational Research Services Agreement

In October 2018, the Company entered into a services agreement (the Services Agreement) with Penn for additional research and development services from various laboratories within Penn. The research and development activities will be detailed in Penn organization-specific addenda to be separately executed. In October and November 2018, the Company executed three project addenda under this agreement for research and development work. The three projects are anticipated to commence and conclude in 2019.

In January 2019, the Company executed two project addenda under the Services Agreement for manufacturing and development work. The two projects are anticipated to commence in 2019. The manufacturing addendum is expected to occur through June 2020. The development addenda are expected to occur through December 2019.

No amounts were due to Penn under the master translational research service agreements as of December 31, 2018.

CABALETTA BIO, INC.

Notes to the Financial Statements

6. Commitments and Contingencies (continued)

Indemnification

The Company enters into certain types of contracts that contingently requires the Company to indemnify various parties against claims from third parties. These contracts primarily relate to (i) the Company's bylaws, under which the Company must indemnify directors and executive officers, and may indemnify other officers and employees, for liabilities arising out of their relationship, (ii) contracts under which the Company must indemnify directors and certain officers and consultants for liabilities arising out of their relationship, (iii) contracts under which the Company may be required to indemnify partners against certain claims, including claims from third parties asserting, among other things, infringement of their intellectual property rights, and (iv) procurement, consulting, or license agreements under which the Company may be required to indemnify vendors, consultants or licensors for certain claims, including claims that may be brought against them arising from the Company's acts or omissions with respect to the supplied products, technology or services. From time to time, the Company may receive indemnification claims under these contracts in the normal course of business. In addition, under these contracts, the Company may have to modify the accused infringing intellectual property and/or refund amounts received.

In the event that one or more of these matters were to result in a claim against the Company, an adverse outcome, including a judgment or settlement, may cause a material adverse effect on the Company's future business, operating results or financial condition. It is not possible to determine the maximum potential amount under these contracts due to the limited history of prior indemnification claims and the unique facts and circumstances involved in each particular agreement.

7. Convertible Preferred Stock

The Company has issued Series A Preferred, Series A-1 Preferred, Series A-2 Preferred, and Series B Preferred (collectively, the Convertible Preferred Stock). The Company classifies Convertible Preferred Stock outside of stockholders' deficit because the shares contain deemed liquidation rights that are a contingent redemption feature not solely within the control of the Company. The following table summarizes the Company's outstanding Convertible Preferred Stock:

	Series A Preferred		Series A-1 Preferred		Series A-2 Preferred		Total Convertible Preferred Stock	
	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount
Balance—December 31, 2017	—	$ —	—	$ —	—	$ —	—	$ —
Issuance on conversion of convertible notes	—	—	2,819,267	9,558	1,873,777	6,352	4,693,044	15,910
Issuance on milestone closing of convertible notes	—	—	4,553,452	15,436	—	—	4,553,452	15,436
Issuance	3,146,551	12,744	—	—	—	—	3,146,551	12,744
Issuance costs	—	(169)	—	—	—	—	—	(169)
Balance—December 31, 2018	3,146,551	$ 12,575	7,372,719	$ 24,994	1,873,777	$ 6,352	12,393,047	$ 43,921

As of December 31, 2018, the Company's amended and restated certificate of incorporation authorized the Company to issue 12,393,497 shares of $0.00001 par value Convertible Preferred Stock. In October 2018, the Company issued 3,146,551 shares of Series A Preferred, resulting in gross proceeds of $12,744. Series A-1

CABALETTA BIO, INC.

Notes to the Financial Statements

7. Convertible Preferred Stock (continued)

Preferred and Series A-2 Preferred were issued October 2018 upon conversion of the Notes and in connection with the milestone closing of the Notes (Note 5).

In January 2019, the Company's certificate of incorporation was amended to increase the authorized shares of Convertible Preferred Stock to 20,762,168 shares, and the Company issued 6,963,788 shares of Series B Preferred, resulting in gross proceeds of $50,000. In connection, the Company issued a further 1,405,332 shares of Series B Preferred in exchange for 1,405,332 shares of Series A-2 Preferred.

The holders of the Convertible Preferred Stock have various rights, preferences and privileges as follows:

Voting Rights

Series A-2 Preferred are non-voting shares. Each share of Series A Preferred, Series A-1 Preferred and Series B Preferred (the Voting Preferred Stock) shall be entitled to cast the number of votes equal to the number of whole shares of common stock into which such shares of Voting Preferred Stock are convertible as of the record date for determining stockholders entitled to vote on such matter holds a number of votes equal to the number of shares of common stock into which it is convertible. Generally, holders of Voting Preferred Stock shall vote together with the holders of common stock as a single class and on an as-converted into common stock basis.

Holders of shares of Series A Preferred and Series A-1 Preferred, exclusively and as a separate class, are entitled to elect three members of the board of directors. Holders of shares of common stock are entitled to elect one member of the board of directors. The holders of common stock and Convertible Preferred Stock, voting together as a single class on an as-converted basis, are entitled to elect the balance of the total number of directors of the Company (two).

Dividends

The holders of shares of Convertible Preferred Stock shall be entitled to receive, on a *pari passu* basis, dividends, out of any assets legally available therefor, prior and in preference to any declaration or payment of any dividend (other than dividends on shares of common stock payable in shares of common stock) on the common stock, at a rate of (i) $0.24 per annum for each share of Series A Preferred, (ii) $0.1656 per annum for each share of Series A-1 Preferred, (iii) $0.1656 per annum for each share of Series A-2 Convertible Preferred Stock and (iv) $0.4308 per annum for each share of Series B Preferred, in each case, as adjusted for any stock splits, stock dividends, combinations, subdivisions, or other similar recapitalization affecting such shares. Dividends are payable when, as and if declared by the board of directors, and such dividends shall not be cumulative.

The holders of each series of Convertible Preferred Stock can waive any dividend preference that the holders of such series of Convertible Preferred Stock shall be entitled to receive upon the affirmative vote or written consent of the holders of at least a majority of the shares of such series of Convertible Preferred Stock then outstanding, voting together as a separate series, and on an as-converted to common stock basis.

After payment of such dividends on the shares of Convertible Preferred Stock, any additional dividends or distributions shall be distributed among all holders of common stock and Convertible Preferred Stock in proportion to the number of shares of common stock that would be held by each such holder if all shares of Convertible Preferred Stock were converted to common stock at the then effective conversion price.

CABALETTA BIO, INC.

Notes to the Financial Statements

7. Convertible Preferred Stock (continued)

Optional Conversion Rights

Each share of Convertible Preferred Stock shall be convertible, at the option of the holder, at any time and from time to time, and without the payment of additional consideration by the holder thereof, into such number of fully paid shares of common stock as is determined by dividing the applicable original issuance price by the conversion price in effect at the time of conversion. As of December 31, 2018, each share of Convertible Preferred Stock is convertible on a one-for-one basis into common stock. The respective applicable conversion prices for the Convertible Preferred Stock is subject to adjustment upon any future stock split, stock dividend, combination, reclassification or similar event affecting the Convertible Preferred Stock or any series thereof. Such applicable conversion prices for the Convertible Preferred Stock and the rate at which the Convertible Preferred Stock may be converted into shares of common stock, shall be subject to adjustment as provided.

Mandatory Conversion Rights

Each share of Convertible Preferred Stock automatically converts into the number of shares of common stock determined in accordance with the conversion rate upon either: (a) the closing of a public offering of common stock at a price of at least $12.15 per share resulting in at least $50,000 of gross proceeds, or (b) written consent of a majority of the holders of the then outstanding shares of Convertible Preferred Stock.

In the event of a mandatory conversion of Preferred Stock as a result of a Qualified IPO, each holder of Preferred Stock may elect to receive non-voting Common Stock in lieu of all or a portion of such holder's voting Common Stock. The non-voting shares of Common Stock shall have the same rights and preferences as the Common Stock but shall be non-voting.

Liquidation

The holders of Convertible Preferred Stock then outstanding shall be entitled to be paid (a) out of the consideration payable to stockholders in the event of a merger, consolidation, or reorganization involving the Company or a subsidiary or on the sale, lease, transfer, exclusive license or other disposition by the Company or a subsidiary of all or substantially all assets of the not elected otherwise by a requisite of holders of the Series A Preferred, or (b) out of the available proceeds the event of any voluntary or involuntary liquidation, dissolution or winding up of the Company, the holders of shares of Convertible Preferred Stock then outstanding shall be entitled to be paid, on a *pari passu* basis, before any payment shall be made to the holders of common stock by reason of their ownership thereof, an amount per share equal to the greater of (i) the applicable original issue price, plus any dividends declared but unpaid thereon, or (ii) such amount per share as would have been payable had all shares of Convertible Preferred Stock been converted into common stock immediately prior to such event. If upon any such event, the assets of the Company available for distribution to its stockholders shall be insufficient to pay the holders of the outstanding shares of Convertible Preferred Stock the full amount to which they shall be entitled, the holders of shares of Convertible Preferred Stock shall share ratably, on a *pari passu* basis, in any distribution of the assets available for distribution in proportion to the respective amounts which would otherwise be payable in respect of the shares held by them upon such distribution if all amounts payable on or with respect to such shares were paid in full.

Anti-Dilution

Holders of Convertible Preferred Stock are afforded certain anti-dilution protection with respect to corporate events such as stock splits and recapitalizations.

CABALETTA BIO, INC.

Notes to the Financial Statements

7. Convertible Preferred Stock (continued)

Redemption

The Company's Convertible Preferred Stock is not redeemable but does contain deemed liquidation rights in the event of a merger, consolidation, or reorganization involving the Company or a subsidiary or on the sale, lease, transfer, exclusive license or other disposition by the Company or a subsidiary of all or substantially all assets of the Company, and unless elected otherwise by a requisite of holders of the Series A Preferred.

8. Common Stock

Common Stock

Pursuant to the Amended and Restated Certificate of Incorporation filed in August 2018, the Company is authorized to issue a total of 21,147,115 shares of common stock, of which 5,772,484 shares were issued and outstanding at December 31, 2018. In January 2019, the Company's certificate of incorporation was further amended to authorize the issuance of 29,000,000 shares of common stock.

In connection with the issuance of the Notes in May 2018 (Note 5), several of the Company's founders agreed to modify their shares of common stock outstanding to include vesting provisions that require continued service to the Company in order to vest in those shares. As such, the 4,356,000 modified shares of common stock became compensatory upon such modification. The fair value of the awards on the modification date was determined to be $0.49 per share of common stock, by calibrating to the recent Notes issuance considering the maximum conversion price and the seniority of the Notes. The total compensation cost resulting from the modification was $2,126. The total compensation cost is being recognized over the three-year vesting term attendant to the founders' common shares. During the year ended December 31, 2018, the Company recognized $399 and $118 of this amount in research and development expense and general and administrative expense, respectively.

Holders of shares of common stock have the right to elect one member of the board of directors.

Common stockholders are entitled to dividends, if and when declared by the board of directors, subject to the prior rights of the Convertible Preferred Stockholders. As of December 31, 2018, no dividends on common stock had been declared.

2018 Stock Option and Grant Plan

In September 2018, the Company adopted the 2018 stock option and grant plan (the 2018 Plan), which provides for the Company to sell or issue common stock, or other stock-based awards, to employees, members of the board of directors and consultants of the Company. The 2018 Plan is administered by the board of directors, or at the discretion of the board of directors, by a committee of the board of directors. The exercise prices, vesting and other restrictions are determined at the discretion of the board of directors, or their committee if so delegated, except that the exercise price per share of stock options may not be less than 100% of the fair market value of the share of common stock on the date of grant and the term of stock option may not be greater than 10 years. The Company generally grants stock-based awards with service conditions only (service-based awards), although there has been one grant with performance conditions. Stock options granted under the 2018 Plan generally vest over three to four years. There were 2,726,999 shares reserved under the 2018 Plan for the future issuance of equity awards and, as of December 31, 2018, 1,269,976 shares were available for grant.

CABALETTA BIO, INC.

Notes to the Financial Statements

8. Common Stock (continued)

There was no option activity for the period from April 3, 2017 (inception) to December 31, 2017. A summary of the stock option activity under the 2018 Plan is presented below:

	Number of Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (years)	Aggregate Intrinsic Value
Outstanding as of January 1, 2018	—	$ —	—	$ —
Granted	1,457,023	0.67		
Outstanding as of December 31, 2018	1,457,023	0.67	9.8	4,051
Options Exercisable at December 31, 2018	20,800	0.67	9.8	58

The aggregate intrinsic value of options granted is calculated as the difference between the exercise price of the options and the estimated fair value of the Company's common stock. The weighted average grant-date fair value of stock options granted during the year ended December 31, 2018 was $1.27. The aggregate grant-date fair value of options vested during the year ended December 31, 2018 was $26.

The fair value of each award is estimated using Black-Scholes based on the following assumptions:

	For the Year Ended December 31, 2018
Risk-free interest rate	2.92%—2.96%
Expected term	5.5—6.2 years
Expected volatility	72%
Expected dividend yield	0%

Black-Scholes requires the use of subjective assumptions which determine the fair value of stock-based awards. These assumptions include:

Fair value of common stock—Historically, because there has been no public market for the Company's common stock, the fair value of the Company's common stock underlying stock-based awards was estimated on each grant date by the Company's board of directors. In order to determine the fair value of the Company's common stock underlying stock-based awards, the Company's board of directors considered, among other things, a valuation of the Company's common stock prepared by an unrelated third-party valuation firm in accordance with the guidance provided by the American Institute of Certified Public Accountants Practice Guide, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation*.

Expected term—The expected term represents the period that stock-based awards are expected to be outstanding. The expected term for option grants is determined using the simplified method. The simplified method deems the term to be the average of the time-to-vesting and the contractual life of the stock-based awards.

Expected volatility—Since the Company is a privately held company and does not have any trading history for its common stock, the expected volatility is estimated based on the average volatility for comparable publicly traded biotechnology companies over a period equal to the expected term of the stock-based awards. The comparable companies were chosen based on their similar size, stage in the life cycle or area of specialty. The Company will continue to apply this process until a sufficient amount of historical information regarding the volatility of its own stock price becomes available.

CABALETTA BIO, INC.

Notes to the Financial Statements

8. Common Stock (continued)

Risk-free interest rate—The risk-free interest rate is based on the U.S. Treasury zero coupon issues in effect at the time of grant for periods corresponding with the expected term of a stock-based award.

Expected dividend—The Company has never paid dividends on its common stock and has no plans to pay dividends on its common stock. Therefore, the Company used an expected dividend yield of zero.

Stock-based Compensation

The Company has recorded stock-based compensation in the accompanying statements of operations as follows:

	For the Year Ended December 31, 2018
Research and development	$ 455
General and administrative	151
Total	$ 606

As of December 31, 2018, there was $1,762 of unrecognized compensation cost related to unvested option awards, including $527 with respect to one grant with performance-based vesting terms, which is expected to be recognized over a weighted-average period of 3.0 years. As of December 31, 2018, there was $1,618 of unrecognized compensation cost related to unvested Founder Stock awards, which is expected to be recognized over a weighted-average period of 2.3 years.

9. Income Taxes

2017 U.S. Tax Reform

On December 22, 2017, the U.S. government signed into law the Tax Cuts and Jobs Act (the Tax Act) that significantly reforms the Internal Revenue Code of 1986, as amended. The Tax Act, among other things, contains significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, effective as of January 1, 2018; limitation of the tax deduction for interest expense; limitation of the deduction for net operating losses to 80% of annual taxable income and elimination of net operating loss carrybacks, in each case, for losses arising in taxable years beginning after December 31, 2017 (though any such tax losses may be carried forward indefinitely); and modifying or repealing many business deductions and credits, including reducing the business tax credit for certain clinical testing expenses incurred in the testing of certain drugs for rare diseases or conditions generally referred to as orphan drugs.

The staff of the Securities and Exchange Commission issued Staff Accounting Bulletin No. 118 to address the application of GAAP in situations when a registrant does not have the necessary information available, prepared or analyzed (including computations) in reasonable detail to complete the accounting for certain income tax effects of the Tax Act. In connection with the initial analysis of the impact of the Tax Act, the Company remeasured its deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, which is generally 21% for federal tax purposes. The remeasurement of the Company's deferred tax assets and liabilities was offset by a change in the valuation allowance.

In 2018, the Company finished its analysis of the impact of the Tax Act. Where the Company made reasonable estimates in 2017 of the effects related to the Tax Act, the Company recorded provisional amounts. After the completed analysis, the resulting impact to the Company's financial statements did not differ from the recorded provisional amounts.

CABALETTA BIO, INC.

Notes to the Financial Statements

9. Income Taxes (continued)

The reconciliation of federal statutory income tax rate to the Company's effective income tax rate is as follows:

	Period from April 3, 2017 (inception) to December 31, 2017	For the Year Ended December 31, 2018
Expected income tax benefit at the federal statutory rate	35.0%	21.0%
State taxes, net of federal benefit	6.5	7.9
Research and development credit, net	—	0.6
Non-deductible items	—	(16.8)
Tax rate reduction due to the Tax Act	(12.6)	—
Change in valuation allowance	(28.9)	(12.7)
Total	0.0%	0.0%

Deferred income taxes reflect the net effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. The principal components of the Company's deferred tax assets consisted of the following:

	December 31,	
	2017	2018
Deferred tax assets:		
Federal and state net operating loss carryforwards	$ 72	$ 1,163
License fee deductions	—	$ 328
Research and development tax credits	—	69
Share based Compensation deductions	—	17
Accruals	—	35
Gross deferred tax assets	72	1,612
Less: valuation allowance	(72)	(1,612)
Total deferred tax assets	—	—
Deferred tax liabilities:	—	—
	$ —	$ —
Net deferred tax assets	$ —	$ —

The Company increased its valuation allowance by $1,540 for the year ended December 31, 2018 in order to maintain a full valuation allowance against its deferred tax assets. Based on the Company's history of losses, the Company recorded a full valuation allowance against its deferred tax assets as of December 31, 2018. The Company intends to maintain a valuation allowance until sufficient positive evidence exists to support a reversal of the allowance.

As of December 31, 2018, the Company had federal and state net operating loss carryforwards of $4,026; $3,776 of the federal amounts do not expire, and the remaining $250 expire in 2038. The $4,026 of state net operating losses begin to expire in 2038. As of December 31, 2018, the Company had federal research and development tax credit carryforwards of $69. The federal credits expire in 2038.

CABALETTA BIO, INC.

Notes to the Financial Statements

9. Income Taxes (continued)

Under the provisions of Sections 382 and 383 of the Internal Revenue Code (the IRC), net operating loss and credit carryforwards and other tax attributes may be subject to limitation if there has been a significant change in ownership of the Company, as defined by the IRC. Future owner or equity shifts, including an initial public offering, could result in limitations on net operating loss and credit carryforwards.

The Company files income tax returns in the U.S. federal jurisdiction as well as in Pennsylvania. The tax year 2017 remains open to examination by the jurisdictions where the Company is subject to tax.

The Company evaluates tax positions for recognition using amore-likely-than-not recognition threshold, and those tax positions eligible for recognition are measured as the largest amount of tax benefit that is greater than 50% likely of being realized upon the effective settlement with a taxing authority that has full knowledge of all relevant information.

10. Net Loss Per Share

The following outstanding potentially dilutive shares have been excluded from the calculation of diluted net loss per share, as their effect is anti-dilutive:

	Period from April 3, 2017 (inception) to December 31, 2017	For the Year Ended December 31, 2018
Convertible Preferred Stock	—	12,393,047
Stock options to purchase common stock	—	1,457,023
Non-vested Founder Stock	612,563	3,577,132

11. Subsequent Events

Subsequent events have been evaluated through August 2, 2019, which is the date that the financial statements were available to be issued. In addition to the items described in Note 6, regarding the execution of a new facility lease, a manufacturing service agreement and research and development work with Penn, Note 7, regarding the amendment to the certificate of incorporation authorizing an increase of convertible preferred shares and the issuance of Series B Preferred and Note 8, regarding the amendment to the certificate of incorporation authorizing an increase to issuable common shares, the following subsequent events occurred that require disclosure.

2018 Plan

In July 2019, the Company's board of directors and stockholders approved an amendment to the 2018 Plan to increase the total number of shares of common stock reserved for future issuance of equity awards under the 2018 Plan to 3,870,680 shares.

In July 2019, the Company also entered into certain new and amendments to existing agreements with Penn, including the following:

Amended and Restated Penn License Agreement

The Company entered into amended and restated license agreement with Penn and the Children's Hospital of Philadelphia. There were no changes in the financial terms relative to the Penn Agreement.

CABALETTA BIO, INC.

Notes to the Financial Statements

11. Subsequent Events (continued)

Subscription and Technology Transfer Agreement

The Company entered into a subscription and technology transfer agreement pursuant to which the Company will pay Penn an upfront subscription fee and a nominal non-refundable royalty on the net sales of products, a portion of which will be credited toward milestone payments and royalties, respectively, under the Amended License Agreement. Technology transfer activities will be at the Company's cost and subject to agreement as to the technology to be transferred.

Services Agreement Addendum

The Company entered into an additional addendum pursuant to the Services Agreement with Penn for the manufacture of the Company's clinical supply of DSG3-CAART, the Company's lead product candidate, for its Phase 1 clinical trial. Pursuant to the addendum, the Company will pay Penn a fee for dedicated resources as well as the cost to manufacture the clinical supply.

Alliance Management

The Company entered into an alliance agreement with Penn pursuant to which the Company will pay Penn a nominal annual fee in order for Penn to provide an adequate and consistent level of support to the services that it provides to the Company.

CABALETTA BIO, INC.
Balance Sheets
(in thousands, except share and per share amounts)
(unaudited)

	December 31, 2018	June 30, 2019	Proforma June 30, 2019
Assets			
Current assets:			
Cash and cash equivalents	$ 33,017	$ 75,258	$ 75,258
Prepaid expenses and other current assets	977	1,064	1,064
Total current assets	33,994	76,322	76,322
Property and equipment, net	—	359	359
Deferred offering costs	180	1,066	1,066
Deposits	—	89	89
Total Assets	$ 34,174	$ 77,836	$ 77,836
Liabilities and stockholders' deficit			
Current liabilities:			
Accounts payable	$ 603	$ 483	$ 483
Accrued and other current liabilities	340	1,393	1,393
Total current liabilities	943	1,876	1,876
Commitments and Contingencies (see Note 6)			
Convertible preferred stock:			
Series A, A-1, A-2 and B convertible preferred stock, $0.00001 par value: 12,393,497 and 20,762,168 shares authorized as of December 31, 2018 and June 30, 2019, respectively; 12,393,047, 19,356,835 and no shares issued and outstanding at December 31, 2018, June 30, 2019 and proforma June 30, 2019, respectively; aggregate liquidation preference of $38,256 and $94,475 at December 31, 2018 and June 30, 2019, respectively.	43,921	97,954	—
Stockholders' deficit:			
Common stock, $0.00001 par value: 21,147,115 and 29,000,000 shares authorized as of December 31, 2018 and June 30, 2019, respectively; 5,772,484 shares issued and outstanding at both December 31, 2018 and June 30, 2019; 25,129,319 shares issued and outstanding proforma June 30, 2019	—	—	—
Additional paid-in capital	1,762	—	97,954
Accumulated deficit	(12,452)	(21,994)	(21,994)
Total stockholders' deficit	(10,690)	(21,994)	75,960
Total liabilities convertible preferred stock and stockholders' deficit	$ 34,174	$ 77,836	$ 77,836

The accompanying notes are an integral part of these financial statements.

CABALETTA BIO, INC.
Statements of Operations
(in thousands, except share and per share amounts)
(unaudited)

	Six Months Ended June 30,	
	2018	2019
Operating expenses:		
Research and development	$ 639	$ 5,425
General and administrative	409	2,367
Total operating expenses	1,048	7,792
Loss from operations	(1,048)	(7,792)
Other income:		
Interest income	27	902
Net loss	(1,021)	(6,890)
Deemed dividend	—	(5,326)
Net loss attributable to common stockholders	$ (1,021)	$ (12,216)
Net loss per share, basic and diluted	$ (0.29)	$ (4.99)
Weighted-average number of shares used in computing net loss per share, basic and diluted	3,548,955	2,448,788
Pro forma net loss per share, basic and diluted		$ (0.56)
Weighted-average number of shares used in computing pro forma net loss per share, basic and diluted		21,768,343

The accompanying notes are an integral part of these financial statements.

CABALETTA BIO, INC.
Statements of Convertible Preferred Stock and Stockholders' Deficit
(in thousands, except share and per share amounts)
(unaudited)

	Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Total Stockholders' Deficit
	Shares	Amount	Shares	Amount			
Balance—December 31, 2017	—	—	5,000,000	—	1	(250)	(249)
Issuance of common stock	—	—	50,506	—	—	—	—
Stock-based compensation	—	—	—	—	131	—	131
Net loss	—	—	—	—	—	(1,021)	(1,021)
Balance—June 30, 2018	—	$ —	5,050,506	$ —	$ 132	$ (1,271)	$ (1,139)
Balance—December 31, 2018	12,393,047	$43,921	5,772,484	$ —	$ 1,762	$ (12,452)	$ (10,690)
Issuance of convertible preferred stock, net of issuance costs of $1,293	6,963,788	48,707	—	—	—	—	—
Exchange of convertible preferred stock, including deemed dividend	—	5,326	—	—	(2,674)	(2,652)	(5,326)
Stock-based compensation	—	—	—	—	912	—	912
Net loss	—	—	—	—	—	(6,890)	(6,890)
Balance—June 30, 2019	19,356,835	$97,954	5,772,484	$ —	$ —	$ (21,994)	$ (21,994)

The accompanying notes are an integral part of these financial statements.

CABALETTA BIO, INC.
Statements of Cash Flows
(in thousands)
(unaudited)

	Six Months Ended June 30,	
	2018	2019
Cash flows from operating activities:		
Net loss	$ (1,021)	$ (6,890)
Adjustments to reconcile net loss to net cash used in operating activities:		
Stock-based compensation	131	912
Depreciation	—	21
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	(907)	93
Deferred offering costs	—	(817)
Deposits	—	(89)
Accounts payable	3	(120)
Accrued and other current liabilities	108	804
Net cash used in operating activities	(1,686)	(6,086)
Cash flows from investing activities:		
Purchases of property and equipment	—	(380)
Net cash used in investing activities	—	(380)
Cash flows from financing activities:		
Proceeds from issuance of convertible notes	12,535	—
Proceeds from issuance of convertible preferred stock	—	50,000
Issuance costs of convertible preferred stock	—	(1,293)
Net cash provided by financing activities	12,535	48,707
Net increase in cash and cash equivalents	10,849	42,241
Cash and cash equivalents—beginning of period	1	33,017
Cash and cash equivalents—end of period	$10,850	$75,258
Supplemental disclosures of non-cash financing activities:		
Exchange of convertible preferred stock, including deemed dividend	$ —	$10,090
Deferred offering costs in accrued expenses at end of period	$ —	$ 249

The accompanying notes are an integral part of these financial statements.

CABALETTA BIO, INC.

Notes to the Financial Statements
(in thousands, except share and per share amounts.)
(unaudited)

1. Basis of Presentation

Cabaletta Bio, Inc. (the Company or Cabaletta) was incorporated in April 2017 in the State of Delaware as Tycho Therapeutics, Inc. and, in August 2018, changed its name to Cabaletta Bio, Inc. The Company is headquartered in Pennsylvania. Cabaletta is a biotechnology company focused on the discovery and development of T cell therapies for B cell-mediated autoimmune diseases.

Principal operations commenced in April 2018, when the Company executed sponsored research agreements with the Trustees of the University of Pennsylvania (Penn).

Risks and Uncertainties

The Company does not expect to generate revenue from sales of T cell therapies for B cell-mediated autoimmune diseases or any other revenue unless and until the Company completes preclinical and clinical development and obtains regulatory approval for one or more product candidates. If the Company seeks to obtain regulatory approval for any of its product candidates, the Company expects to incur significant commercialization expenses.

The Company has sustained annual operating losses and expects to continue to generate operating losses for the foreseeable future. The Company's ultimate success depends on the outcome of its research and development activities. The Company had cash and cash equivalents of $75,258 as of June 30, 2019. Through June 30, 2019, the Company had an accumulated deficit of $21,994. Management expects to incur additional losses in the future as it continues its research and development activities and will need to raise additional capital to fully implement its business plan and to fund its operations.

The Company intends to raise such additional capital through a combination of public or private equity offerings, debt financings, government funding arrangements, strategic alliances or other sources. However, if such financing is not available at adequate levels and on a timely basis, or such agreements are not available on favorable terms, or at all, as and when needed, the Company will need to reevaluate its operating plan and may be required to delay or discontinue the development of one or more of its product candidates or operational initiatives. The Company expects that its cash and cash equivalents as of June 30, 2019, will be sufficient to fund its projected operations for at least 12 months following the date that these financial statements are issued.

The Company is subject to risks common to companies in the biotechnology industry including, but not limited to, new technological innovations, protection of proprietary technology, dependence on key personnel, compliance with government regulations and the need to obtain additional financing. As a result, the Company is unable to predict the timing or amount of increased expenses or when or if the Company will be able to achieve or maintain profitability. Further, the Company is currently dependent on Penn for much of its preclinical research, clinical research and development activities, and expects to be dependent upon Penn for initial and manufacturing activities (Note 6). Product candidates currently under development will require significant additional research and development efforts, including extensive preclinical and clinical testing and regulatory approval, prior to commercialization. Even if the Company is able to generate revenues from the sale of its product candidates, if approved, it may not become profitable. If the Company fails to become profitable or is unable to sustain profitability on a continuing basis, then it may be unable to continue its operations at planned levels and be forced to reduce its operations.

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies

Unaudited Interim Financial Information

The accompanying unaudited interim financial statements have been prepared in conformity with generally accepted accounting principles (GAAP). Any reference in these notes to applicable guidance is meant to refer to GAAP as found in the Accounting Standards Codification (ASC) and Accounting Standards Updates (ASU) of the Financial Accounting Standards Board (FASB).

In the opinion of management, the accompanying unaudited interim financial statements include all normal and recurring adjustments (which consist primarily of accruals and estimates that impact the financial statements) considered necessary to present fairly the Company's financial position as of June 30, 2019 and the results of its operations and its cash flows for the six months ended June 30, 2019 and 2018. The results for the six months ended June 30, 2019 are not necessarily indicative of results to be expected for the year ending December 31, 2019, any other interim periods, or any future year or period. The balance sheet as of December 31, 2018 included herein was derived from the audited financial statements as of that date. The unaudited interim financial statements, presented herein, do not contain the required disclosures under GAAP for annual financial statements. These unaudited financial statements should be read in conjunction with the Company's audited financial statements included elsewhere in this prospectus.

Unaudited Pro Forma Information

The accompanying unaudited pro forma balance sheet as of June 30, 2019 has been prepared to give effect to the automatic conversion of all outstanding shares of convertible preferred stock into 19,356,835 shares of common stock as if the Company's proposed initial public offering had occurred on June 30, 2019.

In the accompanying statements of operations, the unaudited pro forma basic and diluted net loss per share attributable to common stockholders for the six months ended June 30, 2019 has been prepared to give effect to the automatic conversion of all outstanding shares of convertible preferred stock upon the closing of the proposed initial public offering into 19,356,835 shares of common stock as if the conversion had occurred on January 1, 2019 or, if later, the issuance date of the convertible preferred stock.

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America (GAAP) requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities as of the date of the financial statements and the reported amounts of expenses during the reporting period. Significant estimates and assumptions made in the accompanying financial statements include but are not limited to the fair value of common stock, stock-based compensation, the valuation allowance on the Company's deferred tax assets, and the fair value of convertible debt. The Company evaluates its estimates and assumptions on an ongoing basis using historical experience and other factors and adjusts those estimates and assumptions when facts and circumstances dictate. Actual results could differ from those estimates.

Cash and Cash Equivalents

The Company considers all highly liquid investments purchased with original maturities of three months or less from the purchase date to be cash equivalents. Cash equivalents consist primarily of amounts invested in money market accounts.

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies (continued)

Property and Equipment

Property and equipment are recorded at cost less accumulated depreciation. Cost includes the acquisition costs and all costs necessary to bring the asset to the location and working condition necessary for its intended use. Depreciation expense is recognized using the straight-line method over the estimated useful life of each asset. Upon retirement or sale, the cost of assets disposed of and the related accumulated depreciation are removed from the accounts and any resulting gain or loss is included in the accompanying statements of operations. Expenditures for normal, recurring or periodic repairs and maintenance related to property and equipment are charged to expense as incurred. The cost for planned major maintenance activities, including the related acquisition or construction of assets, is capitalized if it will result in future economic benefits.

Estimated useful lives for property and equipment are as follows:

Property and equipment	Estimated useful life
Computer and office equipment	Three years
Furniture and fixtures	Three years
Leasehold improvements	Lesser of estimated useful life or remaining lease term

Deferred Offering Costs

The Company capitalizes certain legal, professional accounting and other third-party fees that are directly associated with in-process equity financings as deferred offering costs until such financings are consummated. After consummation of the equity financing, these costs are recorded in stockholders' deficit as a reduction of additional paid-in capital generated as a result of the offering. Should the in-process equity financing be abandoned the deferred offering costs will be expensed immediately as a charge to operating expenses in the statements of operations.

Equity-Classified Preferred Shares

The Company takes into consideration the expected economics and the business purpose of exchange of or amendments to its equity-classified preferred shares in evaluating and determining the accounting or any such exchange or amendment. Fundamental changes to the nature of a preferred share and significant changes, additions or deletions of substantive contractual terms that are reasonably possible of being exercised are accounted for as an extinguishment of the preferred shares. An exchange of preferred shares or an amendment to a preferred share that does not meet these criteria is accounted for as a modification.

Fair Value Measurement

Assets and liabilities recorded at fair value on a recurring basis in the balance sheets are categorized based upon the level of judgment associated with the inputs used to measure their fair values. Fair value is defined as the exchange price that would be received for an asset or an exit price that would be paid to transfer a liability in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date. Valuation techniques used to measure fair value must maximize the use of observable inputs and minimize the use of unobservable inputs. The authoritative guidance on fair value measurements establishes a three-tier fair value hierarchy for disclosure of fair value measurements as follows:

Level 1—Observable inputs such as unadjusted, quoted prices in active markets for identical assets or liabilities at the measurement date.

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies (continued)

Level 2—Inputs (other than quoted prices included in Level 1) that are either directly or indirectly observable for the asset or liability. These include quoted prices for similar assets or liabilities in active markets and quoted prices for identical or similar assets or liabilities in markets that are not active.

Level 3—Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the assets or liabilities.

Accrued Research and Development Costs

The Company records accrued liabilities for estimated costs of research and development activities conducted by service providers, which include activities under the Penn Agreement (Note 6), the conduct of sponsored research, preclinical studies and contract manufacturing activities. The Company records the estimated costs of research and development activities based upon the estimated amount of services provided but not yet invoiced and includes these costs in accrued and other current liabilities in the accompanying balance sheets and within research and development expense in the accompanying statements of operations.

The Company accrues for these costs based on factors such as estimates of the work completed and in accordance with agreements established with service providers. The Company makes significant judgments and estimates in determining the accrued liabilities balance in each reporting period. As actual costs become known, the Company adjusts its accrued liabilities. The Company has not experienced any material differences between accrued costs and actual costs incurred since its inception.

Research and Development Expenses

Research and development costs include costs incurred for internal and external research and development activities and are expensed as incurred in the accompanying statements of operations. Research and development costs consist of salaries and benefits, including associated stock-based compensation, and laboratory supplies and facility costs, as well as fees paid to entities that conduct certain research and development activities on the Company's behalf.

Stock-based Compensation

The Company measures its stock-based awards granted to employees and non-employees based on the estimated fair values of the awards and recognizes the compensation over the requisite service period. The Company uses the Black-Scholes option-pricing model (Black-Scholes) to estimate the fair value of its stock-based awards. The Company uses the simplified method in accordance with guidance provided by the Securities and Exchange Commission and calculates the expected term as the midpoint between the vesting date and the contractual term for certain awards with service or performance conditions. As stock-based compensation is based on awards ultimately expected to vest, it is reduced by forfeitures. The Company accounts for forfeitures as they occur.

Net Loss Per Share

The Company calculates basic and diluted net loss per share attributable to common stockholders in conformity with the two-class method required for participating securities. The Company considers its convertible preferred stock to be participating securities as in the event a dividend is paid on common stock, the holders of convertible preferred stock would be entitled to receive dividends on a basis consistent with the

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies (continued)

common stockholders. Under the two-class method, the net loss attributable to common stockholders is not allocated to the convertible preferred stock as the holders of the convertible preferred stock do not have a contractual obligation to share in losses.

Under the two-class method, basic net loss per share attributable to common stockholders is computed by dividing the net loss attributable to common stockholders by the weighted average number of shares of common stock.

Segments

Operating segments are defined as components of an entity for which separate financial information is available and that is regularly reviewed by the Chief Operating Decision Maker (CODM) in deciding how to allocate resources to an individual segment and in assessing performance. The Company's CODM is its Chief Executive Officer and President. The Company has determined it operates in a single operating segment and has one reportable segment.

Related Party Transactions

The Company engaged a firm controlled by a former executive (until February 2019) of the Company for professional services related to accounting, finance and other administrative functions. For the six month periods ended June 30, 2018 and 2019, the costs incurred under this arrangement totaled $11 and $280, respectively, which were recorded as general and administrative expense in the accompanying statements of operations. As of June 30, 2019, amounts owed under this arrangement totaled $60 and are included in accounts payable in the accompanying balance sheets.

The Company engaged the services of its current Chief Executive Officer and President prior to his employment in October 2018. For the six month period ended June 30, 2018, the costs incurred under this arrangement totaled $65, which were recorded as general and administrative expense in the accompanying statements of operations.

Emerging Growth Company Status

The Company is an emerging growth company, as defined in the Jumpstart Our Business Startups Act of 2012 (the JOBS Act). Under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards issued subsequent to the enactment of the JOBS Act, until such time as those standards apply to private companies. The Company has elected to use this extended transition period for complying with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date that it (i) is no longer an emerging growth company or (ii) affirmatively and irrevocably opts out of the extended transition period provided in the JOBS Act. As a result, these financial statements may not be comparable to companies that comply with the new or revised accounting pronouncements as of public company effective dates.

Recently Issued Accounting Pronouncements

In February 2016, the FASB issued ASU2016-02, *Leases* (Topic 842), with guidance regarding the accounting for and disclosure of leases. The update requires lessees to recognize the liabilities related all leases, including operating leases, with a term greater than 12 months on the balance sheet. This update also requires

CABALETTA BIO, INC.

Notes to the Financial Statements

2. Summary of Significant Accounting Policies (continued)

lessees and lessors to disclose key information about their leasing transactions. This guidance will be effective for public companies for annual and interim periods beginning after December 15, 2018. For all other entities, this standard is effective for annual reporting periods beginning after December 15, 2019, and interim periods within annual periods beginning after December 15, 2020. Early adoption is permitted. The Company has yet to evaluate the effect that ASU 2016-02 will have on its financial statements or financial statement disclosures.

In July 2017, the FASB issued ASU2017-11, *Earnings Per Share* (Topic 260), Distinguishing Liabilities from Equity (Topic 480) and Derivatives and Hedging (Topic 815): *I. Accounting for Certain Financial Instruments with Down Round Features; II. Replacement of the Indefinite Deferral for Mandatorily Redeemable Financial Instruments of Certain Nonpublic Entities and Certain Mandatorily Redeemable Noncontrolling Interests with a Scope Exception*. Part I of this update addresses the complexity of accounting for certain financial instruments with down round features. Down round features are features of certain equity-linked instruments (or embedded features) that result in the strike price being reduced on the basis of the pricing of future equity offerings. Current accounting guidance creates cost and complexity for entities that issue financial instruments (such as warrants and convertible instruments) with down round features that require fair value measurement of the entire instrument or conversion option. Part II of this update addresses the difficulty of navigating Topic 480, *Distinguishing Liabilities from Equity*, because of the existence of extensive pending content in the FASB Accounting Standards Codification. This pending content is the result of the indefinite deferral of accounting requirements about mandatorily redeemable financial instruments of certain nonpublic entities and certain mandatorily redeemable noncontrolling interests. The amendments in Part II of this update do not have an accounting effect. For public business entities, the amendments in Part I of ASU 2017-11 are effective for fiscal years and interim periods within those years beginning after December 15, 2018. For all other entities, the amendments in Part I of this update are effective for fiscal years beginning after December 15, 2019, and interim periods within fiscal years beginning after December 15, 2020. Early adoption is permitted for all entities, including adoption in an interim period. The Company is currently assessing the potential impact of adopting ASU 2017-11 on its financial statements and financial statement disclosures.

3. Fair Value Measurements

As of December 31, 2018, the Company had $33,017 of money market funds, which were valued by the Company based on quoted market prices, which represent a Level 1 measurement within the fair value hierarchy.

The following table presents financial information about the Company's financial assets measured at fair value on a recurring basis as of June 30, 2019 and indicate the level of the fair value hierarchy utilized to determine such fair values:

	Total	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Financial assets				
Cash equivalents:				
Money market funds	$75,258	$ 75,258	$ —	$ —
Balance—June 30, 2019	$75,258	$ 75,258	$ —	$ —

The fair value of the convertible notes (Note 5) is a recurring Level 3 fair value measurement; however, there were no changes in the estimated fair value between the date of issuance and June 30, 2018 that were recognized in the statements of operations.

CABALETTA BIO, INC.

Notes to the Financial Statements

3. Fair Value Measurements (continued)

There were no transfers among Level categories in the periods presented.

The carrying value of accounts payable and accrued expenses that are reported on the balance sheets approximate their fair value due to the short-term nature of these assets and liabilities.

4. Accrued and Other Current Liabilities

Accrued and other current liabilities consist of the following:

	December 31, 2018	June 30, 2019
Research and development services	$ 181	$ 682
General and administrative services	36	150
Accrued offering costs	—	249
Compensation	121	256
Other	2	56
	$ 340	$ 1,393

5. Convertible Notes

In May 2018, the Company issued convertible notes (the Notes) with aggregate proceeds to the Company in an initial closing of $12,535, including $5,000 issued to Penn. The Notes carried a stated interest rate of 7.5% per annum. All unpaid principal, together with the then accrued interest, for the Notes was due and payable at the earlier of May 4, 2021 or upon an event of default. The terms of the Notes provided for an additional milestone-based closing of $12,567 upon the achievement of certain Company-specific events. The Notes contained a number of provisions addressing automatic and optional conversion, events of default and prepayment provisions.

The Notes were amended in September 2018 to adjust the terms of the automatic and optional conversion provisions. In October 2018, the Notes were amended again to reduce the qualified financing threshold, make a qualified financing a milestone event, revise the structure of a milestone-based closing and reallocate milestone closing purchase rights to new purchasers and the existing noteholders. On the same day, immediately following the amendment of the Notes, the Company completed a qualified financing, issuing 3,146,551 shares of Series A convertible preferred stock for gross proceeds of $12,744 (Note 7). At this time, the Company issued 4,553,452 shares of Series A-1 Preferred in connection with the milestone-based closing resulting in $12,567 of proceeds ($2.76 per share) and the Notes together with interest accrued thereon ($409) were converted into 2,819,267 shares of Series A-1 convertible preferred stock (Series A-1 Preferred) and 1,873,777 shares of Series A-2 convertible preferred stock (Series A-2 Preferred), reflecting a conversion price per share of $2.76.

On issuance, the Company elected to account for the Notes at fair value with any changes in fair value being recognized through the statements of operations until the Notes settled. The fair value of the Notes was determined to be $12,535 on issuance and as of June 30, 2018 and, as a result, had no fair value adjustments on convertible notes recognized in other expense in the accompanying statements of operations in the six months ended June 30, 2018. On issuance in May 2018, the fair value of the Notes was determined to be equal to $12,535, which is the principal amount of the Notes. The fair value of the Notes as of June 30, 2018 was determined to be the same as that on issuance ($12,535) based on management's determination of no material changes to the assumptions underlying the determination of the fair value of the Notes.

CABALETTA BIO, INC.

Notes to the Financial Statements

6. Commitments and Contingencies

Operating Lease Agreement

In August 2018, the Company entered into an operating lease agreement for office space. The lease term expires in September 2019. The initial annual base rent is approximately $14. Rent expense related to this lease agreement recognized in the accompanying statements of operations for the six months ended June 30, 2018 and 2019 was $0 and $7, respectively.

In February 2019, the Company entered into an operating lease agreement for new office space in Philadelphia, Pennsylvania. The lease term commenced in May 2019 and will expire in July 2022. The initial annual base rent is $261, and such amount will increase by 2% annually on each anniversary of the commencement date. Rent expense related to this lease agreement recognized in the accompanying statements of operations for the six months ended June 30, 2019 was $43.

As of June 30, 2019, the future minimum payments for operating leases are as follows:

July 1, 2019 to December 31, 2019	$109
2020	263
2021	268
2022	158
Thereafter	—
	$798

Research Service Agreement

In August 2018, the Company entered into a research service agreement with the Children's Hospital of Philadelphia for the manufacturing of pre-clinical study and clinical trial material. Research and development expense related to this research service agreement with the Children's Hospital of Philadelphia recognized in the accompanying statements of operations in the six months ended June 30, 2018 and 2019 were $0 and $201, respectively. There were no amounts due under the research service agreement with the Children's Hospital of Philadelphia as of June 30, 2019.

License Agreement with the University of Pennsylvania

In August 2018, the Company entered into a license agreement with Penn (the Penn Agreement) and activated the license in October 2018 pursuant to which the Company obtained (a) a non-exclusive, non-sublicensable worldwide license to certain of Penn's intellectual property to conduct research, product development, clinical trials, cell manufacturing and other activities, and (b) an exclusive, worldwide, royalty-bearing right and license, with a right to sublicense, on a target-by-target basis, under certain of Penn's intellectual property to make, use, sell, offer for sale, import, and otherwise commercialize products for the treatment of autoimmune and alloimmune diseases.

Unless earlier terminated, the Penn Agreement expires on the expiration or abandonment or other termination of the last valid claim in Penn's intellectual property licensed by the Company. The Company may terminate the Penn Agreement at any time for convenience upon 60 days written notice. In the event of an uncured, material breach, Penn may terminate the Penn Agreement upon 60 days written notice.

CABALETTA BIO, INC.

Notes to the Financial Statements

6. Commitments and Contingencies (continued)

Under the terms of the Penn Agreement, Penn is obligated to pay $2,000 annually for three years beginning August 2018 for funding to the laboratories of each of Drs. Milone and Payne (see *Sponsored Research Agreements—Penn*). During the term of the Penn Agreement until the first commercial sale of the first product, the Company is obligated to pay Penn a non-refundable, non-creditable annual license maintenance fee of $10. The Company is required to pay certain milestone payments upon the achievement of specified clinical and commercial milestones. Milestone payments are reduced by a certain percentage for the second product that achieves a milestone, by an additional percentage for the third product that achieves a milestone, and so on, for each subsequent product that achieves a milestone. In the event that the Company is able to successfully develop and launch multiple products under the Penn Agreement, total milestone payments could approach $20,000. Penn is also eligible to receive tiered royalties at percentage rates in the low single-digits, subject to an annual minimum royalty, on annual worldwide net sales of any products that are commercialized by the Company or its sublicensees that contain or incorporate, or are covered by, the intellectual property licensed by the Company. To the extent the Company sublicenses its license rights under the Penn Agreement, Penn would be eligible to receive tiered sublicense income at percentage rates in the mid-single to low double-digits.

There were no amounts due under the Penn Agreement as of June 30, 2019.

Sponsored Research Agreements

Penn

The Company has sponsored research agreements with two faculty members at Penn, who are also founders of the Company and members of the Company's scientific advisory board. Under the agreements, the Company has committed to funding a defined research plan for three years through April 2021. The total $8,500 under the two agreements satisfies the Company's annual obligation under the Penn Agreement (see *License Agreement with the University of Pennsylvania* above). Research and development expense related to these Penn faculty member research agreements recognized in the accompanying statements of operations in the six months ended June 30, 2018 and 2019 was $537 and $1,421, respectively. Advance payments under the Penn faculty member sponsored research agreements included in prepaid expenses and other current assets in the accompanying balance sheets were $884 as of June 30, 2019.

The Regents of the University of California

In October 2018, the Company executed a research agreement with The Regents of the University of California. Under the agreement, the Company has committed to funding scientific research through October 2020. Research and development expense related to this research agreement with The Regents of the University of California recognized in the accompanying statements of operations in the six months ended June 30, 2018 and 2019 was $0 and $46, respectively. There were no amounts were due under this research agreement with The Regents of the University of California as of June 30, 2019.

Master Translational Research Services Agreement

In October 2018, the Company entered into a service agreement (the Services Agreement) with Penn for additional research and development services from various laboratories within Penn. The research and development activities will be detailed in Penn organization-specific addenda to be separately executed.

In October and November 2018, the Company executed three project addenda under this agreement for research and development work. The three projects commenced in 2019 and are anticipated to conclude in 2019.

CABALETTA BIO, INC.

Notes to the Financial Statements

6. Commitments and Contingencies (continued)

In January 2019, the Company executed two project addenda under the Services Agreement for manufacturing and preclinical work. The two projects are commenced in 2019. The manufacturing addendum is expected to occur through June 2020. The preclinical addenda concluded in the six months ended June 30, 2019.

Research and development expense related to executed addenda under the master translational research service agreement with Penn recognized in the accompanying statements of operations in the six months ended June 30, 2018 and 2019 was $0 and $1,684, respectively. Amounts due under the master translational research service agreement with Penn were $616 as of June 30, 2019.

7. Convertible Preferred Stock

The Company has issued Series A Preferred, Series A-1 Preferred, Series A-2 Preferred, and Series B Preferred (collectively, the Convertible Preferred Stock). The Company classifies Convertible Preferred Stock outside of stockholders' deficit because the shares contain deemed liquidation rights that are a contingent redemption feature not solely within the control of the Company. There was no Convertible Preferred Stock issued during the six months ended June 30, 2018 or outstanding as of June 30, 2018. The following table summarizes the Company's Convertible Preferred Stock issued in the six months ended June 30, 2019 and outstanding as of June 30, 2019:

	Series A Preferred		Series A-1 Preferred		Series A-2 Preferred		Series B Preferred		Total Convertible Preferred Stock	
	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount	Shares	Amount
Balance—December 31, 2018	3,146,551	$ 12,575	7,372,719	$ 24,994	1,873,777	$ 6,352	—	$ —	12,393,047	$ 43,921
Issuance	—	—	—	—	—	—	6,963,788	50,000	6,963,788	50,000
Exchange, including deemed dividend	—	—	—	—	(1,405,332)	(4,764)	1,405,332	10,090	—	5,326
Issuance costs	—	—	—	—	—	—	—	(1,293)	—	(1,293)
Balance—June 30, 2019	3,146,551	$ 12,575	7,372,719	$ 24,994	468,445	$ 1,588	8,369,120	$ 58,797	19,356,835	$ 97,954

As of December 31, 2018, the Company's amended and restated certificate of incorporation authorized the Company to issue 12,393,497 shares of $0.00001 par value Convertible Preferred Stock. In January 2019, the Company's certificate of incorporation was amended to increase the authorized shares of Convertible Preferred Stock to 20,762,168 shares, and the Company issued 6,963,788 shares of Series B Preferred, resulting in gross proceeds of $50,000. In connection, the Company issued a further 1,405,332 shares of Series B Preferred in exchange for 1,405,332 shares of Series A-2 Preferred. The Company determined the terms of the Series B Preferred to be materially, qualitatively different than the terms of the Series A-2 Preferred and, as such, applied extinguishment accounting with respect to the Series A-2 Preferred received in the exchange resulting in removal of the carrying amount of the Series A-2 Preferred received ($4,764), the addition of the Series B Preferred issued at fair value determined with reference to the contemporaneous issuance of Series B Preferred ($10,090) and the difference ($5,326) determined to be a deemed dividend recorded to additional paid-in capital (to the extent of paid-in capital) and accumulated deficit within stockholders' deficit on the balance sheet.

The holders of the Convertible Preferred Stock have various rights, preferences and privileges as follows:

Voting Rights

Series A-2 Preferred are non-voting shares. Each share of Series A Preferred, Series A-1 Preferred and Series B Preferred (the Voting Preferred Stock) shall be entitled to cast the number of votes equal to the number

CABALETTA BIO, INC.

Notes to the Financial Statements

7. Convertible Preferred Stock (continued)

of whole shares of common stock into which such shares of Voting Preferred Stock are convertible as of the record date for determining stockholders entitled to vote on such matter holds a number of votes equal to the number of shares of common stock into which it is convertible. Generally, holders of Voting Preferred Stock shall vote together with the holders of common stock as a single class and on an as-converted into common stock basis.

Holders of shares of Series A Preferred and SeriesA-1 Preferred, exclusively and as a separate class, are entitled to elect three members of the board of directors. Holders of shares of common stock are entitled to elect one member of the board of directors. The holders of common stock and Convertible Preferred Stock, voting together as a single class on an as-converted basis, are entitled to elect the balance of the total number of directors of the Company (two).

Dividends

The holders of shares of Convertible Preferred Stock shall be entitled to receive, on a*pari passu* basis, dividends, out of any assets legally available therefor, prior and in preference to any declaration or payment of any dividend (other than dividends on shares of common stock payable in shares of common stock) on the common stock, at a rate of (i) $0.24 per annum for each share of Series A Preferred, (ii) $0.1656 per annum for each share of Series A-1 Preferred, (iii) $0.1656 per annum for each share of SeriesA-2 Convertible Preferred Stock and (iv) $0.4308 per annum for each share of Series B Preferred, in each case, as adjusted for any stock splits, stock dividends, combinations, subdivisions, or other similar recapitalization affecting such shares. Dividends are payable when, as and if declared by the board of directors, and such dividends shall not be cumulative.

The holders of each series of Convertible Preferred Stock can waive any dividend preference that the holders of such series of Convertible Preferred Stock shall be entitled to receive upon the affirmative vote or written consent of the holders of at least a majority of the shares of such series of Convertible Preferred Stock then outstanding, voting together as a separate series, and on an as-converted to common stock basis.

After payment of such dividends on the shares of Convertible Preferred Stock, any additional dividends or distributions shall be distributed among all holders of common stock and Convertible Preferred Stock in proportion to the number of shares of common stock that would be held by each such holder if all shares of Convertible Preferred Stock were converted to common stock at the then effective conversion price.

Optional Conversion Rights

Each share of Convertible Preferred Stock shall be convertible, at the option of the holder, at any time and from time to time, and without the payment of additional consideration by the holder thereof, into such number of fully paid shares of common stock as is determined by dividing the applicable original issuance price by the conversion price in effect at the time of conversion. As of December 31, 2018, each share of Convertible Preferred Stock is convertible on a one-for-one basis into common stock. The respective applicable conversion prices for the Convertible Preferred Stock is subject to adjustment upon any future stock split, stock dividend, combination, reclassification or similar event affecting the Convertible Preferred Stock or any series thereof. Such applicable conversion prices for the Convertible Preferred Stock and the rate at which the Convertible Preferred Stock may be converted into shares of common stock, shall be subject to adjustment as provided.

CABALETTA BIO, INC.

Notes to the Financial Statements

7. Convertible Preferred Stock (continued)

Mandatory Conversion Rights

Each share of Convertible Preferred Stock automatically converts into the number of shares of common stock determined in accordance with the conversion rate upon either: (a) the closing of a public offering of common stock at a price of at least $12.15 per share resulting in at least $50,000 of gross proceeds, or (b) written consent of a majority of the holders of the then outstanding shares of Convertible Preferred Stock.

In the event of a mandatory conversion of Preferred Stock as a result of a Qualified IPO, each holder of Preferred Stock may elect to receive non-voting Common Stock in lieu of all or a portion of such holder's voting Common Stock. The non-voting shares of Common Stock shall have the same rights and preferences as the Common Stock but shall be non-voting.

Liquidation

The holders of Convertible Preferred Stock then outstanding shall be entitled to be paid (a) out of the consideration payable to stockholders in the event of a merger, consolidation, or reorganization involving the Company or a subsidiary or on the sale, lease, transfer, exclusive license or other disposition by the Company or a subsidiary of all or substantially all assets of the not elected otherwise by a requisite of holders of the Series A Preferred, or (b) out of the available proceeds the event of any voluntary or involuntary liquidation, dissolution or winding up of the Company, the holders of shares of Convertible Preferred Stock then outstanding shall be entitled to be paid, on a *pari passu* basis, before any payment shall be made to the holders of common stock by reason of their ownership thereof, an amount per share equal to the greater of (i) the applicable original issue price, plus any dividends declared but unpaid thereon, or (ii) such amount per share as would have been payable had all shares of Convertible Preferred Stock been converted into common stock immediately prior to such event. If upon any such event, the assets of the Company available for distribution to its stockholders shall be insufficient to pay the holders of the outstanding shares of Convertible Preferred Stock the full amount to which they shall be entitled, the holders of shares of Convertible Preferred Stock shall share ratably, on a *pari passu* basis, in any distribution of the assets available for distribution in proportion to the respective amounts which would otherwise be payable in respect of the shares held by them upon such distribution if all amounts payable on or with respect to such shares were paid in full.

Anti-Dilution

Holders of Convertible Preferred Stock are afforded certain anti-dilution protection with respect to corporate events such as stock splits and recapitalizations.

Redemption

The Company's Convertible Preferred Stock is not redeemable but do contain deemed liquidation rights in the event of a merger, consolidation, or reorganization involving the Company or a subsidiary or on the sale, lease, transfer, exclusive license or other disposition by the Company or a subsidiary of all or substantially all assets of the Company, and unless elected otherwise by a requisite of holders of the Series A Preferred.

8. 2018 Stock Option and Grant Plan

In September 2018, the Company adopted the 2018 stock option and grant plan (the 2018 Plan), which provides for the Company to sell or issue common stock, or other stock-based awards, to employees, members of

CABALETTA BIO, INC.

Notes to the Financial Statements

8. 2018 Stock Option and Grant Plan (continued)

the board of directors and consultants of the Company. The 2018 Plan is administered by the board of directors, or at the discretion of the board of directors, by a committee of the board of directors. The exercise prices, vesting and other restrictions are determined at the discretion of the board of directors, or their committee if so delegated, except that the exercise price per share of stock options may not be less than 100% of the fair market value of the share of common stock on the date of grant and the term of stock option may not be greater than 10 years. The Company generally grants stock-based awards with service conditions only (service-based awards), although there has been one grant with performance conditions. Stock options granted under the 2018 Plan generally vest over three to four years. There were 2,726,999 shares reserved under the 2018 Plan for the future issuance of equity awards and, as of June 30, 2019, 291,454 shares were available for grant.

There were no awards in the six months ended June 30, 2018. A summary of the stock option activity under the 2018 Plan is presented below:

	Number of Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (years)	Aggregate Intrinsic Value
Outstanding as of January 1, 2019	1,457,023	$ 0.67	—	$ —
Granted	978,522	3.91		
Outstanding as of June 30, 2019	2,435,545	1.97	9.4	5,432
Options Exercisable at June 30, 2019	120,252	1.28	6.0	351

The aggregate intrinsic value of options granted is calculated as the difference between the exercise price of the options and the estimated fair value of the Company's common stock. The weighted average grant-date fair value of stock options granted during the six months ended June 30, 2019 was $2.65. The aggregate grant-date fair value of options vested during the six months ended June 30, 2019 was $276.

The Company uses the Black-Scholes option pricing method to calculate the grant-date fair value of an award. The fair values of options granted during the six months ended June 30, 2019 were calculated using the following assumptions: risk-free interest rate of 1.82%—2.59% percent; expected term of 5.6—6.1 years; expected volatility of 70.3%—73.2% percent; and no expected dividend.

Stock-based Compensation

The Company recognizes stock-based compensation with respect to equity awards under the 2018 Plan and with respect to vesting common stock issued to founders. The Company has recorded stock-based compensation in the accompanying statements of operations as follows:

	Six Months Ended June 30,	
	2018	2019
Research and development	$ 102	$ 597
General and administrative	29	315
Total	$ 131	$ 912

As of June 30, 2019, there was $3,916 of unrecognized compensation cost related to unvested option awards, including $527 with respect to one grant with performance-based vesting terms, which is expected to be

CABALETTA BIO, INC.

Notes to the Financial Statements

8. 2018 Stock Option and Grant Plan (continued)

recognized over a weighted-average period of 2.9 years. As of June 30, 2019, there was $1,265 of unrecognized compensation cost related to unvested Founder Stock awards, which is expected to be recognized over a weighted-average period of 1.9 years.

9. Income Taxes

The Company did not record an income tax benefit in its statement of operations for the six months ended June 30, 2018 and 2019 as it is more likely than not that the Company will not recognize the federal and state deferred tax benefits generated by its losses. The Company has provided a valuation allowance for the full amount of its net deferred tax assets and liabilities as of December 31, 2018 and June 30, 2019, as management has determined it is more likely than not that any future benefit from deductible temporary differences and net operating loss and tax credit carryforwards would not be realized. The Company has not recorded any amounts for unrecognized tax benefits as of December 31, 2018 or June 30, 2019.

10. Net Loss Per Share

The following outstanding potentially dilutive shares have been excluded from the calculation of diluted net loss per share, as their effect is anti-dilutive:

	December 31, 2018	June 30, 2019
Convertible Preferred Stock	12,393,497	19,356,835
Stock options to purchase common stock	1,457,023	2,435,545
Non-vested Founder Stock	3,577,132	2,775,850
	17,427,652	24,568,230

11. Subsequent Events

Subsequent events have been evaluated through August 2, 2019, which is the date that the financial statements were available to be issued. The following subsequent events occurred that require disclosure:

2018 Plan

In July 2019, the Company's board of directors and stockholders approved an amendment to the 2018 Plan to increase the total number of shares of common stock reserved for future issuance of equity awards under the 2018 Plan to 3,870,680 shares.

In July 2019, the Company also entered into certain new and amendments to existing agreements with Penn, including the following:

Amended and Restated Penn License Agreement

The Company entered into amended and restated license agreement with Penn and the Children's Hospital of Philadelphia. There were no changes in the financial terms relative to the Penn Agreement.

Subscription and Technology Transfer Agreement

The Company entered into a subscription and technology transfer agreement pursuant to which the Company will pay Penn an upfront subscription fee and a nominal non-refundable royalty on the net sales of

CABALETTA BIO, INC.

Notes to the Financial Statements

11. Subsequent Events (continued)

products, a portion of which will be credited toward milestone payments and royalties, respectively, under the Amended License Agreement. Technology transfer activities will be at the Company's cost and subject to agreement as to the technology to be transferred.

Services Agreement Addendum

The Company entered into an additional addendum pursuant to the Services Agreement with Penn for the manufacture of the Company's clinical supply of DSG3-CAART, the Company's lead product candidate, for its Phase 1 clinical trial. Pursuant to the addendum, the Company will pay Penn a fee for dedicated resources as well as the cost to manufacture the clinical supply.

Alliance Management

The Company entered into an alliance agreement with Penn pursuant to which the Company will pay Penn a nominal annual fee in order for Penn to provide an adequate and consistent level of support to the services that it provides to the Company.

Through and including , 2019 (the 25th day after the date of this prospectus), all dealers effecting transactions in these securities, whether or not participating in this offering, may be required to deliver a prospectus. This is in addition to each dealer's obligation to deliver a prospectus when acting as underwriter, and with respect to its unsold allotments or subscriptions.

Shares

Cabaletta Bio™

Common Stock

PRELIMINARY PROSPECTUS

MORGAN STANLEY
COWEN
EVERCORE ISI

, 2019

PART II

Information Not Required in Prospectus

Item 13. Other Expenses of Issuance and Distribution.

The following table sets forth the fees and expenses, other than underwriting discounts and commissions, payable in connection with the registration of the common stock hereunder. All amounts are estimates except the Securities and Exchange Commission registration fee, the Financial Industry Regulatory Authority, Inc. filing fee and The Nasdaq Global Market listing fee.

	AMOUNT TO BE PAID
Securities and Exchange Commission registration fee	$ *
Financial Industry Regulatory Authority, Inc. filing fee	*
Nasdaq Global Market listing fee	*
Printing and engraving expenses	*
Legal fees and expenses	*
Accounting fees and expenses	*
Transfer agent and registrar fees and expenses	*
Miscellaneous fees and expenses	*
Total	$ *

* To be completed by amendment.

Item 14. Indemnification of Directors and Officers.

Section 102 of the Delaware General Corporation Law, or the DGCL, permits a corporation to eliminate the personal liability of its directors or its stockholders for monetary damages for a breach of fiduciary duty as a director, except where the director breached his or her duty of loyalty, failed to act in good faith, engaged in intentional misconduct or knowingly violated a law, authorized the payment of a dividend or approved a stock repurchase in violation of Delaware corporate law or obtained an improper personal benefit. Our certificate of incorporation that will be effective upon the completion of this offering provides that no director shall be personally liable to us or our stockholders for monetary damages for any breach of fiduciary duty as a director, notwithstanding any provision of law imposing such liability, except to the extent that the DGCL prohibits the elimination or limitation of liability of directors for breaches of fiduciary duty.

Section 145 of the DGCL authorizes a corporation to indemnify its directors and officers against liabilities arising out of actions, suits and proceedings to which they are made or threatened to be made a party by reason of the fact that they have served or are currently serving as a director or officer to a corporation. The indemnity may cover expenses (including attorneys' fees) judgments, fines and amounts paid in settlement actually and reasonably incurred by the director or officer in connection with any such action, suit or proceeding. Section 145 permits corporations to pay expenses (including attorneys' fees) incurred by directors and officers in advance of the final disposition of such action, suit or proceeding. In addition, Section 145 provides that a corporation has the power to purchase and maintain insurance on behalf of its directors and officers against any liability asserted against them and incurred by them in their capacity as a director or officer, or arising out of their status as such, whether or not the corporation would have the power to indemnify the director or officer against such liability under Section 145.

We have adopted provisions in our certificate of incorporation and bylaws to be in effect upon the closing of this offering that limit or eliminate the personal liability of our directors to the fullest extent permitted by the

DGCL, as it now exists or may in the future be amended. Consequently, a director will not be personally liable to us or our stockholders for monetary damages or breach of fiduciary duty as a director, except for liability for:

- any breach of the director's duty of loyalty to us or our stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- any unlawful payments related to dividends or unlawful stock purchases, redemptions or other distributions; or
- any transaction from which the director derived an improper personal benefit.

These limitations of liability do not alter director liability under the federal securities laws and do not affect the availability of equitable remedies such as an injunction or rescission.

In addition, our bylaws provide that:

- we will indemnify our directors, officers and, in the discretion of our board of directors, certain employees to the fullest extent permitted by the DGCL, as it now exists or may in the future be amended; and
- we will advance reasonable expenses, including attorneys' fees, to our directors and, in the discretion of our board of directors, to our officers and certain employees, in connection with legal proceedings relating to their service for or on behalf of us, subject to limited exceptions.

We have entered into indemnification agreements with each of our directors and intend to enter into such agreements with our executive officers. These agreements provide that we will indemnify each of our directors, certain of our executive officers and, at times, their affiliates to the fullest extent permitted by Delaware law. We will advance expenses, including attorneys' fees (but excluding judgments, fines and settlement amounts), to each indemnified director or executive officer in connection with any proceeding in which indemnification is available and we will indemnify our directors and officers for any action or proceeding arising out of that person's services as a director or officer brought on behalf of us or in furtherance of our rights. Additionally, certain of our directors or officers may have certain rights to indemnification, advancement of expenses or insurance provided by their affiliates or other third parties, which indemnification relates to and might apply to the same proceedings arising out of such director's or officer's services as a director referenced herein. Nonetheless, we have agreed in the indemnification agreements that our obligations to those same directors or officers are primary and any obligation of such affiliates or other third parties to advance expenses or to provide indemnification for the expenses or liabilities incurred by those directors are secondary.

We also maintain general liability insurance which covers certain liabilities of our directors and officers arising out of claims based on acts or omissions in their capacities as directors or officers, including liabilities under the Securities Act of 1933, as amended, or the Securities Act.

The underwriting agreement filed as Exhibit 1.1 to this registration statement provides for indemnification, under certain conditions, of us and our directors and officers by the underwriters against certain liabilities under the Securities Act and the Securities Exchange Act of 1934 arising in connection with the offering being registered hereby.

Item 15. Recent Sales of Unregistered Securities.

In the three years preceding the filing of this registration statement, we have issued the following securities that were not registered under the Securities Act:

(a) Issuances of Capital Stock

From August 2017 to January 2018, we issued and sold an aggregate of 5,050,506 shares of our restricted common stock to certain of our officers and scientific advisory board members as consideration for service provided to our company.

In October 2018, we issued and sold to an accredited investor an aggregate of 721,978 shares of our common stock in connection with a licensing transaction.

In October 2018, we issued and sold an aggregate of 3,146,551 shares of our Series A preferred stock, 7,372,719 shares of our Series A-1 preferred stock, and 1,873,777 shares of our Series A-2 preferred stock to eleven investors for aggregate consideration of approximately $38.3 million.

In January 2019, we issued and sold an aggregate of 6,963,788 shares of our Series B preferred stock to 16 investors for aggregate consideration of approximately $50.0 million. In addition, we issued a further 1,405,332 shares of Series B Preferred Stock in exchange for 1,405,332 shares of Series A-2 Preferred Stock.

No underwriters were involved in the foregoing sales of securities. The sales of securities described above were deemed to be exempt from registration pursuant to Section 4(a)(2) of the Securities Act, including Regulation D and Rule 506 promulgated thereunder, as transactions by an issuer not involving a public offering. All of the purchasers in these transactions represented to us in connection with their purchase that they were acquiring the securities for investment and not distribution, that they could bear the risks of the investment and could hold the securities for an indefinite period of time. Such purchasers received written disclosures that the securities had not been registered under the Securities Act and that any resale must be made pursuant to a registration or an available exemption from such registration. All of the foregoing securities are deemed restricted securities for the purposes of the Securities Act.

(b) Grants and Exercises of Stock Options

We have granted stock options to purchase an aggregate of 2,435,545 shares of our common stock, with exercise price ranging from $0.67 to $4.20 per share, to employees, directors and consultants pursuant to the 2018 Plan. No shares of common stock have been issued upon the exercise of stock options pursuant to the 2018 Plan.

The issuances of the securities described above were deemed to be exempt from registration pursuant to Section 4(a)(2) of the Securities Act or Rule 701 promulgated under the Securities Act as transactions pursuant to compensatory benefit plans. The shares of common stock issued upon the exercise of options are deemed to be restricted securities for purposes of the Securities Act.

Item 16. Exhibits and Financial Statement Schedules.

The exhibits to the registration statement are listed in the Exhibit Index to this registration statement and are incorporated herein by reference.

Item 17. Undertakings.

The undersigned Registrant hereby undertakes to provide to the underwriters at the closing specified in the Underwriting Agreement certificates in such denominations and registered in such names as required by the underwriters to permit prompt delivery to each purchaser.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the Registrant pursuant to the foregoing provisions, or otherwise, the Registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

The undersigned Registrant hereby undertakes that:

(1) For purposes of determining any liability under the Securities Act, the information omitted from the form of prospectus filed as part of this registration statement in reliance upon Rule 430A and contained in a form of prospectus filed by the Registrant pursuant to Rule 424(b)(1) or (4) or 497(h) under the Securities Act shall be deemed to be part of this registration statement as of the time it was declared effective.

(2) For the purpose of determining any liability under the Securities Act, each post-effective amendment that contains a form of prospectus shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, the registrant has duly caused this Registration Statement on Form S-1 to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Philadelphia, Commonwealth of Pennsylvania, on the day of , 2019.

CABALETTA BIO, INC.

By: _____

Steven Nichtberger

Chief Executive Officer and President

POWER OF ATTORNEY AND SIGNATURES

Each individual whose signature appears below hereby constitutes and appoints each of Steven Nichtberger and Anup Marda as such person's true and lawful attorney-in-fact and agent with full power of substitution and re-substitution, for such person in such person's name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this Registration Statement (or any Registration Statement for the same offering that is to be effective upon filing pursuant to Rule 462(b) under the Securities Act of 1933), and to file the same, with all exhibits thereto, and all documents in connection therewith, with the Securities and Exchange Commission granting unto each said attorney-in-fact and agent full power and authority to do and perform each and every act and thing requisite and necessary to be done in and about the premises, as fully to all intents and purposes as such person might or could do in person, hereby ratifying and confirming all that any said attorney-in-fact and agent, or any substitute or substitutes of any of them, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, as amended, this Registration Statement and Power of Attorney has been signed by the following person in the capacities and on the date indicated.

NAME	TITLE	DATE
Steven Nichtberger	*Director, Chief Executive Officer and President (Principal Executive Officer)*	
Anup Marda	*Chief Financial Officer (Principal Financial and Accounting Officer)*	
Catherine Bollard	*Director*	
Brian Daniels	*Director*	
Richard Henriques	*Director*	
Mark Simon	*Director*	

EXHIBIT INDEX

EXHIBIT NO.	EXHIBIT INDEX
1.1*	Form of Underwriting Agreement
3.1	Second Amended and Restated Certificate of Incorporation of the Registrant, as currently in effect
3.2*	Form of Third Amended and Restated Certificate of Incorporation of the Registrant (to be effective upon the closing of this offering)
3.3	By-laws of the Registrant, as currently in effect
3.4*	Form of Amended and Restated By-laws (to be effective upon the closing of this offering)
4.1*	Form of Specimen Common Stock Certificate
4.2	Investors' Rights Agreement among the Registrant and certain of its stockholders, dated as of January 2, 2019
5.1*	Opinion of Goodwin Procter LLP
10.1	2018 Stock Option and Incentive Plan, as amended, and forms of award agreements thereunder
10.2*	2019 Stock Option and Grant Plan and forms of award agreements thereunder
10.3*	2019 Employee Stock Purchase Plan
10.4*	Form of Indemnification Agreement between the Registrant and each of its directors and officers
10.5*†	Amended and Restated License Agreement, dated as of July 23, 2019, among the Registrant, the Trustees of the University of Pennsylvania and the Children's Hospital of Philadelphia
10.6*†	Sponsored Research Agreement, dated as of April 23, 2018, between the Registrant and the Trustees of the University of Pennsylvania
10.7*†	Sponsored Research Agreement, dated as of April 23, 2018, between the Registrant and the Trustees of the University of Pennsylvania
10.8*†	Master Translational Research Services Agreement, dated as of October 2018, between the Registrant and the Trustees of the University of Pennsylvania
10.9*†	CAROT Master Services Addendum to Master Translational Research Services Agreement, dated as of February 4, 2019, between the Registrant and the Trustees of the University of Pennsylvania
10.10*†	CVPF Master Services Addendum to Master Translational Research Services Agreement, dated as of October 22, 2018, between the Registrant and the Trustees of the University of Pennsylvania
10.11*†	Research Agreement A19-3095, dated as of October 31, 2018, between the Registrant and The Regents of the University of California
10.12	Lease, dated as of February 11, 2019, between the Registrant and Brandywine Cira, L.P.
10.13*	Form of Amended and Restated Employment Agreement for executive officers of the Registrant
10.14*	Consulting Agreement, dated as of May 7, 2018, between the Registrant and Danforth Advisors, LLC
10.15*	Amendment No. 1 to Consulting Agreement, dated as of May 7, 2019, between the Registrant and Danforth Advisors, LLC
21.1	Subsidiaries of the Registrant

EXHIBIT NO.	EXHIBIT INDEX
23.1*	Consent of Ernst & Young, Independent Registered Public Accounting Firm
23.2*	Consent of Goodwin Procter LLP (included in Exhibit 5.1)
24.1*	Power of Attorney (included on signature page to this registration statement)

* To be included by amendment.

† Certain portions of the exhibit have been omitted pursuant to Rule 406 promulgated under the Securities Act because they are not material and would likely cause competitive harm to the Registrant if disclosed.

Exhibit 3.1

SECOND AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
CABALETTA BIO, INC.

(Pursuant to Sections 242 and 245 of the
General Corporation Law of the State of Delaware)

Cabaletta Bio, Inc., a corporation organized and existing under and by virtue of the provisions of the General Corporation Law of the State of Delaware (the "**General Corporation Law**"),

DOES HEREBY CERTIFY:

1. That the name of this corporation is Cabaletta Bio, Inc., and that this corporation was originally incorporated pursuant to the General Corporation Law on April 3, 2017, under the name Tycho Therapeutics, Inc., and that such Certificate of Incorporation was amended by a filing dated August 21, 2018, filed with the Secretary of State of the State of Delaware on August 22, 2018.

2. That an Amended and Restated Certificate of Incorporation of this corporation was filed with the Secretary of State of the State of Delaware on October 10, 2018 (the "***Existing Certificate***").

3. That the Board of Directors of this corporation duly adopted resolutions proposing to amend and restate the Existing Certificate of this corporation, declaring said amendment and restatement to be advisable and in the best interests of this corporation and its stockholders, and authorizing the appropriate officers of this corporation to solicit the consent of the stockholders therefor, which resolution setting forth the proposed amendment and restatement is as follows:

RESOLVED, that the Existing Certificate of this corporation be amended and restated in its entirety to read as follows:

FIRST: The name of this corporation is Cabaletta Bio, Inc. (the "**Corporation**").

SECOND: The address of the registered office of the Corporation in the State of Delaware is 1209 Orange Street, in the City of Wilmington, 19801, County of New Castle. The name of its registered agent at such address is The Corporation Trust Company.

THIRD: The nature of the business or purposes to be conducted or promoted is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law.

FOURTH: The total number of shares of all classes of stock which the Corporation shall have authority to issue is (i) 29,000,000 shares of Common Stock, $0.00001 par value per share ("**Common Stock**") and (ii) 20,762,168 shares of Preferred Stock, $0.00001 par value per share ("**Preferred Stock**").

The following is a statement of the designations and the powers, privileges and rights, and the qualifications, limitations or restrictions thereof in respect of each class of capital stock of the Corporation.

A. COMMON STOCK

1. General. The voting, dividend and liquidation rights of the holders of the Common Stock are subject to and qualified by the rights, powers and preferences of the holders of the Preferred Stock set forth herein.

2. Voting. The holders of the Common Stock are entitled to one vote for each share of Common Stock held at all meetings of stockholders (and written actions in lieu of meetings); provided, however, that, except as otherwise required by law, holders of Common Stock, as such, shall not be entitled to vote on any amendment to this Certificate of Incorporation that relates solely to the terms of one or more outstanding series of Preferred Stock if the holders of such affected series of Preferred Stock are entitled, either separately or together with the holders of one or more other such series, to vote thereon pursuant to this Certificate of Incorporation or pursuant to the General Corporation Law. There shall be no cumulative voting. The number of authorized shares of Common Stock may be increased or decreased (but not below the number of shares thereof then outstanding) by (in addition to any vote of the holders of one or more series of Preferred Stock that may be required by the terms of this Certificate of Incorporation) the affirmative vote of the holders of shares of capital stock of the Corporation representing a majority of the votes represented by all outstanding shares of capital stock of the Corporation entitled to vote, irrespective of the provisions of Section 242(b)(2) of the General Corporation Law.

B. PREFERRED STOCK

Preferred Stock may be issued from time to time in one or more series, each of such series to consist of such number of shares and to have such terms, rights, powers and preferences, and the qualification and limitations with respect thereto as stated or expressed herein.

3,146,551 shares of the authorized Preferred Stock of the Corporation are hereby designated "**Series A Preferred Stock**", 7,372,720 shares of the authorized Preferred Stock of the Corporation are hereby designated "**Series A-1 Preferred Stock**", 1,873,777 shares of the authorized Preferred Stock of the Corporation are hereby designated "**Series A-2 Preferred Stock**" and 8,369,120 shares of the authorized Preferred Stock of the Corporation are hereby designated "**Series B Preferred Stock**", each with the following rights, preferences, powers, privileges and restrictions, qualifications and limitations. Unless otherwise indicated, references to "sections" or "subsections" in this Part B of this Article Fourth refer to sections and subsections of Part B of this Article Fourth. "**Original Issue Price**" shall mean (i) with respect to the Series A Preferred Stock, $4.05 per share, (ii) with respect to the Series A-1 Preferred Stock, $2.76 per share, (iii) with respect to the Series A-2 Preferred Stock, $2.76 per share, and (iv) with respect to the Series B Preferred Stock, $7.18 per share, in each case subject to appropriate adjustment in the event of a stock split, stock dividend, combination, reclassification, or similar event affecting the Preferred Stock or any series thereof. The Series A Preferred Stock, Series A-1 Preferred Stock and Series B Preferred Stock are sometimes collectively referred to herein as "**Voting Preferred Stock**."

1. Dividends.

1.1 The holders of shares of the Preferred Stock shall be entitled to receive, on a *pari passu* basis, dividends, out of any assets legally available therefor, prior and in preference to any declaration or payment of any dividend (other than dividends on shares of Common Stock payable in shares of Common Stock) on the Common Stock of this Corporation, at the applicable Dividend Rate, payable when, as and if declared by the Board of Directors of the Corporation (the "**Board of Directors**"). Such dividends shall not be cumulative.

1.2 The holders of the outstanding shares of each series of Preferred Stock can waive any dividend preference that the holders of such series of Preferred Stock shall be entitled to receive under this Section 1 upon the affirmative vote or written consent of the holders of at least a majority of the shares of such series of Preferred Stock then outstanding (voting together as a separate series, and on an as-converted to Common Stock basis). For purposes of this Section 1, "**Dividend Rate**" shall mean (i) $0.24 per annum for each share of Series A Preferred Stock, (ii) $0.1656 per annum for each share of Series A-1 Preferred Stock, (iii) $0.1656 per annum for each share of SeriesA-2 Preferred Stock and (iv) $0.4308 per annum for each share of Series B Preferred Stock, in each case, as adjusted for any stock splits, stock dividends, combinations, subdivisions, or other similar recapitalization affecting such shares. After payment of such dividends on the shares of Preferred Stock, any additional dividends or distributions shall be distributed among all holders of Common Stock and Preferred Stock in proportion to the number of shares of Common Stock that would be held by each such holder if all shares of Preferred Stock were converted to Common Stock at the then effective Conversion Price (as defined below).

2. Liquidation, Dissolution or Winding Up; Certain Mergers, Consolidations and Asset Sales

2.1 Preferential Payments to Holders of Preferred Stock. In the event of any voluntary or involuntary liquidation, dissolution or winding up of the Corporation, the holders of shares of Preferred Stock then outstanding shall be entitled to be paid, on a *pari passu* basis, out of the assets of the Corporation available for distribution to its stockholders, and in the event of a Deemed Liquidation Event (as defined below) the holders of shares of Preferred Stock then outstanding shall be entitled to be paid out of the consideration payable to stockholders in such Deemed Liquidation Event or out of the Available Proceeds (as defined below), as applicable, before any payment shall be made to the holders of Common Stock by reason of their ownership thereof, an amount per share equal to the greater of (i) the applicable Original Issue Price, plus any dividends declared but unpaid thereon, or (ii) such amount per share as would have been payable had all shares of Preferred Stock been converted into Common Stock pursuant to Section 4 immediately prior to such liquidation, dissolution, winding up or Deemed Liquidation Event (the "**Liquidation Amount**"). If upon any such liquidation, dissolution or winding up of the Corporation or Deemed Liquidation Event, the assets of the Corporation available for distribution to its stockholders shall be insufficient to pay the holders of the outstanding shares of Preferred Stock the full amount to which they shall be entitled under this Subsection 2.1, the holders of shares of Preferred Stock shall share ratably, on a *pari passu* basis, in any distribution of the assets available for distribution in proportion to the respective amounts which would otherwise be payable in respect of the shares held by them upon such distribution if all amounts payable on or with respect to such shares were paid in full.

2.2 Payments to Holders of Common Stock. In the event of any voluntary or involuntary liquidation, dissolution or winding up of the Corporation or Deemed Liquidation Event, after the payment of all preferential payments required to be paid to the holders of shares of Preferred Stock pursuant to Subsection 2.1, the remaining assets of the Corporation available for distribution to its stockholders or, in the case of a Deemed Liquidation Event, the consideration not payable to the holders of shares of Preferred Stock pursuant to Subsection 2.1 or the remaining Available Proceeds, as the case may be, shall be distributed among the holders of shares of Common Stock, pro rata based on the number of shares held by each such holder.

2.3 Deemed Liquidation Events.

2.3.1 Definition. Each of the following events shall be considered a "**Deemed Liquidation Event**" unless the Requisite Series A Holders (as defined below), elect otherwise by written notice sent to the Corporation at least ten (10) days prior to the effective date of any such event:

(a) a merger, consolidation or reorganization in which

(i) the Corporation is a constituent party or

(ii) a subsidiary of the Corporation is a constituent party and the Corporation issues shares of its capital stock pursuant to such merger or consolidation,

except any such merger, consolidation or reorganization involving the Corporation or a subsidiary in which the shares of capital stock of the Corporation outstanding immediately prior to such merger, consolidation or reorganization continue to represent, or are converted into or exchanged for shares of capital stock that represent, immediately following such merger, consolidation or reorganization, at least a majority, by voting power, of the capital stock of (1) the surviving or resulting corporation; or (2) if the surviving or resulting corporation is a subsidiary of another corporation immediately following such merger, consolidation or reorganization, the ultimate parent corporation of such surviving or resulting corporation; provided that, any transaction or series of related transactions solely for the purpose of effecting a change in the domicile of the Corporation shall not constitute a "Deemed Liquidation Event"; or

(b) the sale, lease, transfer, exclusive license or other disposition, in a single transaction or series of related transactions, by the Corporation or any subsidiary of the Corporation of all or substantially all the assets of the Corporation and its subsidiaries taken as a whole, or the sale, transfer or disposition (whether by equity sale, merger, consolidation or otherwise, and whether in a single transaction or a series of related transactions) of one or more subsidiaries of the Corporation if substantially all of the assets of the Corporation and its subsidiaries taken as a whole are held by such subsidiary or subsidiaries, except where such sale, lease, transfer, exclusive license or other disposition is to a wholly owned subsidiary of the Corporation.

As used herein, "**Requisite Series A Holders**" means at least two of the following three holders of the Corporation's Series A Preferred Stock, SeriesA-1 Preferred Stock or Series A-2 Preferred Stock, as applicable: (i) 5AM Venture V, L.P. ("**5AM**"), for so long as 5AM and its affiliates continue to own at least ten percent (10%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock), (ii) Baker Brothers Life Sciences, L.P. and 677, L.P., acting together (collectively, "**Baker Brothers**"), for so long as Baker Brothers and its affiliates continue to own at least ten percent (10%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock), and (iii) Adage Capital Partners, L.P. ("**Adage**"), for so long as Adage and its affiliates continue to own at least ten percent (10%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock).

2.3.2 Effecting a Deemed Liquidation Event.

(a) The Corporation shall not have the power to effect or enter into a definitive agreement to effect a Deemed Liquidation Event referred to in Subsection 2.3.1(a)(i) unless the agreement (in whatever form, including without limitation, a plan of merger or consolidation) for such transaction (the "**Deemed Liquidation Agreement**") provides that the consideration payable to the stockholders of the Corporation shall be allocated among the holders of capital stock of the Corporation in accordance with Subsections 2.1 and 2.2.

(b) In the event of a Deemed Liquidation Event referred to inSubsection 2.3.1(a)(ii) or 2.3.1(b), if the Corporation does not effect a dissolution of the Corporation under the General Corporation Law within ninety (90) days after such Deemed Liquidation Event, then (i) the Corporation shall send a written notice to each holder of Preferred Stock no later than the ninetieth (90th) day after the Deemed Liquidation Event advising such holders of their right (and the requirements to be met to secure such right) pursuant to the terms of the following clauses to require the redemption of such shares of Preferred Stock, and (ii) if the Requisite Series A Holders so request in a written instrument delivered to the Corporation not later than one hundred twenty (120) days after such Deemed Liquidation Event, the Corporation shall use the consideration received by the Corporation for such Deemed Liquidation Event (net of any retained liabilities associated with the assets sold or technology licensed, as determined in good faith by the Board of Directors of the Corporation), together with any other assets of the Corporation available for distribution to its stockholders, all to the extent permitted by Delaware law governing distributions to stockholders (the "**Available Proceeds**"), on the one hundred fiftieth (150th) day after such Deemed Liquidation Event, to redeem all outstanding shares of Preferred Stock at a price per share equal to the applicable Liquidation Amount for such series of Preferred Stock (the "**Redemption Price**"). Notwithstanding the foregoing, in the event of a redemption pursuant to the preceding sentence, if the Available Proceeds are not sufficient to redeem all outstanding shares of Preferred Stock at the Redemption Price, the Corporation shall redeem a pro rata portion of each holder's shares of Preferred Stock, to the fullest extent of such Available Proceeds at the Redemption Price, and shall redeem the remaining shares at the Redemption Price as soon as it may lawfully do so under Delaware law governing distributions to stockholders. The provisions of Subsection 2.3.2(c) through Subsection 2.3.2(e) shall apply to the redemption of the Preferred Stock pursuant to this Subsection 2.3.2(b). Prior to the distribution or redemption provided for in this Subsection 2.3.2(b), the Corporation shall not expend or dissipate the consideration received for such Deemed Liquidation Event, except to discharge expenses incurred in connection with such Deemed Liquidation Event.

(c) Redemption Notice. In the event of a redemption of the Preferred Stock pursuant to the foregoing Section 2.3.2(b), the Corporation shall send written notice of such redemption (the "**Redemption Notice**") to each holder of record of Preferred Stock not less than forty (40) days prior to the Redemption Date (as defined below). Each Redemption Notice shall state:

(i) the number of shares of Preferred Stock held by the holder that the Corporation shall redeem;

(ii) the date of redemption (the "**Redemption Date**") and the Redemption Price; and

(iii) for holders of shares in a certificate form, that the holder is to surrender to the Corporation, in the manner and at the place reasonably designated by the Corporation, his, her or its certificate or certificates representing the shares of Preferred Stock to be redeemed.

(d) Surrender of Certificates; Payment. On or before the applicable Redemption Date, each holder of shares of Preferred Stock to be redeemed on such Redemption Date, unless such holder has exercised his, her or its right to convert such shares as provided in Section 4, shall, if a holder of shares in certificated form, surrender the certificate or certificates representing such shares (or, if such registered holder alleges that such certificate has been lost, stolen or destroyed, a lost certificate affidavit and agreement reasonably acceptable to the Corporation to indemnify the Corporation against any claim that may be made against the Corporation on account of the alleged loss, theft or destruction of such certificate) to the Corporation, in the manner and at the place designated in the Redemption Notice, and thereupon the Redemption Price for such shares shall be payable to the order of the person whose name appears on such certificate or certificates as the owner thereof. In the event less than all of the shares of Preferred Stock represented by a certificate are redeemed, a new certificate, instrument, or book entry representing the unredeemed shares of Preferred Stock shall promptly be issued to such holder.

(e) Rights Subsequent to Redemption. If the Redemption Notice shall have been duly given, and if on the applicable Redemption Date the Redemption Price payable upon redemption of the shares of Preferred Stock to be redeemed on such Redemption Date is paid or tendered for payment or deposited with an independent payment agent so as to be available therefor in a timely manner, then notwithstanding that any certificates evidencing any of the shares of Preferred Stock so called for redemption shall not have been surrendered, dividends with respect to such shares of Preferred Stock shall cease to accrue after such Redemption Date and all rights with respect to such shares shall forthwith after the Redemption Date terminate, except only the right of the holders to receive the Redemption Price without interest upon surrender of any such certificate or certificates therefor.

2.3.3 Amount Deemed Paid or Distributed. The value of any non-cash consideration paid or distributed to the holders of capital stock of the Corporation, including, without limitation, upon any Deemed Liquidation Event or redemption shall be the value of the property, rights or securities to be paid or distributed to such holders as determined in good faith by the Board of Directors of the Corporation, including the approval of at least one of the Preferred Directors (as defined herein).

2.3.4 Allocation of Escrow and Contingent Consideration. In the event of a Deemed Liquidation Event pursuant to Subsection 2.3.1(a)(i), if any portion of the consideration payable to the stockholders of the Corporation is payable only upon satisfaction of contingencies (the "**Additional Consideration**"), the Deemed Liquidation Agreement shall provide that (a) the portion of such consideration that is not Additional Consideration (such portion, the "**Initial Consideration**") shall be allocated among the holders of capital stock of the Corporation in accordance with Subsections 2.1 and 2.2 as if the Initial Consideration were the only consideration payable in connection with such Deemed Liquidation Event; and (b) any Additional Consideration which becomes payable to the stockholders of the Corporation upon satisfaction of such contingencies shall be allocated among the holders of capital stock of the Corporation in accordance with Subsections 2.1 and 2.2 after taking into account the previous payment of the Initial Consideration as part of the same transaction. For the purposes of this Subsection 2.3.4, consideration placed into escrow or retained as holdback to be available for satisfaction of indemnification or similar obligations in connection with such Deemed Liquidation Event shall be deemed to be Additional Consideration.

3. Voting.

3.1 General. On any matter presented to the stockholders of the Corporation for their action or consideration at any meeting of stockholders of the Corporation (or by written consent of stockholders in lieu of meeting), each holder of outstanding shares of Voting Preferred Stock shall be entitled to cast the number of votes equal to the number of whole shares of Common Stock into which such shares of Series A Preferred Stock, Series A-1 Preferred Stock and Series B Preferred Stock held by such holder are convertible as of the record date for determining stockholders entitled to vote on such matter. Except as provided by law or by the other provisions of this Certificate of Incorporation, holders of Voting Preferred Stock shall vote together with the holders of Common Stock as a single class and on an as-converted to Common Stock basis. The shares of Series A-2 Preferred Stock are non-voting shares of the Corporation and holders of shares of Series A-2 Preferred Stock shall not be entitled to receive notice of, or to vote at, any meetings of the stockholders of the Corporation, except as otherwise provided by law or this Certificate of Incorporation.

3.2 Election of Directors. The holders of record of the shares of Series A Preferred Stock and Series A-1 Preferred Stock, exclusively and as a separate class, shall be entitled to elect three (3) directors of the Corporation (the "**Preferred Directors**") and the holders of record of the shares of Common Stock, exclusively and as a separate class, shall be entitled to elect one (1) director of the Corporation. Any director elected as provided in the preceding sentence may be removed without cause by, and only by, the affirmative vote of the holders of the shares of the class or series of capital stock entitled to elect such director or directors, given either at a special meeting of such stockholders duly called for that purpose or pursuant to a written consent of stockholders. If the holders of shares of Series A Preferred Stock, Series A-1 Preferred Stock or Common Stock, as the case may be, fail to elect a sufficient

number of directors to fill all directorships for which they are entitled to elect directors, voting exclusively and as a separate class, pursuant to the first sentence of this Subsection 3.2, then any directorship not so filled shall remain vacant until such time as the holders of the Series A Preferred Stock, Series A-1 Preferred Stock or Common Stock, as the case may be, elect a person to fill such directorship by vote or written consent in lieu of a meeting; and no such directorship may be filled by stockholders of the Corporation other than by the stockholders of the Corporation that are entitled to elect a person to fill such directorship, voting exclusively and as a separate class. The holders of record of the shares of Common Stock and of any other class or series of voting stock (including the Series A Preferred Stock, Series A-1 Preferred Stock, and Series B Preferred Stock), exclusively and voting together as a single class and on an as- converted basis, shall be entitled to elect the balance of the total number of directors of the Corporation. At any meeting held for the purpose of electing a director, the presence in person or by proxy of the holders of a majority of the outstanding shares of the class or series entitled to elect such director shall constitute a quorum for the purpose of electing such director. Except as otherwise provided in this Subsection 3.2, a vacancy in any directorship filled by the holders of any class or series shall be filled only by vote or written consent in lieu of a meeting of the holders of such class or series or by any remaining director or directors elected by the holders of such class or series pursuant to this Subsection 3.2.

3.3 Preferred Stock Protective Provisions. At any time when an aggregate of at least 3,296,314 shares of Series A Preferred Stock, Series A-1 Preferred Stock, and Series A-2 Preferred Stock (subject to appropriate adjustment in the event of any stock dividend, stock split, combination or other similar recapitalization with respect to the Preferred Stock) are outstanding, the Corporation shall not, either directly or indirectly by amendment, merger, consolidation or otherwise, do any of the following without (in addition to any other vote required by law or this Certificate of Incorporation) the written consent or affirmative vote of the Requisite Series A Holders, given in writing or by vote at a meeting, consenting or voting (as the case may be) separately as a class, and any such act or transaction entered into without such consent or vote shall be null and void *ab initio*, and of no force or effect:

3.3.1 liquidate, dissolve or wind-up the business and affairs of the Corporation, effect or enter into a definitive agreement to effect any Deemed Liquidation Event, or consent to any of the foregoing;

3.3.2 amend, alter or repeal any provision of this Certificate of Incorporation or Bylaws of the Corporation;

3.3.3 create, or authorize the creation of, or issue or obligate itself to issue shares of, any additional class or series of capital stock unless the same (i) ranks junior to the Series A Preferred Stock, Series A-1 Preferred Stock and Series A-2 Preferred Stock with respect to the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends and rights of redemption and (ii) if applicable, is mandatorily convertible into Common Stock at any time when the Series A Preferred Stock, Series A-1 Preferred Stock and Series A-2 Preferred Stock is mandatorily convertible into Common Stock; provided that sub-clauses (i) and (ii) hereof shall not apply to the issuance by the Corporation of any shares of Series A-2 Preferred Stock that are retired by the Corporation and resume the status of authorized and unissued shares of Series A-2 Preferred Stock (and the written consent or affirmative vote of the Requisite Series A Holders shall be required for the issuance of any such shares of Series A-2 Preferred Stock);

3.3.4 increase or decrease the authorized number of shares of Common Stock or Preferred Stock or increase the authorized number of shares of any additional class or series of capital stock of the Corporation;

3.3.5 cause or permit any of its subsidiaries to, without approval of the Board of Directors, including at least one of the Preferred Directors, sell, issue, sponsor, create or distribute any digital tokens, cryptocurrency or other blockchain-based assets (collectively, "**Tokens**"), including through a pre-sale, initial coin offering, token distribution event or crowdfunding, or through the issuance of any instrument convertible into or exchangeable for Tokens;

3.3.6 (i) reclassify, alter or amend any existing security of the Corporation that is*pari passu* with any of the Series A Preferred Stock, Series A-1 Preferred Stock and Series A-2 Preferred Stock in respect of the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, if such reclassification, alteration or amendment would render such other security senior to any of the Series A Preferred Stock, Series A-1 Preferred Stock and Series A-2 Preferred Stock in respect of any such right, preference, or privilege or (ii) reclassify, alter or amend any existing security of the Corporation that is junior to any of the Series A Preferred Stock, Series A-1 Preferred Stock and Series A-2 Preferred Stock in respect of the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, if such reclassification, alteration or amendment would render such other security senior to or *pari passu* with any of the Series A Preferred Stock, Series A-1 Preferred Stock and Series A-2 Preferred Stock in respect of any such right, preference or privilege;

3.3.7 purchase or redeem (or permit any subsidiary to purchase or redeem) or pay or declare any dividend or make any distribution on, any shares of capital stock of the Corporation other than (i) redemptions of or dividends or distributions on the Preferred Stock as expressly authorized herein, (ii) dividends or other distributions payable on the Common Stock solely in the form of additional shares of Common Stock, (iii) repurchases of stock from current or former employees, officers, directors, consultants or other persons who performed services for the Corporation or any subsidiary in connection with the cessation of such employment or service at the lower of the original purchase price or the then current fair market value thereof or (iv) the Corporation's exercise of contractual rights of first refusal as approved by the Board of Directors, including the approval of a majority of the Preferred Directors who are members of the Board of Directors at such time;

3.3.8 create, or authorize the creation of, or issue, or authorize the issuance of any debt security or incur other indebtedness for borrowed money, including but not limited to obligations and contingent obligations under guarantees, or permit any subsidiary to take any such action with respect to any debt security, if the aggregate indebtedness of the Corporation and its subsidiaries for borrowed money following such action would exceed $500,000 unless such debt security has received the prior approval of the Board of Directors, including the approval of a majority of the Preferred Directors who are members of the Board of Directors at such time;

3.3.9 create, or hold capital stock in, any subsidiary that is not wholly owned (either directly or through one or more other subsidiaries) by the Corporation, or permit any subsidiary to create, or authorize the creation of, or issue or obligate itself to issue, any shares of any class or series of capital stock, or sell, transfer or otherwise dispose of any capital stock of any direct or indirect subsidiary of the Corporation, or permit any direct or indirect subsidiary to sell, lease, transfer, exclusively license or otherwise dispose (in a single transaction or series of related transactions) of all or substantially all of the assets of such subsidiary;

3.3.10 enter into transaction or series of transactions to acquire another entity or all or substantially all of the assets of another entity, if such transaction results in the Corporation issuing shares of its capital stock in an amount greater than ten percent (10%) of the outstanding capital stock of the Corporation immediately prior to such transaction;

3.3.11 increase or decrease the authorized number of directors who constitute the Board of Directors;

3.3.12 sell, transfer, exclusively license, as may be applicable, or otherwise dispose of any material assets of the Corporation, other than in the ordinary course of business;

3.3.13 make, or permit any subsidiary to make, any loan or advance to, or own any stock or other securities of, any subsidiary or other corporation, partnership, or other entity unless it is wholly owned by the Corporation;

3.3.14 make, or permit any subsidiary to make, any loan or advance to any person, including, without limitation, any employee or director of the Corporation or any subsidiary, except advances and similar expenditures in the ordinary course of business or under the terms of an employee stock or option plan approved by the Board of Directors;

3.3.15 guarantee, directly or indirectly, or permit any subsidiary to guarantee, directly or indirectly, any indebtedness except for trade accounts of the Corporation or any subsidiary arising in the ordinary course of business;

3.3.16 make any investment inconsistent with any investment policy approved by the Board of Directors;

3.3.17 otherwise enter into or be a party to any transaction with any director, officer, or employee of the Corporation or any "associate" (as defined in Rule 12b-2 promulgated under the Exchange Act) of any such Person, except for transactions contemplated by the Amended and Restated Investors' Rights Agreement, dated as of January 2, 2019, as amended from time to time, the Series B Preferred Stock Purchase Agreement, dated as of January 2, 2019, as amended from time to time, or transactions made in the ordinary course of business and pursuant to reasonable requirements of the Corporation's business and upon fair and reasonable terms that are approved by a majority of the Board of Directors;

3.3.18 change the principal business of the Corporation, enter new lines of business, or exit the current line of business;

3.3.19 sell, assign, license, pledge, or encumber material technology or intellectual property, other than licenses granted in the ordinary course of business; or

3.3.20 enter into any corporate strategic relationship involving the payment, contribution, or assignment by the Corporation or to the Corporation of money or assets greater than $500,000.

3.4 Series B Preferred Stock Protective Provisions. At any time when at least 2,510,736 shares of Series B Preferred Stock (subject to appropriate adjustment in the event of any stock dividend, stock split, combination or other similar recapitalization with respect to the Series B Preferred Stock) are outstanding, the Corporation shall not, either directly or indirectly by amendment, merger, consolidation or otherwise, do any of the following without (in addition to any other vote required by law or this Certificate of Incorporation) the written consent or affirmative vote of the holders of a majority of the Series B Preferred Stock given in writing or by vote at a meeting, consenting or voting (as the case may be) separately as a class, and any such act or transaction entered into without such consent or vote shall be null and void *ab initio*, and of no force or effect:

3.4.1 amend, alter or repeal the rights, powers, preferences or privileges of the Series B Preferred Stock in a manner that is adverse to the Series B Preferred Stock (provided that the creation or issuance of any additional class or series of capital stock of the Corporation, including a new series of Preferred Stock that ranks senior to the Series B Preferred Stock with respect to the distribution of assets on the liquidation, dissolution or winding up of the Corporation, the payment of dividends or rights of redemption, shall not be deemed to be an amendment, alteration or repeal that is adverse to the rights, powers, preferences or privileges of the Series B Preferred Stock);

3.4.2 purchase or redeem (or permit any subsidiary to purchase or redeem) or pay or declare any dividend or make any distribution on, any shares of capital stock of the Corporation other than (i) redemptions of or dividends or distributions on the Preferred Stock as expressly authorized herein, (ii) dividends or other distributions payable on the Common Stock solely in the form of additional shares of Common Stock and (iii) repurchases of stock from current or former employees, officers, directors, consultants or other persons who performed services for the Corporation or any subsidiary in connection with the cessation of such employment or service at the lower of the original purchase price or the then current fair market value thereof or (iv) the Corporation's exercise of contractual rights of first refusal as approved by the Board of Directors, including the approval of a majority of the Preferred Directors who are members of the Board of Directors at such time; or

3.4.3 increase or decrease the authorized number of shares of Series B Preferred Stock.

4. Optional Conversion.

The holders of the Preferred Stock shall have conversion rights as follows (the "**Conversion Rights**"):

4.1 Right to Convert.

4.1.1 Conversion Ratio. Each share of Preferred Stock shall be convertible, at the option of the holder thereof, at any time and from time to time, and without the payment of additional consideration by the holder thereof, into such number of fully paid and non-assessable shares of Common Stock as is determined by dividing the applicable Original Issue Price by the applicable Conversion Price (as defined below) in effect at the time of conversion. The "**Conversion Price**" shall initially be equal to (ii) with respect to the Series A Preferred Stock, $4.05 per share, (iii) with respect to the Series A-1 Preferred Stock, $2.76 per share, (iii) with respect to the Series A-2 Preferred Stock, $2.76 per share, and (iv) with respect to the Series B Preferred Stock, $7.18 per share, in each case subject to appropriate adjustment in the event of a stock split, stock dividend, combination, reclassification, or similar event affecting the Preferred Stock or any series thereof. Such initial Conversion Prices, and the rate at which shares of Preferred Stock may be converted into shares of Common Stock, shall be subject to adjustment as provided below.

4.1.2 Termination of Conversion Rights. In the event of a liquidation, dissolution or winding up of the Corporation or a Deemed Liquidation Event, the Conversion Rights shall terminate at the close of business on the last full day preceding the date fixed for the payment of any such amounts distributable on such event to the holders of Preferred Stock.

4.2 Fractional Shares. No fractional shares of Common Stock shall be issued upon conversion of the Preferred Stock. In lieu of any fractional shares to which the holder would otherwise be entitled, the Corporation shall pay cash equal to such fraction multiplied by the fair market value of a share of Common Stock as determined in good faith by the Board of Directors of the Corporation. Whether or not fractional shares would be issuable upon such conversion shall be determined on the basis of the total number of shares of Preferred Stock the holder is at the time converting into Common Stock and the aggregate number of shares of Common Stock issuable upon such conversion.

4.3 Mechanics of Conversion.

4.3.1 Notice of Conversion. In order for a holder of Preferred Stock to voluntarily convert shares of Preferred Stock into shares of Common Stock, such holder shall (a) provide written notice to the Corporation's transfer agent at the office of the transfer agent for the Preferred Stock (or at the principal office of the Corporation if the Corporation serves as its own transfer agent) that such holder elects to convert all or any number of such holder's shares of Preferred Stock and, if applicable, any event on which such conversion is contingent and (b), if such holder's shares are certificated, surrender the certificate or certificates for such shares of Preferred Stock (or, if such registered holder alleges that such certificate has been lost, stolen or destroyed, a lost certificate affidavit and agreement reasonably acceptable to the Corporation to indemnify the Corporation against any claim that may be made against the Corporation on account of the alleged loss, theft or destruction of such certificate), at the office of the transfer agent for the Preferred Stock (or at the principal office of the Corporation if the Corporation serves as its own transfer agent). Such notice shall state such holder's name or the names of the nominees in which such holder wishes the shares of Common Stock to be issued. If reasonably required by the Corporation, any certificates surrendered for conversion shall be endorsed or accompanied by a written instrument or instruments of transfer, in form reasonably

satisfactory to the Corporation, duly executed by the registered holder or his, her or its attorney duly authorized in writing. The close of business on the date of receipt by the transfer agent (or by the Corporation if the Corporation serves as its own transfer agent) of such notice and, if applicable, certificates (or lost certificate affidavit and agreement) shall be the time of conversion (the "**Conversion Time**"), and the shares of Common Stock issuable upon conversion of the specified shares shall be deemed to be outstanding of record as of such date. The Corporation shall, as soon as practicable after the Conversion Time (i) issue and deliver to such holder of Preferred Stock, or to his, her or its nominees, a certificate or certificates for the number of full shares of Common Stock issuable upon such conversion in accordance with the provisions hereof and a certificate for the number (if any) of the shares of Preferred Stock represented by the surrendered certificate that were not converted into Common Stock, (ii) pay in cash such amount as provided in Subsection 4.2 in lieu of any fraction of a share of Common Stock otherwise issuable upon such conversion and (iii) pay all declared but unpaid dividends on the shares of Preferred Stock converted.

4.3.2 Reservation of Shares. The Corporation shall at all times when the Preferred Stock shall be outstanding, reserve and keep available out of its authorized but unissued capital stock, for the purpose of effecting the conversion of the Preferred Stock, such number of its duly authorized shares of Common Stock as shall from time to time be sufficient to effect the conversion of all outstanding Preferred Stock; and if at any time the number of authorized but unissued shares of Common Stock shall not be sufficient to effect the conversion of all then outstanding shares of the Preferred Stock, the Corporation shall take such corporate action as may be necessary to increase its authorized but unissued shares of Common Stock to such number of shares as shall be sufficient for such purposes, including, without limitation, engaging in best efforts to obtain the requisite stockholder approval of any necessary amendment to this Certificate of Incorporation. Before taking any action which would cause an adjustment reducing the applicable Conversion Price below the then par value of the shares of Common Stock issuable upon conversion of any series of Preferred Stock, the Corporation will take any corporate action which may, in the opinion of its counsel, be necessary in order that the Corporation may validly and legally issue fully paid and non-assessable shares of Common Stock at such adjusted applicable Conversion Price.

4.3.3 Effect of Conversion. All shares of Preferred Stock which shall have been surrendered for conversion as herein provided shall no longer be deemed to be outstanding and all rights with respect to such shares shall immediately cease and terminate at the Conversion Time, except only the right of the holders thereof to receive shares of Common Stock in exchange therefor, to receive payment in lieu of any fraction of a share otherwise issuable upon such conversion as provided in Subsection 4.2 and to receive payment of any dividends declared but unpaid thereon. Any shares of Preferred Stock so converted shall be retired and cancelled and may not be reissued as shares of such series, and the Corporation may thereafter take such appropriate action (without the need for stockholder action) as may be necessary to reduce the authorized number of shares of Preferred Stock accordingly.

4.3.4 No Further Adjustment. Upon any such conversion, no adjustment to the applicable Conversion Price shall be made for any declared but unpaid dividends on such series of Preferred Stock surrendered for conversion or on the Common Stock delivered upon conversion.

4.3.5 Taxes. The Corporation shall pay any and all issue and other similar taxes that may be payable in respect of any issuance or delivery of shares of Common Stock upon conversion of shares of Preferred Stock pursuant to this Section 4. The Corporation shall not, however, be required to pay any tax which may be payable in respect of any transfer involved in the issuance and delivery of shares of Common Stock in a name other than that in which the shares of Preferred Stock so converted were registered, and no such issuance or delivery shall be made unless and until the person or entity requesting such issuance has paid to the Corporation the amount of any such tax or has established, to the satisfaction of the Corporation, that such tax has been paid.

4.4 Adjustments to Conversion Price for Diluting Issues.

4.4.1 Special Definitions. For purposes of this Article Fourth, the following definitions shall apply:

(a) "**Option**" shall mean options, warrants or any other similar rights to subscribe for, purchase or otherwise acquire Common Stock or Convertible Securities.

(b) "**Original Issue Date**" shall mean the date on which the first share of Series B Preferred Stock was issued.

(c) "**Convertible Securities**" shall mean any evidences of indebtedness, shares or other securities directly or indirectly convertible into or exchangeable for Common Stock, but excluding Options.

(d) "**Additional Shares of Common Stock**" shall mean all shares of Common Stock issued (or, pursuant toSubsection 4.4.3 below, deemed to be issued) by the Corporation after the Original Issue Date, other than (1) the following shares of Common Stock and (2) shares of Common Stock deemed issued pursuant to the following Options and Convertible Securities (clauses (1) and (2), collectively, "**Exempted Securities**"):

(i) shares of Common Stock, Options or Convertible Securities issued as a dividend or distribution on Preferred Stock;

(ii) shares of Common Stock, Options or Convertible Securities issued by reason of a dividend, stock split, split-up or other distribution on shares of Common Stock that is covered bySubsection 4.5, 4.6, 4.7 or 4.8;

(iii) shares of Common Stock or Options issued to employees or directors of, or consultants or advisors to, the Corporation or any of its subsidiaries pursuant to a plan, agreement or arrangement approved by the Board of Directors, including the approval of at least one of the Preferred Directors who are members of the Board of Directors at such time;

(iv) shares of Common Stock or Convertible Securities actually issued upon the exercise of Options or shares of Common Stock actually issued upon the conversion or exchange of Convertible Securities, in each case provided such issuance is pursuant to the terms of such Option or Convertible Security;

(v) shares of Common Stock, Options or Convertible Securities issued to banks, equipment lessors or other financial institutions, or to real property lessors, pursuant to a debt financing, equipment leasing or real property leasing transaction approved by the Board of Directors, including the approval of at least one of the Preferred Directors who are members of the Board of Directors at such time;

(vi) shares of Common Stock, Options or Convertible Securities issued to suppliers or third party service providers in connection with the provision of goods or services pursuant to transactions approved by the Board of Directors, including the approval of at least one of the Preferred Directors who are members of the Board of Directors at such time;

(vii) shares of Common Stock, Options or Convertible Securities issued pursuant to the acquisition of another corporation by the Corporation by merger, purchase of substantially all of the assets or other reorganization or to a joint venture agreement, provided that (1) such transaction does not constitute a Deemed Liquidation Event and (2) such issuances are approved by the Board of Directors, including the approval of at least one of the Preferred Directors who are members of the Board of Directors at such time;

(viii) shares of Common Stock, Options or Convertible Securities issued in connection with sponsored research, collaboration, technology license, development, OEM, marketing or other similar agreements or strategic partnerships approved by the Board of Directors, including the approval of at least one of the Preferred Directors who are members of the Board of Directors at such time; or

(ix) additional shares of Series B Preferred Stock, issued pursuant to that certain Series B Preferred Stock Purchase Agreement dated as of the date hereof.

4.4.2 No Adjustment of Conversion Price.

(a) No adjustment in the Conversion Price applicable to shares of Series A Preferred Stock shall be made as the result of the issuance or deemed issuance of Additional Shares of Common Stock if the Corporation receives written notice from the holders of at least a majority of the shares of Series A Preferred Stock then outstanding (voting together as a single class and not as separate series, and on an as-converted to Common Stock basis), agreeing that no such adjustment shall be made as the result of the issuance or deemed issuance of such Additional Shares of Common Stock.

(b) No adjustment in the Conversion Price applicable to shares of SeriesA-1 Preferred Stock shall be made as the result of the issuance or deemed issuance of Additional Shares of Common Stock if the Corporation receives written notice from the holders of at least a majority of the then outstanding shares of the Series A-1 Preferred Stock, voting together as a separate class, agreeing that no such adjustment shall be made as the result of the issuance or deemed issuance of such Additional Shares of Common Stock.

(c) No adjustment in the Conversion Price applicable to shares of SeriesA-2 Preferred Stock shall be made as the result of the issuance or deemed issuance of Additional Shares of Common Stock if the Corporation receives written notice from the holders of at least a majority of the then outstanding shares of the Series A-2 Preferred Stock, voting together as a separate class, agreeing that no such adjustment shall be made as the result of the issuance or deemed issuance of such Additional Shares of Common Stock.

(d) No adjustment in the Conversion Price applicable to shares of Series B Preferred Stock shall be made as the result of the issuance or deemed issuance of Additional Shares of Common Stock if the Corporation receives written notice from the holders of at least a majority of the then outstanding shares of the Series B Preferred Stock, voting together as a separate class, agreeing that no such adjustment shall be made as the result of the issuance or deemed issuance of such Additional Shares of Common Stock.

4.4.3 Deemed Issue of Additional Shares of Common Stock.

(a) If the Corporation at any time or from time to time after the Original Issue Date shall issue any Options or Convertible Securities (excluding Options or Convertible Securities which are themselves Exempted Securities) or shall fix a record date for the determination of holders of any class of securities entitled to receive any such Options or Convertible Securities, then the maximum number of shares of Common Stock (as set forth in the instrument relating thereto, assuming the satisfaction of any conditions to exercisability, convertibility or exchangeability but without regard to any provision contained therein for a subsequent adjustment of such number of shares of Common Stock) issuable upon the exercise of such Options or, in the case of Convertible Securities and Options therefor, the conversion or exchange of such Convertible Securities, shall be deemed to be Additional Shares of Common Stock issued as of the time of such issue or, in case such a record date shall have been fixed, as of the close of business on such record date.

(b) If the terms of any Option or Convertible Security, the issuance of which resulted in an adjustment to the Conversion Price of a series of Preferred Stock pursuant to the terms of Subsection 4.4.4, are revised as a result of an amendment to such terms or any other adjustment pursuant to the provisions of such Option or Convertible Security (but excluding automatic adjustments to such terms pursuant to anti-dilution or similar provisions of such Option or Convertible Security) to provide for either (1) any increase or decrease in the number of shares of Common Stock issuable upon the exercise, conversion and/or exchange of any such Option or Convertible Security or (2) any increase or decrease in the consideration payable to the Corporation upon such exercise, conversion and/or exchange, then, effective upon such increase or decrease becoming effective, the applicable Conversion Price computed upon the original issue of such Option or Convertible Security (or upon the occurrence of a record date with respect thereto) shall be readjusted to such Conversion Price as would have obtained had such revised terms been in effect upon the original date of issuance of such Option or Convertible Security. Notwithstanding the foregoing, no readjustment pursuant to this clause (b) shall have the effect of increasing the applicable Conversion Price to an amount which exceeds the lower of (i) the applicable Conversion Price in effect immediately prior to the original adjustment made as a result of the issuance of such Option or Convertible Security, or (ii) the Conversion Price that would have resulted from any issuances of Additional Shares of Common Stock (other than deemed issuances of Additional Shares of Common Stock as a result of the issuance of such Option or Convertible Security) between the original adjustment date and such readjustment date.

(c) If the terms of any Option or Convertible Security (excluding Options or Convertible Securities which are themselves Exempted Securities), the issuance of which did not result in an adjustment to the Conversion Price of a series of Preferred Stock pursuant to the terms of Subsection 4.4.4 (either because the consideration per share (determined pursuant to Subsection 4.4.5) of the Additional Shares of Common Stock subject thereto was equal to or greater than the Conversion Price then in effect, or because such Option or Convertible Security was issued before the Original Issue Date), are revised after the Original Issue Date as a result of an amendment to such terms or any other adjustment pursuant to the provisions of such Option or Convertible Security (but excluding automatic adjustments to such terms pursuant to anti-dilution or similar provisions of such Option or Convertible Security) to provide for either (1) any increase in the number of shares of Common Stock issuable upon the exercise, conversion or exchange of any such Option or Convertible Security or (2) any decrease in the consideration payable to the Corporation upon such exercise, conversion or exchange, then such Option or Convertible Security, as so amended or adjusted, and the Additional Shares of Common Stock subject thereto (determined in the manner provided in Subsection 4.4.3(a)) shall be deemed to have been issued effective upon such increase or decrease becoming effective.

(d) Upon the expiration or termination of any unexercised Option or unconverted or unexchanged Convertible Security (or portion thereof) which resulted (either upon its original issuance or upon a revision of its terms) in an adjustment to the Conversion Price of a series of Preferred Stock pursuant to the terms of Subsection 4.4.4, the applicable Conversion Price shall be readjusted to such Conversion Price as would have obtained had such Option or Convertible Security (or portion thereof) never been issued. For purposes of clarification, no readjustment pursuant to this clause (d) shall have the effect of increasing the applicable Conversion Price to an amount which exceeds the lower of (i) the applicable Conversion Price in effect immediately prior to the adjustment made as a result of the original issuance, or upon the revision of the terms, of such Option or Convertible Security, or (ii) the Conversion Price that would have resulted from any issuances of Additional Shares of Common Stock (other than deemed issuances of Additional Shares of Common Stock as a result of the issuance, or revision of the terms, of such Option or Convertible Security) between the adjustment date and such readjustment date.

(e) If the number of shares of Common Stock issuable upon the exercise, conversion and/or exchange of any Option or Convertible Security, or the consideration payable to the Corporation upon such exercise, conversion and/or exchange, is calculable at the time such Option or Convertible Security is issued or amended but is subject to adjustment based upon subsequent events, any adjustment to the Conversion Price of a series of Preferred Stock provided for in this Subsection 4.4.3 shall be effected at the time of such issuance or amendment based on such number of shares or amount of consideration without regard to any provisions for subsequent adjustments (and any subsequent adjustments shall be treated as provided in clauses (b) and (c) of this Subsection 4.4.3). If the number of shares of Common Stock issuable upon the exercise, conversion and/or exchange of any Option or Convertible Security, or the consideration payable to the Corporation upon such exercise, conversion and/or exchange, cannot be calculated at all at the time such Option or Convertible Security is issued or amended, any adjustment to the Conversion Price that would result under the terms of this Subsection 4.4.3 at the time of such issuance or amendment shall instead be effected at the time such number of shares and/or amount of consideration is first calculable (even if subject to subsequent adjustments), assuming for purposes of calculating such adjustment to such Conversion Price that such issuance or amendment took place at the time such calculation can first be made.

4.4.4 Adjustment of Conversion Prices Upon Issuance of Additional Shares of Common Stock. In the event the Corporation shall at any time after the Original Issue Date issue Additional Shares of Common Stock (including Additional Shares of Common Stock deemed to be issued pursuant to Subsection 4.4.3), for a consideration per share less than any Conversion Price in effect immediately prior to such issuance or deemed issuance, then the applicable Conversion Price shall be reduced, concurrently with such issuance or deemed issuance, to a price (calculated to the nearest one-hundredth of a cent) determined in accordance with the following formula:

$$CP_2 = CP_1 * (A + B) \div (A + C).$$

For purposes of the foregoing formula, the following definitions shall apply:

(a) "CP_2" shall mean the applicable Conversion Price in effect immediately after such issuance or deemed issuance of Additional Shares of Common Stock

(b) "CP_1" shall mean the applicable Conversion Price in effect immediately prior to such issuance or deemed issuance of Additional Shares of Common Stock;

(c) "A" shall mean the number of shares of Common Stock outstanding immediately prior to such issuance or deemed issuance of Additional Shares of Common Stock (treating for this purpose as outstanding all shares of Common Stock issuable upon exercise of Options outstanding immediately prior to such issuance or deemed issuance or upon conversion or exchange of Convertible Securities (including the Preferred Stock) outstanding (assuming exercise of any outstanding Options therefor) immediately prior to such issue);

(d) "B" shall mean the number of shares of Common Stock that would have been issued or deemed issued if such Additional Shares of Common Stock had been issued at a price per share equal to CP1 (determined by dividing the aggregate consideration received by the Corporation in respect of such issue by CP_1); and

(e) "C" shall mean the number of such Additional Shares of Common Stock issued in such transaction.

4.4.5 Determination of Consideration. For purposes of this Subsection 4.4, the consideration received by the Corporation for the issuance or deemed issuance of any Additional Shares of Common Stock shall be computed as follows:

(a) Cash and Property: Such consideration shall:

(i) insofar as it consists of cash, be computed at the aggregate amount of cash received by the Corporation, excluding amounts paid or payable for accrued interest;

(ii) insofar as it consists of property other than cash, be computed at the fair market value thereof at the time of such issue, as determined in good faith by the Board of Directors of the Corporation; and

(iii) in the event Additional Shares of Common Stock are issued together with other shares or securities or other assets of the Corporation for consideration which covers both, be the proportion of such consideration so received, computed as provided in clauses (i) and (ii) above, as determined in good faith by the Board of Directors of the Corporation.

(b) Options and Convertible Securities. The consideration per share received by the Corporation for Additional Shares of Common Stock deemed to have been issued pursuant to Subsection 4.4.3, relating to Options and Convertible Securities, shall be determined by dividing:

(i) The total amount, if any, received or receivable by the Corporation as consideration for the issue of such Options or Convertible Securities, plus the minimum aggregate amount of additional consideration (as set forth in the instruments relating thereto, without regard to any provision contained therein for a subsequent adjustment of such consideration) payable to the Corporation upon the exercise of such Options or the conversion or exchange of such Convertible Securities, or in the case of Options for Convertible Securities, the exercise of such Options for Convertible Securities and the conversion or exchange of such Convertible Securities, by

(ii) the maximum number of shares of Common Stock (as set forth in the instruments relating thereto, without regard to any provision contained therein for a subsequent adjustment of such number) issuable upon the exercise of such Options or the conversion or exchange of such Convertible Securities, or in the case of Options for Convertible Securities, the exercise of such Options for Convertible Securities and the conversion or exchange of such Convertible Securities.

4.4.6 Multiple Closing Dates. In the event the Corporation shall issue on more than one date Additional Shares of Common Stock that are a part of one transaction or a series of related transactions and that would result in an adjustment to the Conversion Price of a series of Preferred Stock pursuant to the terms of Subsection 4.4.4, then, upon the final such issuance, the applicable Conversion Price shall be readjusted to give effect to all such issuances as if they occurred on the date of the first such issuance (and without giving effect to any additional adjustments as a result of any such subsequent issuances within such period).

4.5 Adjustment for Stock Splits and Combinations. If the Corporation shall at any time or from time to time after the Original Issue Date effect a subdivision of the outstanding Common Stock, each Conversion Price in effect immediately before that subdivision shall be proportionately decreased so that the number of shares of Common Stock issuable on conversion of each share of such series shall be increased in proportion to such increase in the aggregate number of shares of Common Stock outstanding. If the Corporation shall at any time or from time to time after the Original Issue Date combine the outstanding shares of Common Stock, each Conversion Price in effect immediately before the combination shall be proportionately increased so that the number of shares of Common Stock issuable on conversion of each share of such series shall be decreased in proportion to such decrease in the aggregate number of shares of Common Stock outstanding. Any adjustment under this subsection shall become effective at the close of business on the date the subdivision or combination becomes effective.

4.6 Adjustment for Certain Dividends and Distributions. In the event the Corporation at any time or from time to time after the Original Issue Date shall make or issue, or fix a record date for the determination of holders of Common Stock entitled to receive, a dividend or other distribution payable on the Common Stock in additional shares of Common Stock, then and in each such event each Conversion Price in effect immediately before such event shall be decreased as of the time of such issuance or, in the event such a record date shall have been fixed, as of the close of business on such record date, by multiplying each Conversion Price then in effect by a fraction:

(1) the numerator of which shall be the total number of shares of Common Stock issued and outstanding immediately prior to the time of such issuance or the close of business on such record date, and

(2) the denominator of which shall be the total number of shares of Common Stock issued and outstanding immediately prior to the time of such issuance or the close of business on such record date plus the number of shares of Common Stock issuable in payment of such dividend or distribution.

Notwithstanding the foregoing (a) if such record date shall have been fixed and such dividend is not fully paid or if such distribution is not fully made on the date fixed therefor, each Conversion Price shall be recomputed accordingly as of the close of business on such record date and thereafter each Conversion Price shall be adjusted pursuant to this subsection as of the time of actual payment of such dividends or distributions; and (b) that no such adjustment shall be made if the holders of Preferred Stock simultaneously receive a dividend or other distribution of shares of Common Stock in a number equal to the number of shares of Common Stock as they would have received if all outstanding shares of Preferred Stock had been converted into Common Stock on the date of such event.

4.7 Adjustments for Other Dividends and Distributions. In the event the Corporation at any time or from time to time after the Original Issue Date shall make or issue, or fix a record date for the determination of holders of Common Stock entitled to receive, a dividend or other distribution payable in securities of the Corporation (other than a distribution of shares of Common Stock in respect of outstanding shares of Common Stock) or in other property and the provisions of Section 1 do not apply to such dividend or distribution, then and in each such event the holders of Preferred Stock shall receive on a *pari passu* basis, simultaneously with the distribution to the holders of Common Stock, a dividend or other distribution of such securities or other property in an amount equal to the amount of such securities or other property as they would have received if all outstanding shares of Preferred Stock had been converted into Common Stock on the date of such event.

4.8 Adjustment for Merger or Reorganization, etc. Subject to the provisions of Subsection 2.3, if there shall occur any reorganization, recapitalization, reclassification, consolidation or merger involving the Corporation in which the Common Stock (but not the Preferred Stock) is converted into or exchanged for securities, cash or other property (other than a transaction covered by Subsections 4.4, 4.6 or 4.7), then, following any such reorganization, recapitalization, reclassification, consolidation or merger, each share of Preferred Stock shall thereafter be convertible in lieu of the Common Stock into which it was convertible prior to such event into the kind and amount of securities, cash or other property which a holder of the number of shares of Common Stock of the Corporation issuable upon conversion of one share of Preferred Stock immediately prior to such reorganization, recapitalization, reclassification, consolidation or merger would have been entitled to receive pursuant to such transaction; and, in such case, appropriate adjustment (as determined in good faith by the Board of Directors (or following a consolidation, merger or other similar transaction, the board of directors of the ultimate parent of the Corporation)) shall be made in the application of the provisions in this Section 4 with respect to the rights and interests thereafter of the holders of the Preferred Stock, to the end that the provisions set forth in this Section 4 (including provisions with respect to changes in and other adjustments of a Conversion Price) shall thereafter be applicable, as nearly as reasonably may be, in relation to any securities or other property thereafter deliverable upon the conversion of the Preferred Stock. For the avoidance of doubt, nothing in this Subsection 4.8 shall be construed as preventing the holders of Preferred Stock from seeking any appraisal rights to which they are otherwise entitled under the DGCL in connection with a merger triggering an adjustment hereunder, nor shall this Subsection 4.8 be deemed conclusive evidence of the fair value of the shares of Preferred Stock in any such appraisal proceeding.

4.9 Certificate as to Adjustments. Upon the occurrence of each adjustment or readjustment of the Conversion Price of a series of Preferred Stock pursuant to this Section 4, the Corporation at its expense shall, as promptly as reasonably practicable but in any event not later than fifteen (15) days thereafter, compute such adjustment or readjustment in accordance with the terms hereof and notify each holder of Preferred Stock of such adjustment or readjustment (including the kind and amount of securities, cash or other property into which the Preferred Stock is convertible) and showing in detail the facts upon which such adjustment or readjustment is based. The Corporation shall, as promptly as reasonably practicable after the written request at any time of any holder of Preferred Stock (but in any event not later than ten (10) days thereafter), furnish or cause to be furnished to such holder a certificate setting forth (i) the Conversion Price then in effect, and (ii) the number of shares of Common Stock and the amount, if any, of other securities, cash or property which then would be received upon the conversion of such Preferred Stock.

4.10 Notice of Record Date. In the event:

(a) the Corporation shall take a record of the holders of its Common Stock (or other capital stock or securities at the time issuable upon conversion of the Preferred Stock) for the purpose of entitling or enabling them to receive any dividend or other distribution, or to receive any right to subscribe for or purchase any shares of capital stock of any class or any other securities, or to receive any other security; or

(b) of any capital reorganization of the Corporation, any reclassification of the Common Stock of the Corporation, or any Deemed Liquidation Event; or

(c) of the voluntary or involuntary dissolution, liquidation orwinding-up of the Corporation,

then, and in each such case, the Corporation will send or cause to be sent to the holders of the Preferred Stock a notice specifying, as the case may be, (i) the record date for such dividend, distribution or right, and the amount and character of such dividend, distribution or right, or (ii) the effective date on which such reorganization, reclassification, consolidation, merger, transfer, dissolution, liquidation or winding-up is proposed to take place, and the time, if any is to be fixed, as of which the holders of record of Common Stock (or such other capital stock or securities at the time issuable upon the conversion of the Preferred Stock) shall be entitled to exchange their shares of Common Stock (or such other capital stock or securities) for securities or other property deliverable upon such reorganization, reclassification, consolidation, merger, transfer, dissolution, liquidation or winding-up, and the amount per share and character of such exchange applicable to the Preferred Stock and the Common Stock. Such notice shall be sent at least ten (10) days prior to the record date or effective date for the event specified in such notice.

5. Mandatory Conversion.

5.1 Trigger Events. Upon either (a) the closing of the sale of shares of Common Stock to the public at a price of at least $12.15 per share (subject to appropriate adjustment in the event of any stock dividend, stock split, combination or other similar recapitalization with respect to the Common Stock), in a firm-commitment underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended, resulting in at least $50,000,000 of gross proceeds to the Corporation and in connection with such offering the Common Stock is listed for trading on the Nasdaq Stock Market's Global Market, the New York Stock Exchange or another nationally recognized exchange approved the Board of Directors, including the approval of at least one of the Preferred Directors (a "**Qualified Public Offering**"), or (b) the date and time, or the occurrence of an event, specified by vote or written consent of the Requisite Series A Holders and the Requisite Series B Holders (as defined below) (the time of such closing or the date and time specified or the time of the event specified in such vote or written consent is referred to herein as the "**Mandatory Conversion Time**"), then (i) all outstanding shares of Preferred Stock shall automatically be converted into shares of Common Stock, at the then effective Conversion Price as calculated pursuant to Subsection 4.1.1 and (ii) such shares may not be reissued by the Corporation. Notwithstanding the foregoing, if, following the closing of a public offering, including a Qualified Public Offering, a conversion pursuant to this Subsection 5.1 would result in the holder(s) of Preferred Stock beneficially owning (for purposes of Section 13(d) of the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder (collectively, the "**Exchange Act**")), when aggregated with affiliates with whom such holder is required to aggregate beneficial ownership for purposes of Section 13(d) of the Exchange Act, in excess of the Beneficial Ownership Limitation, then, for purposes of this Subsection 5.1, at such holder(s) election by written notice delivered to the Corporation within thirty (30) days prior to the closing of such public offering or Qualified Public Offering, all or a portion of such holder(s) outstanding shares of Preferred Stock, as so elected by such holder, shall automatically be converted, at the then effective Conversion Price as calculated pursuant to

Subsection 4.1.1, into a class of shares of common stock of the Corporation, which shares shall have the same rights and preferences as the Common Stock but shall be non-voting (which such class of non-voting common stock shall be convertible into shares of voting Common Stock, at the election of the holder thereof, provided that immediately prior to or as a result of such conversion, the holder, when aggregated with affiliates with whom such holder is required to aggregate beneficial ownership for purposes of Section 13(d) of the Exchange Act, does not beneficially own shares in excess of the Beneficial Ownership Limitation), except as otherwise provided by law or this Certificate of Incorporation. The "**Beneficial Ownership Limitation**" means initially 4.99% of any class of securities of the Corporation registered under the Exchange Act, which percentage may be increased or decreased to such other percentage as any holder of outstanding shares of Preferred Stock may designate in writing upon 61 days' notice to the Corporation, *provided*, *however*, that no holder may make such an election to change the percentage unless all holders managed by the same investment advisor as such electing holder make the same election.

As used herein, "**Requisite Series B Holders**" means at least one of the following four holders of the Corporation's Series B Preferred Stock: (i) Deerfield Private Design Fund IV, L.P. and Deerfield Special Situations Fund, L.P. acting together (collectively "**Deerfield**"), for so long as Deerfield and its affiliates continue to own at least three percent (3%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock), (ii) Boxer Capital, LLC and MVA Investors, LLC acting together (collectively, "**Boxer**"), for so long as Boxer and its affiliates continue to own at least three percent (3%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock), (iii) Redmile Biopharma Investments I, L.P. and RAF, L.P. acting together (collectively "**Redmile**"), for so long as Redmile and its affiliates continue to own at least three percent (3%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock), and (iv) Cormorant Private Healthcare Fund II, LP, Cormorant Global Healthcare Master Fund, LP, and CRMA SPV, LP acting together (collective, "**Cormorant**") for so long as Cormorant and its affiliates continue to own at least one percent (1%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock). For purposes of clarification, if at any time (i) none of Deerfield, Boxer and Redmile, each together with its respective affiliates, owns at least three percent (3%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock) and (ii) Cormorant, together with its affiliates, ceases to own at least one percent (1%) of the then outstanding shares of Common Stock (including shares of Common Stock issued or issuable upon conversion of the Preferred Stock), neither the vote nor written consent of the Requisite Series B Holders will be required pursuant to clause (b) of this Subsection 5.1. The rights of the Requisite Series B Holders provided in clause (b) of this Subsection 5.1 and this paragraph may not be amended, altered, repealed, or waived (directly or indirectly by amendment, merger, consolidation or otherwise) without the prior written consent of the Requisite Series B Holders.

5.2 Procedural Requirements. All holders of record of shares of Preferred Stock shall be sent written notice of the Mandatory Conversion Time and the place designated for mandatory conversion of all such shares of Preferred Stock pursuant to this Section 5. Such notice need not be sent in advance of the occurrence of the Mandatory Conversion Time, provided that, in connection with a Qualified Public Offering, the Corporation

shall provide notice to the holders of record of shares of Preferred Stock at least 30 days prior to the effectiveness of any registration statement with respect thereto. Upon receipt of such notice, each holder of shares of Preferred Stock in certificated form shall surrender his, her or its certificate or certificates for all such shares (or, if such holder alleges that such certificate has been lost, stolen or destroyed, a lost certificate affidavit and agreement reasonably acceptable to the Corporation to indemnify the Corporation against any claim that may be made against the Corporation on account of the alleged loss, theft or destruction of such certificate) to the Corporation in the manner and at the place reasonably designated in such notice. If so required by the Corporation, any certificates surrendered for conversion shall be endorsed or accompanied by written instrument or instruments of transfer, in form reasonably satisfactory to the Corporation, duly executed by the registered holder or by his, her or its attorney duly authorized in writing. All rights with respect to the Preferred Stock converted pursuant to Subsection 5.1, including the rights, if any, to receive notices and vote (other than as a holder of Common Stock), will terminate at the Mandatory Conversion Time (notwithstanding the failure of the holder or holders thereof to surrender any certificates at or prior to such time), except only the rights of the holders thereof, upon surrender of any certificate or certificates of such holders (or lost certificate affidavit and agreement) therefor, to receive the items provided for in the next sentence of this Subsection 5.2. As soon as practicable after the Mandatory Conversion Time and, if applicable, the surrender of any certificate or certificates (or lost certificate affidavit and agreement) for Preferred Stock, the Corporation shall (a) issue and deliver to such holder, or to his, her or its nominees, a certificate or certificates for the number of full shares of Common Stock issuable on such conversion in accordance with the provisions hereof and (b) pay cash as provided in Subsection 4.2 in lieu of any fraction of a share of Common Stock otherwise issuable upon such conversion and the payment of any declared but unpaid dividends on the shares of Preferred Stock converted. Such converted Preferred Stock shall be retired and cancelled and may not be reissued as shares of such series, and the Corporation may thereafter take such appropriate action (without the need for stockholder action) as may be necessary to reduce the authorized number of shares of the applicable series of Preferred Stock accordingly.

6. Redemption. Except as expressly set forth inSection 2.3 above, the Preferred Stock is not redeemable at the option of the holder thereof.

7. Redeemed or Otherwise Acquired Shares. Any shares of Preferred Stock that are redeemed or otherwise acquired by the Corporation or any of its subsidiaries shall be automatically and immediately cancelled and retired and shall not be reissued, sold or transferred. Neither the Corporation nor any of its subsidiaries may exercise any voting or other rights granted to the holders of Preferred Stock following redemption.

8. Waiver. Any of the rights, powers, preferences and other terms of the Series A Preferred Stock set forth herein may be waived on behalf of all holders of Series A Preferred Stock by the affirmative written consent or vote of the holders of at least a majority of the shares of Series A Preferred Stock then outstanding. Any of the rights, powers, preferences and other terms of the Series A-1 Preferred Stock set forth herein may be waived on behalf of all holders of Series A-1 Preferred Stock by the affirmative written consent or vote of the holders of at least a majority of the shares of SeriesA-1 Preferred Stock then outstanding. Any of the rights, powers, preferences and other terms of the Series A-2 Preferred Stock set forth herein may be waived on behalf of all holders of Series A-2 Preferred Stock by the affirmative written consent of the holders of at least a majority of the shares of SeriesA-2 Preferred Stock then outstanding. Any of the rights, powers, preferences and other terms of the Series B Preferred Stock set forth herein may be waived on behalf of all holders of Series B Preferred Stock by the affirmative written consent of the holders of at least a majority of the shares of Series B Preferred Stock then outstanding.

9. Notices. Any notice required or permitted by the provisions of this Article Fourth to be given to a holder of shares of Preferred Stock shall be mailed, postage prepaid, to the post office address last shown on the records of the Corporation, or given by electronic communication in compliance with the provisions of the General Corporation Law, and shall be deemed sent upon such mailing or electronic transmission.

FIFTH: Subject to any additional vote required by this Certificate of Incorporation or Bylaws, in furtherance and not in limitation of the powers conferred by statute, the Board of Directors is expressly authorized to make, repeal, alter, amend and rescind any or all of the Bylaws of the Corporation.

SIXTH: Subject to any additional vote required by this Certificate of Incorporation, the number of directors of the Corporation shall be determined in the manner set forth in the Bylaws of the Corporation. Each director shall be entitled to one vote on each matter presented to the Board of Directors; provided, however, that, so long as the holders of Preferred Stock are entitled to elect the Preferred Directors, the affirmative vote of at least one the Preferred Directors shall be required for the authorization by the Board of Directors of any of the matters set forth in Section 5.3 of the Amended and Restated Investors' Rights Agreement, dated on or about January 2, 2019, by and among the Corporation and the other parties thereto, as such agreement may be amended from time to time.

SEVENTH: Elections of directors need not be by written ballot unless the Bylaws of the Corporation shall so provide.

EIGHTH: Meetings of stockholders may be held within or without the State of Delaware, as the Bylaws of the Corporation may provide. The books of the Corporation may be kept outside the State of Delaware at such place or places as may be designated from time to time by the Board of Directors or in the Bylaws of the Corporation.

NINTH: To the fullest extent permitted by law, a director of the Corporation shall not be personally liable to the Corporation or its stockholders for monetary damages for breach of fiduciary duty as a director. If the General Corporation Law or any other law of the State of Delaware is amended after approval by the stockholders of this Article Ninth to authorize corporate action further eliminating or limiting the personal liability of directors, then the liability of a director of the Corporation shall be eliminated or limited to the fullest extent permitted by the General Corporation Law as so amended.

Any repeal or modification of the foregoing provisions of this Article Ninth by the stockholders of the Corporation shall not adversely affect any right or protection of a director of the Corporation existing at the time of, or increase the liability of any director of the Corporation with respect to any acts or omissions of such director occurring prior to, such repeal or modification.

TENTH: The following indemnification provisions shall apply to the persons enumerated below.

1. Right to Indemnification of Directors and Officers. The Corporation shall indemnify and hold harmless, to the fullest extent permitted by applicable law as it presently exists or may hereafter be amended, any person (an "**Indemnified Person**") who was or is made or is threatened to be made a party or is otherwise involved in any action, suit or proceeding, whether civil, criminal, administrative or investigative (a "**Proceeding**"), by reason of the fact that such person, or a person for whom such person is the legal representative, is or was a director or officer of the Corporation or, while a director or officer of the Corporation, is or was serving at the request of the Corporation as a director, officer, employee or agent of another corporation or of a partnership, joint venture, limited liability company, trust, enterprise or nonprofit entity, including service with respect to employee benefit plans, against all liability and loss suffered and expenses (including attorneys' fees) reasonably incurred by such Indemnified Person in such Proceeding. Notwithstanding the preceding sentence, except as otherwise provided in Section 3 of this Article Tenth the Corporation shall be required to indemnify an Indemnified Person in connection with a Proceeding (or part thereof) commenced by such Indemnified Person only if the commencement of such Proceeding (or part thereof) by the Indemnified Person was authorized in advance by the Board of Directors.

2. Prepayment of Expenses of Directors and Officers. The Corporation shall pay the expenses (including attorneys' fees) incurred by an Indemnified Person in defending any Proceeding in advance of its final disposition, provided, however, that, to the extent required by law, such payment of expenses in advance of the final disposition of the Proceeding shall be made only upon receipt of an undertaking by the Indemnified Person to repay all amounts advanced if it should be ultimately determined that the Indemnified Person is not entitled to be indemnified under this Article Tenth or otherwise.

3. Claims by Directors and Officers. If a claim for indemnification or advancement of expenses under this Article Tenth is not paid in full within thirty (30) days after a written claim therefor by the Indemnified Person has been received by the Corporation, the Indemnified Person may file suit to recover the unpaid amount of such claim and, if successful in whole or in part, shall be entitled to be paid the expense of prosecuting such claim. In any such action the Corporation shall have the burden of proving that the Indemnified Person is not entitled to the requested indemnification or advancement of expenses under applicable law.

4. Indemnification of Employees and Agents. The Corporation may indemnify and advance expenses to any person who was or is made or is threatened to be made or is otherwise involved in any Proceeding by reason of the fact that such person, or a person for whom such person is the legal representative, is or was an employee or agent of the Corporation or, while an employee or agent of the Corporation, is or was serving at the request of the Corporation as a director, officer, employee or agent of another corporation or of a partnership, joint venture, limited liability company, trust, enterprise or nonprofit entity, including service with respect to employee benefit plans, against all liability and loss suffered and expenses (including attorneys' fees) reasonably incurred by such person in connection with such Proceeding. The ultimate determination of entitlement to indemnification of persons who are non-director or officer employees or agents shall be made in such manner as is determined by the Board of Directors in its sole discretion. Notwithstanding the foregoing sentence, the Corporation shall not be required to indemnify a person in connection with a Proceeding initiated by such person if the Proceeding was not authorized in advance by the Board of Directors.

5. Advancement of Expenses of Employees and Agents. The Corporation may pay the expenses (including attorneys' fees) incurred by an employee or agent in defending any Proceeding in advance of its final disposition on such terms and conditions as may be determined by the Board of Directors.

6. Non-Exclusivity of Rights. The rights conferred on any person by this Article Tenth shall not be exclusive of any other rights which such person may have or hereafter acquire under any statute, provision of this Certificate of Incorporation, the Bylaws of the Corporation, or any agreement, or pursuant to any vote of stockholders or disinterested directors or otherwise.

7. Other Indemnification. The Corporation's obligation, if any, to indemnify any person who was or is serving at its request as a director, officer or employee of another corporation, partnership, limited liability company, joint venture, trust, organization or other enterprise shall be reduced by any amount such person may collect as indemnification from such other corporation, partnership, limited liability company, joint venture, trust, organization or other enterprise.

8. Insurance. The Board of Directors may, to the full extent permitted by applicable law as it presently exists, or may hereafter be amended from time to time, authorize an appropriate officer or officers to purchase and maintain at the Corporation's expense insurance: (a) to indemnify the Corporation for any obligation which it incurs as a result of the indemnification of directors, officers and employees under the provisions of this Article Tenth; and (b) to indemnify or insure directors, officers and employees against liability in instances in which they may not otherwise be indemnified by the Corporation under the provisions of this Article Tenth.

9. Amendment or Repeal. Any repeal or modification of the foregoing provisions of this Article Tenth shall not adversely affect any right or protection hereunder of any person in respect of any act or omission occurring prior to the time of such repeal or modification. The rights provided hereunder shall inure to the benefit of any Indemnified Person and such person's heirs, executors and administrators.

ELEVENTH: The Corporation renounces, to the fullest extent permitted by law, any interest or expectancy of the Corporation in, or in being offered an opportunity to participate in, any Excluded Opportunity. An "**Excluded Opportunity**" is any matter, transaction or interest that is presented to, or acquired, created or developed by, or which otherwise comes into the possession of (i) any director of the Corporation who is not an employee of the Corporation or any of its subsidiaries, or (ii) any holder of Preferred Stock or any partner, member, director, stockholder, employee, affiliate or agent of any such holder, other than someone who is an employee of the Corporation or any of its subsidiaries (collectively, "**Covered Persons**"), unless such matter, transaction or interest is presented to, or acquired, created or developed by, or otherwise comes into the possession of, a Covered Person expressly and solely in such Covered Person's capacity as a director of the Corporation while such Covered Person is performing services in such capacity.

TWELFTH: Unless the Corporation consents in writing to the selection of an alternative forum, the Court of Chancery in the State of Delaware shall be the sole and exclusive forum for any stockholder (including a beneficial owner) to bring (i) any derivative action or proceeding brought on behalf of the Corporation, (ii) any action asserting a claim of breach of fiduciary duty owed by any director, officer or other employee of the Corporation to the Corporation or the Corporation's stockholders, (iii) any action asserting a claim against the Corporation, its directors, officers or employees arising pursuant to any provision of the Delaware General Corporation Law or the Corporation's certificate of incorporation or bylaws or (iv) any action asserting a claim against the Corporation, its directors, officers or employees governed by the internal affairs doctrine, except for, as to each of (i) through (iv) above, any claim as to which the Court of Chancery determines that there is an indispensable party not subject to the jurisdiction of the Court of Chancery (and the indispensable party does not consent to the personal jurisdiction of the Court of Chancery within ten days following such determination), which is vested in the exclusive jurisdiction of a court or forum other than the Court of Chancery, or for which the Court of Chancery does not have subject matter jurisdiction. If any provision or provisions of this Article Twelfth shall be held to be invalid, illegal or unenforceable as applied to any person or entity or circumstance for any reason whatsoever, then, to the fullest extent permitted by law, the validity, legality and enforceability of such provisions in any other circumstance and of the remaining provisions of this Article Twelfth (including, without limitation, each portion of any sentence of this Article Twelfth containing any such provision held to be invalid, illegal or unenforceable that is not itself held to be invalid, illegal or unenforceable) and the application of such provision to other persons or entities and circumstances shall not in any way be affected or impaired thereby.

* * *

4. That the foregoing amendment and restatement was approved by the holders of the requisite number of shares of this Corporation in accordance with Section 228 of the General Corporation Law.

5. That this Certificate of Incorporation, which restates and integrates and further amends the provisions of this Corporation's Certificate of Incorporation, has been duly adopted in accordance with Sections 242 and 245 of the General Corporation Law.

IN WITNESS WHEREOF, this Amended and Restated Certificate of Incorporation has been executed by a duly authorized officer of this corporation on this 2nd day of January, 2019.

By: /s/ Steven Nichtberger
Steven Nichtberger, President and CEO

Exhibit 3.3

BYLAWS

OF

TYCHO THERAPEUTICS, INC.

(the "Corporation")

1. **MEETINGS OF STOCKHOLDERS**.

1.1 Annual Meeting. If required by applicable law, an annual meeting of stockholders shall be held for the election of directors at such date, time and place, if any, either within or without the State of Delaware, as may be designated by resolution of the Board of Directors from time to time. Any other proper business may be transacted at the annual meeting.

1.2 Special Meetings. Special meetings of stockholders for any purpose or purposes may be called at any time by the Board of Directors, but such special meetings may not be called by any other person or persons. Business transacted at any special meeting of stockholders shall be limited to the purposes stated in the notice.

1.3 Notice of Meetings. Whenever stockholders are required or permitted to take any action at a meeting, a notice of the meeting shall be given that shall state the place, if any, date and hour of the meeting and, in the case of a special meeting, the purpose or purposes for which the meeting is called. Unless otherwise provided by law, the Certificate of Incorporation or these Bylaws, the notice of any meeting shall be given not less than ten (10) nor more than sixty (60) days before the date of the meeting to each stockholder entitled to vote at such meeting. If mailed, such notice shall be deemed to be given when deposited in the United States mail, postage prepaid, directed to the stockholder at such stockholder's address as it appears on the records of the Corporation.

1.4 Adjournments. Any meeting of stockholders, annual or special, may adjourn from time to time to reconvene at the same or some other place and notice need not be given of any such adjourned meeting if the time and place thereof are announced at the meeting at which the adjournment is taken. At the adjourned meeting the Corporation may transact any business which might have been transacted at the original meeting. If the adjournment is for more than thirty (30) days, or if after the adjournment a new record date is fixed for the adjourned meeting, notice of the adjourned meeting shall be given to each stockholder of record entitled to vote at the meeting.

1.5 Quorum. Except as otherwise provided by law, the Certificate of Incorporation or these Bylaws, at each meeting of stockholders the presence in person or by proxy of the holders of a majority in voting power of the outstanding shares of stock entitled to vote at the meeting shall be necessary and sufficient to constitute a quorum. In the absence of a quorum, the stockholders so present may, by a majority in voting power thereof, adjourn the meeting from time to time in the manner provided in Section 1.4 until a quorum shall attend. At any such adjourned meeting at which the requisite amount of stock entitled to vote shall be represented, any business may be transacted which might have been transacted at the meeting as originally noticed; but only those stockholders entitled to vote at the meeting as originally noticed shall be entitled to vote at any adjournment or adjournments thereof.

1.6 Organization. Meetings of stockholders shall be presided over by the Chairperson of the Board, if any, or in his or her absence by the Vice Chairperson of the Board, if any, or in his or her absence by the President, or in his or her absence by a Vice President, or in the absence of the foregoing persons by a chairperson designated by the Board of Directors, or in the absence of such designation by a chairperson chosen at the meeting. The Secretary of the Corporation shall act as secretary of the meeting, but in his or her absence the chairperson of the meeting may appoint any person to act as secretary of the meeting.

1.7 Voting; Proxies. Except as otherwise provided by or pursuant to the provisions of the Certificate of Incorporation, each stockholder entitled to vote at any meeting of stockholders shall be entitled to one vote for each share of stock held by such stockholder which has voting power upon the matter in question. Each stockholder entitled to vote at a meeting of stockholders or to express consent to corporate action in writing without a meeting may authorize another person or persons to act for such stockholder by proxy, but no such proxy shall be voted or acted upon after three (3) years from its date, unless the proxy provides for a longer period. A proxy shall be irrevocable if it states that it is irrevocable and if, and only as long as, it is coupled with an interest sufficient in law to support an irrevocable power. A stockholder may revoke any proxy which is not irrevocable by attending the meeting and voting in person or by delivering to the Secretary of the Corporation a revocation of the proxy or a new proxy bearing a later date. Voting at meetings of stockholders need not be by written ballot. At all meetings of stockholders for the election of directors at which a quorum is present a plurality of the votes cast shall be sufficient to elect. All other elections and questions presented to the stockholders at a meeting at which a quorum is present shall, unless otherwise provided by the Certificate of Incorporation, these Bylaws, the rules or regulations of any stock exchange applicable to the Corporation, or applicable law or pursuant to any regulation applicable to the Corporation or its securities, be decided by the affirmative vote of the holders of a majority in voting power of the shares of stock of the Corporation which are present in person or by proxy and entitled to vote thereon.

1.8 Fixing Date For Determination of Stockholders of Record. In order that the Corporation may determine the stockholders entitled to notice of or to vote at any meeting of stockholders or any adjournment thereof, or to express consent to corporate action in writing without a meeting, or entitled to receive payment of any dividend or other distribution or allotment of any rights, or entitled to exercise any rights in respect of any change, conversion or exchange of stock, or for the purpose of any other lawful action, the Board of Directors may fix a record date, which record date shall not precede the date upon which the resolution fixing the record date is adopted by the Board of Directors, and which record date: (1) in the case of determination of stockholders entitled to vote at any meeting of stockholders or adjournment thereof, shall, unless otherwise required by law, not be more than sixty (60) nor less than ten (10) days before the date of such meeting; (2) in the case of determination of stockholders entitled to express consent to corporate action in writing without a meeting, shall not be more than ten (10) days from the date upon which the resolution fixing the record date is adopted by the Board of

Directors; and (3) in the case of any other action, shall not be more than sixty (60) days prior to such other action. If no record date is fixed: (1) the record date for determining stockholders entitled to notice of or to vote at a meeting of stockholders shall be at the close of business on the day preceding the day on which notice is given or, if notice is waived, at the close of business on the day preceding the day on which the meeting is held; (2) the record date for determining stockholders entitled to express consent to corporate action in writing without a meeting, when no prior action of the Board of Directors is required by law, shall be the first date on which a signed written consent setting forth the action taken or proposed to be taken is delivered to the Corporation in accordance with applicable law or, if prior action by the Board of Directors is required by law, shall be at the close of business on the day on which the Board of Directors adopts the resolution taking such prior action; and (3) the record date for determining stockholders for any other purpose shall be at the close of business on the day on which the Board of Directors adopts the resolution relating thereto. A determination of stockholders of record entitled to notice of or to vote at a meeting of stockholders shall apply to any adjournment of the meeting; provided, however, that the Board of Directors may fix a new record date for any adjourned meeting.

1.9 Action by Written Consent of Stockholders. Any action required or permitted to be taken at any meeting of stockholders may be taken without a meeting, without prior notice and without a vote, if a consent in writing, setting forth the action so taken, shall be signed by the holders of outstanding stock having not fewer than the minimum number of votes that would be necessary to authorize or take such action at a meeting at which all shares entitled to vote thereon were present and voting. Prompt notice of the taking of any such action shall be given to those stockholders who did not consent in writing.

2. **BOARD OF DIRECTORS**.

2.1 Number, Qualification. The business, property, and affairs of the Corporation shall be managed by or under the direction of a Board of Directors. The Board of Directors shall consist of one (1) or more members, the number thereof to be determined from time to time by resolution of the Board of Directors. Directors need not be stockholders.

2.2 Election; Resignation; Vacancies. The Board of Directors shall initially consist of the persons named as directors in the Certificate of Incorporation or elected by the incorporator of the Corporation and each director so elected shall hold office until the first annual meeting of stockholders or until his or her successor is duly elected and qualified. At the first annual meeting of stockholders and at each annual meeting thereafter, the stockholders shall elect directors each of whom shall hold office for a term of one year or until his or her successor is duly elected and qualified, subject to such director's earlier death, resignation, disqualification or removal. Any director may resign at any time upon notice to the Corporation. Unless otherwise provided by law or the Certificate of Incorporation, any newly created directorship or any vacancy occurring in the Board of Directors for any cause may be filled by a majority of the remaining members of the Board of Directors, although such majority is less than a quorum, or by a plurality of the votes cast at a meeting of stockholders, and each director so elected shall hold office until the next annual meeting of stockholders or until his or her successor is elected and qualified.

2.3 Regular Meetings. Regular meetings of the Board of Directors may be held at such places within or without the State of Delaware and at such times as the Board of Directors may from time to time determine.

2.4 Special Meetings. Special meetings of the Board of Directors may be held at any time or place within or without the State of Delaware whenever called by the President, any Vice President, the Secretary of the Corporation or by any member of the Board of Directors. Notice of a special meeting of the Board of Directors shall be given by the person or persons calling the meeting at least twenty-four hours before the special meeting.

2.5 Telephonic Meetings Permitted. Members of the Board of Directors, or any committee designated by the Board of Directors, may participate in a meeting thereof by means of conference telephone or other communications equipment by means of which all persons participating in the meeting can hear each other and such participation in a meeting shall constitute presence in person at such meeting.

2.6 Quorum, Vote Required For Action. At all meetings of the Board of Directors, the directors entitled to cast a majority of the votes of the whole Board of Directors shall constitute a quorum for the transaction of business. Except in cases in which the Certificate of Incorporation, these Bylaws or applicable law otherwise provides, a majority of the votes entitled to be cast by the directors present at a meeting at which a quorum is present shall be the act of the Board of Directors.

2.7 Organization. Meetings of the Board of Directors shall be presided over by the Chairperson of the Board, if any, or in his or her absence by the Vice Chairperson of the Board, if any, or in their absence by a chairperson chosen at the meeting. The Secretary of the Corporation shall act as secretary of the meeting, but in his or her absence the chairperson of the meeting may appoint any person to act as secretary of the meeting.

2.8 Action by Unanimous Consent of Directors. Unless otherwise restricted by the Certificate of Incorporation or these Bylaws, any action required or permitted to be taken at any meeting of the Board of Directors, or of any committee thereof, may be taken without a meeting if all members of the Board of Directors or such committee, as the case may be, consent thereto in writing or by electronic transmission and the writing(s) or electronic transmission(s) are filed with the minutes of proceedings of the Board of Directors or such committee in accordance with applicable law.

3. COMMITTEES.

3.1 Committees. The Board of Directors may designate one or more committees, each committee to consist of one or more of the directors of the Corporation. The Board of Directors may designate one or more directors as alternate members of any committee, who may replace any absent or disqualified member at any meeting of the committee. In the absence or disqualification of a member of the committee, the member or members thereof present at any meeting and not disqualified from voting, whether or not he, she or they constitute

a quorum, may unanimously appoint another member of the Board of Directors to act at the meeting in place of any such absent or disqualified member. Any such committee, to the extent permitted by law and to the extent provided in the resolution of the Board of Directors, shall have and may exercise all the powers and authority of the Board of Directors in the management of the business and affairs of the Corporation and may authorize the seal of the Corporation to be affixed to all papers which may require it.

3.2 Committee Rules. Unless the Board of Directors otherwise provides, each committee designated by the Board of Directors may make, alter and repeal rules for the conduct of its business. In the absence of such rules, each committee shall conduct its business in the same manner as the Board of Directors conducts its business pursuant to Article II of these Bylaws.

4. **OFFICERS.**

4.1 Officers; Elections; Term of Office; Resignation, Removal, Vacancies The Board of Directors shall elect a President and Secretary and it may, if it so determines, choose a Chairperson of the Board and a Vice Chairperson of the Board from among its members. The Board of Directors may also choose one or more Vice Presidents, one or more Assistant Secretaries, a Treasurer and one or more Assistant Treasurers and such other officers as it shall from time to time deem necessary or desirable. Each such officer shall hold office until the first meeting of the Board of Directors after each annual meeting and until his or her successor is elected and qualified or until his or her earlier resignation or removal. Any officer may resign at any time upon written notice to the Corporation. The Board of Directors may remove any officer with or without cause at any time, but such removal shall be without prejudice to the contractual rights of such officer, if any, with the Corporation. Any number of offices may be held by the same person. Any vacancy occurring in any office of the Corporation by death, resignation, removal or otherwise may be filled for the unexpired portion of the term by the Board of Directors at any regular or special meeting. Election of an officer or agent shall not of itself create contract rights between the Corporation and such officer or agent.

4.2 Powers and Duties of Officers. The officers of the Corporation shall have such powers and duties in the management of the Corporation as may be prescribed in a resolution by the Board of Directors and, to the extent not so provided, as generally pertain to their respective offices, subject to the control of the Board of Directors. The Board of Directors may require any officer, agent or employee to give security for the faithful performance of his or her duties.

5. **STOCK.**

5.1 Certificates. The shares of the Corporation shall be represented by certificates, provided that the Board of Directors may provide by resolution or resolutions that some or all of any or all classes or series of stock shall be uncertificated shares. Any such resolution shall not apply to shares represented by a certificate until such certificate is surrendered to the Corporation. Every holder of stock represented by certificates shall be entitled to have a certificate signed by or in the name of the Corporation by the Chairperson or Vice

Chairperson of the Board of Directors, if any, or the President or a Vice President, and by the Treasurer or an Assistant Treasurer, or the Secretary or an Assistant Secretary, of the Corporation certifying the number of shares owned by such holder in the Corporation. Any of or all the signatures on the certificate may be a facsimile. In case any officer, transfer agent or registrar who has signed or whose facsimile signature has been placed upon a certificate shall have ceased to be such officer, transfer agent or registrar before such certificate is issued, it may be issued by the Corporation with the same effect as if such person were such officer, transfer agent or registrar at the date of issue.

5.2 Lost, Stolen or Destroyed Stock Certificates. The corporation may issue a new certificate of stock in the place of any certificate theretofore issued by it, alleged to have been lost, stolen or destroyed, and the Corporation may require the owner of the lost, stolen or destroyed certificate, or such owner's legal representative, to give the Corporation a bond sufficient to indemnify it against any claim that may be made against it on account of the alleged loss, theft or destruction of any such certificate or the issuance of such new certificate.

6. **INDEMNIFICATION AND ADVANCEMENT OF EXPENSES.**

6.1 Right to Indemnification. The corporation shall indemnify and hold harmless, to the fullest extent permitted by applicable law as it presently exists or may hereafter be amended, any person (a "Covered Person") who was or is made or is threatened to be made a party or is otherwise involved in any action, suit or proceeding, whether civil, criminal, administrative or investigative (a "proceeding"), by reason of the fact that he or she, or a person for whom he or she is the legal representative, is or was a director or officer of the Corporation or, while a director or officer of the Corporation, is or was serving at the request of the Corporation as a director, officer, employee or agent of another corporation or of a partnership, joint venture, trust, enterprise or nonprofit entity, including service with respect to employee benefit plans, against all liability and loss suffered and expenses (including attorneys' fees) reasonably incurred by such Covered Person. Notwithstanding the preceding sentence, except as provided in Section 6.3, the Corporation shall be required to indemnify a Covered Person in connection with a proceeding (or part thereof) commenced by such Covered Person only if the commencement of such proceeding (or part thereof) by the Covered Person was authorized in the specific case by the Board of Directors of the Corporation.

6.2 Prepayment of Expenses. The corporation shall to the fullest extent not prohibited by applicable law pay the expenses (including attorneys' fees) incurred by a Covered Person in defending any proceeding in advance of its final disposition; provided, however, that, to the extent required by law, such payment of expenses in advance of the final disposition of the proceeding shall be made only upon receipt of an undertaking by the Covered Person to repay all amounts advanced if it should be ultimately determined that the Covered Person is not entitled to be indemnified under this Article VI or otherwise.

6.3 Claims. If a claim for indemnification (following the final disposition of such proceeding) or advancement of expenses under this Article VI is not paid in full within thirty (30) days after a written claim therefore by the Covered Person has been received by the Corporation, the Covered Person may file suit to recover the unpaid amount of such claim and, if successful in whole or in part, shall be entitled to be paid the expense of prosecuting such claim. In any such action, the Corporation shall have the burden of proving that the Covered Person is not entitled to the requested indemnification or advancement of expenses under applicable law.

6.4 Non-exclusivity of Rights. The rights conferred on any Covered Person by this Article VI shall not be exclusive of any other rights which such Covered Person may have or hereafter acquire under any statute, provision of the Certificate of Incorporation, these Bylaws, agreement, vote of stockholders or disinterested directors or otherwise.

6.5 Other Sources. The corporation's obligation, if any, to indemnify or to advance expenses to any Covered Person who was or is serving at its request as a director, officer, employee or agent of another corporation, partnership, joint venture, trust, enterprise or nonprofit entity shall be reduced by any amount such Covered Person may collect as indemnification or advancement of expenses from such other corporation, partnership, joint venture, trust, enterprise or non-profit enterprise.

6.6 Amendment or Repeal. Any repeal or modification of the foregoing provisions of this Article VI shall not adversely affect any right or protection hereunder of any Covered Person in respect of any act or omission occurring prior to the time of such repeal or modification.

6.7 Other Indemnification and Prepayment of Expenses. This Article VI shall not limit the right of the Corporation, to the extent and in the manner permitted by law, to indemnify and to advance expenses to persons other than Covered Persons when and as authorized by appropriate corporate action.

6.8 Insurance. The Corporation may maintain insurance, at its expense, to protect itself and any director, officer, employee or agent of the Corporation or another corporation, partnership, joint venture, trust or other enterprise against any expense, liability or loss, whether or not the Corporation would have the power to indemnify such person against such expense, liability or loss under the General Corporation Law.

7. MISCELLANEOUS.

7.1 Fiscal Year. The fiscal year of the Corporation shall be determined by resolution of the Board of Directors.

7.2 Seal. The corporate seal shall have the name of the Corporation inscribed thereon and shall be in such form as may be approved from time to time by the Board of Directors. Said seal may be used by causing it or a facsimile thereof to be impressed or affixed or reproduced or otherwise. Whenever the Corporation is permitted or required to affix its seal to a document, it shall be sufficient to meet the requirements of any law, rule or regulation relating to a seal to place the word "(SEAL)" adjacent to the signature of the person authorized to execute the document on behalf of the Corporation.

7.3 Stock of Other Corporations or Other Interests. Unless otherwise ordered by the Board of Directors, the President, the Secretary, and such attorneys or agents of the Corporation as may from time to time be authorized by the Board of Directors or the President, shall have full power and authority on behalf of this Corporation to attend and to act and vote in person or by proxy at any meeting of the holders of securities of any corporation or other entity in which this Corporation may own or hold shares or other securities, and at such meetings shall possess and may exercise all the rights and power incident to the ownership of such shares or other securities which this Corporation, as the owner or holder thereof, might have possessed and exercised if present. The President, the Secretary, or such attorneys or agents, may also execute and deliver on behalf of the Corporation powers of attorney, proxies, consents, waivers, and other instruments relating to the shares or securities owned or held by this Corporation

7.4 Manner of Notice. Except as otherwise provided herein or permitted by applicable law, notices to directors and stockholders shall be in writing and delivered personally or mailed to the directors or stockholders at their addresses appearing on the books of the Corporation. Notice to directors may be given by facsimile, email, telephone or other means of electronic transmission.

7.5 Waiver of Notice of Meetings of Stockholders, Directors and Committees. Any waiver of notice, given by the person entitled to notice, whether before or after the time stated therein, shall be deemed equivalent to notice. Attendance of a person at a meeting shall constitute a waiver of notice of such meeting, except when the person attends a meeting for the express purpose of objecting, at the beginning of the meeting, to the transaction of any business because the meeting is not lawfully called or convened. Neither the business to be transacted at nor the purpose of any regular or special meeting of the stockholders, directors or members of a committee of directors need be specified in a waiver of notice.

7.6 Form of Records. Any records maintained by the Corporation in the regular course of its business, including its stock ledger, books of account and minute books, may be kept on, or by means of, or be in the form of, any information storage device or method, provided that the records so kept can be converted into clearly legible paper form within a reasonable time.

7.7 Amendment of Bylaws. These Bylaws may be altered, amended or repealed, in whole or in part, or new Bylaws may be adopted, by the Board of Directors; provided, however, that the stockholders may make additional bylaws and may alter, amend and repeal any bylaws whether adopted by them or otherwise.

AMENDMENT NO. 1
TO BYLAWS OF
TYCHO THERAPEUTICS, INC.

Pursuant to Section 7.7 of the Bylaws of Tycho Therapeutics, Inc. (the "Bylaws"), the Bylaws are hereby amended by amending Section 2.6 Qualification in its entirety to read as follows:

"2.6 Quorum, Vote Required For Action. At any meeting of the Board of Directors, a majority of the directors then in office at the time quorum is to be determined shall constitute a quorum for the transaction of business. Except in cases in which the Certificate of Incorporation, these Bylaws or applicable law otherwise provides, the affirmative vote of a majority of the directors present at a meeting at which a quorum is present shall be the act of the Board of Directors.

Adopted by the Board of Directors: May 4, 2018

Exhibit 4.2

AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT

THIS AMENDED AND RESTATED INVESTORS' RIGHTS AGREEMENT (this "**Agreement**"), is made as of the 2nd day of January, 2019, by and among Cabaletta Bio, Inc., a Delaware corporation (the "**Company**") and each of the investors listed on Schedule A hereto, each of which is referred to in this Agreement as an "**Investor**" along with any additional investors that become a party to this Agreement in accordance with Section 6.9 hereof.

RECITALS

WHEREAS, certain of the Investors (the "**Existing Investors**") hold shares of the Company's Series A Preferred Stock, Series A-1 Preferred Stock or Series A-2 Preferred Stock and/or shares of Common Stock issued upon conversion thereof and possess registration rights, information rights, rights of first offer, and other rights pursuant to that certain Investors' Rights Agreement, dated as of October 10, 2018, by and among the Company and such Existing Investors (the "**Prior Agreement**");

WHEREAS, the Company and the Investors are parties to the Series B Preferred Stock Purchase Agreement of even date herewith (as the same may be amended from time to time, the "**Purchase Agreement**");

WHEREAS, in order to induce the Company to enter into the Purchase Agreement and to induce the Investors to invest funds in the Company pursuant to the Purchase Agreement, the undersigned, constituting the required votes pursuant to Section 6.6 of the Prior Agreement, desire to amend and restate the Prior Agreement; and

WHEREAS, the Existing Investors are holders of a majority of the Registrable Securities of the Company (as defined in the Prior Agreement), and desire to amend and restate the Prior Agreement in its entirety and to accept the rights created pursuant to this Agreement in lieu of the rights granted to them under the Prior Agreement.

NOW, THEREFORE, the parties hereby agree that the Prior Agreement shall be amended and restated, and the parties to this Agreement further agree as follows:

1. Definitions. For purposes of this Agreement:

1.1 "**Affiliate**" means, with respect to any specified Person, any other Person who, directly or indirectly, controls, is controlled by, or is under common control with such Person, including without limitation any general partner, managing member, officer, or director or trustee of such Person, or any venture capital fund or other investment fund or account or registered investment company now or hereafter existing that is controlled by one or more general partners, or managing members or investment advisors of, or shares the same management company or investment adviser with, such Person.

1.2 "**Board of Directors**" means the board of directors of the Company.

1.3 "**Common Stock**" means shares of the Company's common stock, par value $0.00001 per share.

1.4 "**Competitor**" means a Person engaged, directly or indirectly (including through any partnership, limited liability company, corporation, joint venture or similar arrangement (whether now existing or formed hereafter)), in a business that competes with the Company's business (a "**Competing Activity**"), but shall not include any Investor that, together with its Affiliates, holds less than twenty percent (20%) of the outstanding equity of any Competitor and does not, nor do any of its Affiliates, have a right to designate any members of the board of directors of any Competitor.

1.5 "**Damages**" means any loss, damage, claim or liability (joint or several) to which a party hereto may become subject under the Securities Act, the Exchange Act, or other federal or state law, insofar as such loss, damage, claim or liability (or any action in respect thereof) arises out of or is based upon: (i) any untrue statement or alleged untrue statement of a material fact contained in any registration statement of the Company, including any preliminary prospectus or final prospectus contained therein or any amendments or supplements thereto; (ii) an omission or alleged omission to state therein a material fact required to be stated therein, or necessary to make the statements therein not misleading; or (iii) any violation or alleged violation by the indemnifying party (or any of its agents or Affiliates) of the Securities Act, the Exchange Act, any state securities law, or any rule or regulation promulgated under the Securities Act, the Exchange Act, or any state securities law.

1.6 "**Derivative Securities**" means any securities or rights convertible into, or exercisable or exchangeable for (in each case, directly or indirectly), Common Stock, including options and warrants.

1.7 "**Exchange Act**" means the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder.

1.8 "**Excluded Registration**" means (i) a registration relating to the sale or grant of securities to employees of the Company or a subsidiary pursuant to a stock option, stock purchase, equity incentive or similar plan; (ii) a registration relating to an SEC Rule 145 transaction; (iii) a registration on any form that does not include substantially the same information as would be required to be included in a registration statement covering the sale of the Registrable Securities; or (iv) a registration in which the only Common Stock being registered is Common Stock issuable upon conversion of debt securities that are also being registered.

1.9 "**Form S-1**" means such form under the Securities Act as in effect on the date hereof or any successor registration form under the Securities Act subsequently adopted by the SEC.

1.10 "**Form S-3**" means such form under the Securities Act as in effect on the date hereof or any registration form under the Securities Act subsequently adopted by the SEC that permits forward incorporation of substantial information by reference to other documents filed by the Company with the SEC.

1.11 "**GAAP**" means generally accepted accounting principles in the United States as in effect from time to time.

1.12 "**Holder**" means any holder of Registrable Securities who is a party to this Agreement.

1.13 "**Immediate Family Member**" means a child, stepchild, grandchild, parent, stepparent, grandparent, spouse, sibling, mother-in-law, father-in-law, son-in-law, daughter-in-law, brother-in-law, or sister-in-law, including, adoptive relationships, of a natural person referred to herein.

1.14 "**Initiating Holders**" means, collectively, Holders who properly initiate a registration request under this Agreement.

1.15 "**IPO**" means the Company's first underwritten public offering of its Common Stock under the Securities Act.

1.16 "**Key Employee**" means any executive-level employee (including, division director and vice president-level positions) as well as any employee who, either alone or in concert with others, develops, invents, programs, or designs any Company Intellectual Property (as defined in the Purchase Agreement).

1.17 "**Major Investor**" means any Investor that, individually or together with such Investor's Affiliates, holds at least 49,561 shares of Registrable Securities (as adjusted for any stock split, stock dividend, combination, or other recapitalization or reclassification effected after the date hereof).

1.18 "**New Securities**" means, collectively, equity securities of the Company, whether or not currently authorized, as well as rights, options, or warrants to purchase such equity securities, or securities of any type whatsoever that are, or may become, convertible or exchangeable into or exercisable for such equity securities.

1.19 "**Person**" means any individual, corporation, partnership, trust, limited liability company, association or other entity.

1.20 "**Preferred Director**" has the meaning set forth in the Restated Certificate.

1.21 "**Preferred Stock**" means, collectively, shares of the Company's Series A Preferred Stock, SeriesA-1 Preferred Stock, Series A-2 Preferred Stock and Series B Preferred Stock.

1.22 "**Restated Certificate**" means the Company's Second Amended and Restated Certificate of Incorporation (as it may be amended and/or restated from time to time).

1.23 "**Registrable Securities**" means (i) the Common Stock issuable or issued upon conversion of the Preferred Stock, (ii)any Common Stock, or any Common Stock issued or issuable (directly or indirectly) upon conversion and/or exercise of any other securities of the Company, acquired by the Investors after the Initial Closing Date (as defined in the Purchase Agreement) (the "**Effective Date**"), and (iii) any Common Stock issued as (or issuable upon the conversion or exercise of any warrant, right, or other security that is issued as) a dividend or

other distribution with respect to, or in exchange for or in replacement of, the shares referenced in clauses (i) and (ii) above; excluding in all cases, however, any Registrable Securities sold by a Person in a transaction in which the applicable rights under this Agreement are not assigned pursuant to Subsection 6.1 and excluding for purposes of Section 2 any shares for which registration rights have terminated pursuant to Subsection 2.13 of this Agreement.

1.24 "**Registrable Securities then outstanding**" means the number of shares determined by adding the number of shares of outstanding Common Stock that are Registrable Securities and the number of shares of Common Stock issuable (directly or indirectly) pursuant to then exercisable and/or convertible securities that are Registrable Securities.

1.25 "**Restricted Securities**" means the securities of the Company required to be notated with the legend set forth in Subsection 2.12(b) hereof.

1.26 "**SEC**" means the Securities and Exchange Commission.

1.27 "**SEC Rule 144**" means Rule 144 promulgated by the SEC under the Securities Act.

1.28 "**SEC Rule 145**" means Rule 145 promulgated by the SEC under the Securities Act.

1.29 "**Securities Act**" means the Securities Act of 1933, as amended, and the rules and regulations promulgated thereunder.

1.30 "**Selling Expenses**" means all underwriting discounts, selling commissions, and stock transfer taxes applicable to the sale of Registrable Securities, and fees and disbursements of counsel for any Holder, except for the fees and disbursements of the Holder Counsel borne and paid by the Company as provided in Subsection 2.6.

1.31 "**Series A Preferred Stock**" means shares of the Company's Series A Preferred Stock, par value $0.00001 per share.

1.32 "**Series A-1 Preferred Stock**" means shares of the Company's Series A-1 Preferred Stock, par value $0.00001 per share.

1.33 "**Series A-2 Preferred Stock**" means shares of the Company's Series A-2 Preferred Stock, par value $0.00001 per share.

1.34 "**Series B Preferred Stock**" means shares of the Company's Series B Preferred Stock, par value $0.00001 per share.

2. Registration Rights. The Company covenants and agrees as follows:

2.1 Demand Registration.

(a) Form S-1 Demand. If at any time after the earlier of (i) five (5) years after the date of this Agreement or (ii) one hundred eighty (180) days after the effective date of the registration statement for the IPO, the Company receives a request from Holders of at least forty percent (40%) of the Registrable Securities then outstanding that the Company file a Form S-1 registration statement with respect to at least twenty-five percent (25%) of the Registrable Securities then outstanding, then the Company shall (x) within ten (10) days after the date such request is given, give notice thereof (the "**Demand Notice**") to all Holders other than the Initiating Holders; and (y) as soon as practicable, and in any event within sixty (60) days after the date such request is given by the Initiating Holders, file a Form S-1 registration statement under the Securities Act covering all Registrable Securities that the Initiating Holders requested to be registered and any additional Registrable Securities requested to be included in such registration by any other Holders, as specified by notice given by each such Holder to the Company within twenty (20) days of the date the Demand Notice is given, and in each case, subject to the limitations of Subsections 2.1(c) and 2.3.

(b) Form S-3 Demand. If at any time when it is eligible to use a Form S-3 registration statement, the Company receives a request from Holders (i) who are then deemed to be an "affiliate" (as such term is defined in Rule 405 of the Securities Act) of the Company or (ii) who hold at least twenty percent (20%) of the Registrable Securities then outstanding, that the Company file a Form S-3 registration statement with respect to outstanding Registrable Securities of such Holders having an anticipated aggregate offering price, net of Selling Expenses, of at least $5,000,000, then the Company shall (i) within ten (10) days after the date such request is given, give a Demand Notice to all Holders other than the Initiating Holders; and (ii) as soon as practicable, and in any event within forty-five (45) days after the date such request is given by the Initiating Holders, file a Form S-3 registration statement under the Securities Act covering all Registrable Securities requested to be included in such registration by any other Holders, as specified by notice given by each such Holder to the Company within twenty (20) days of the date the Demand Notice is given, and in each case, subject to the limitations of Subsections 2.1(c) and 2.3.

(c) Notwithstanding the foregoing obligations, if the Company furnishes to Holders requesting a registration pursuant to this Subsection 2.1 a certificate signed by the Company's chief executive officer stating that in the good faith judgment of the Board of Directors it would be materially detrimental to the Company and its stockholders for such registration statement to either become effective or remain effective for as long as such registration statement otherwise would be required to remain effective, because such action would (i) materially interfere with a significant acquisition, corporate reorganization, or other similar transaction involving the Company; (ii) require premature disclosure of material information that the Company has a bona fide business purpose for preserving as confidential; or (iii) render the Company unable to comply with requirements under the Securities Act or Exchange Act, then the Company shall have the right to defer taking action with respect to such filing, and any time periods with respect to filing or effectiveness thereof shall be tolled correspondingly, for a period of not more than ninety (90) days after the request of the Initiating Holders is given; provided, however, that the Company may not invoke this right more than once in any twelve (12) month period; and provided further that the Company shall not register any securities for its own account or that of any other stockholder during such ninety-day (90) period other than an Excluded Registration.

(d) The Company shall not be obligated to effect, or to take any action to effect, any registration pursuant to Subsection 2.1(a)(i) during the period that is sixty (60) days before the Company's good faith estimate of the date of filing of, and ending on a date that is one hundred eighty (180) days after the effective date of, a Company-initiated registration, provided that the Company is actively employing in good faith commercially reasonable efforts to cause such registration statement to become effective; (ii) after the Company has effected two registrations pursuant to Subsection 2.1(a); or (iii) if the Initiating Holders propose to dispose of shares of Registrable Securities that may be immediately registered on Form S-3 pursuant to a request made pursuant to Subsection 2.1(b). The Company shall not be obligated to effect, or to take any action to effect, any registration pursuant to Subsection 2.1(b) (i) during the period that is thirty (30) days before the Company's good faith estimate of the date of filing of, and ending on a date that is ninety (90) days after the effective date of, a Company-initiated registration, provided that the Company is actively employing in good faith commercially reasonable efforts to cause such registration statement to become effective; or (ii) if the Company has effected two registrations pursuant to Subsection 2.1(b) within the twelve (12) month period immediately preceding the date of such request. A registration shall not be counted as "effected" for purposes of this Subsection 2.1(d) until such time as the applicable registration statement has been declared effective by the SEC, unless the Initiating Holders withdraw their request for such registration, elect not to pay the registration expenses therefor, and forfeit their right to one demand registration statement pursuant to Subsection 2.6, in which case such withdrawn registration statement shall be counted as "effected" for purposes of this Subsection 2.1(d), provided, that if such withdrawal is during a period the Company has deferred taking action pursuant to Subsection 2.1(c), then the Initiating Holders may withdraw their request for registration and such registration will not be counted as "effected" for purposes of this Subsection 2.1(d).

2.2 Company Registration. If the Company proposes to register (including, for this purpose, a registration effected by the Company for stockholders other than the Holders) any of its securities under the Securities Act in connection with the public offering of such securities solely for cash (other than in an Excluded Registration), the Company shall, at such time, promptly give each Holder notice of such registration. Upon the request of each Holder given within twenty (20) days after such notice is given by the Company, the Company shall, subject to the provisions of Subsection 2.3, cause to be registered all of the Registrable Securities that each such Holder has requested to be included in such registration. The Company shall have the right to terminate or withdraw any registration initiated by it under this Subsection 2.2 before the effective date of such registration, whether or not any Holder has elected to include Registrable Securities in such registration. The expenses (other than Selling Expenses) of such withdrawn registration shall be borne by the Company in accordance with Subsection 2.6.

2.3 Underwriting Requirements.

(a) If, pursuant to Subsection 2.1, the Initiating Holders intend to distribute the Registrable Securities covered by their request by means of an underwriting, they shall so advise the Company as a part of their request made pursuant to Subsection 2.1, and the Company shall include such information in the Demand Notice. The underwriter(s) will be selected by the Board of Directors and shall be reasonably acceptable to a majority in interest of the Initiating Holders. In such event, the right of any Holder to include such Holder's Registrable Securities in

such registration shall be conditioned upon such Holder's participation in such underwriting and the inclusion of such Holder's Registrable Securities in the underwriting to the extent provided herein. All Holders proposing to distribute their securities through such underwriting shall (together with the Company as provided in Subsection 2.4(e)) enter into an underwriting agreement in customary form with the underwriter(s) selected for such underwriting. Notwithstanding any other provision of this Subsection 2.3, if the underwriter(s) advise(s) the Initiating Holders in writing that marketing factors require a limitation on the number of shares to be underwritten, then the Initiating Holders shall so advise all Holders of Registrable Securities that otherwise would be underwritten pursuant hereto, and the number of Registrable Securities that may be included in the underwriting shall be allocated among such Holders of Registrable Securities, including the Initiating Holders, in proportion (as nearly as practicable) to the number of Registrable Securities owned by each Holder or in such other proportion as shall mutually be agreed to by all such selling Holders; provided, however, that the number of Registrable Securities held by the Holders to be included in such underwriting shall not be reduced unless all other securities are first entirely excluded from the underwriting. To facilitate the allocation of shares in accordance with the above provisions, the Company or the underwriters may round the number of shares allocated to any Holder to the nearest one hundred (100) shares.

(b) In connection with any offering involving an underwriting of shares of the Company's capital stock pursuant toSubsection 2.2, the Company shall not be required to include any of the Holders' Registrable Securities in such underwriting unless the Holders accept the terms of the underwriting as agreed upon between the Company and its underwriters, and then only in such quantity as the underwriters in their sole discretion determine will not jeopardize the success of the offering by the Company. If the total number of securities, including Registrable Securities, requested by stockholders to be included in such offering exceeds the number of securities to be sold (other than by the Company) that the underwriters in their reasonable discretion determine is compatible with the success of the offering, then the Company shall be required to include in the offering only that number of such securities, including Registrable Securities, which the underwriters and the Company in their sole discretion determine will not jeopardize the success of the offering. If the underwriters determine that less than all of the Registrable Securities requested to be registered can be included in such offering, then the Registrable Securities that are included in such offering shall be allocated among the selling Holders in proportion (as nearly as practicable to) the number of Registrable Securities owned by each selling Holder or in such other proportions as shall mutually be agreed to by all such selling Holders. To facilitate the allocation of shares in accordance with the above provisions, the Company or the underwriters may round the number of shares allocated to any Holder to the nearest one hundred (100) shares. Notwithstanding the foregoing, in no event shall (i) the number of Registrable Securities included in the offering be reduced unless all other securities (other than securities to be sold by the Company) are first entirely excluded from the offering, or (ii) the number of Registrable Securities included in the offering be reduced below twenty-five percent (25%) of the total number of securities included in such offering, unless such offering is the IPO, in which case the selling Holders may be excluded further if the underwriters make the determination described above and no other stockholder's securities are included in such offering. For purposes of the provision in this Subsection 2.3(b) concerning apportionment, for any selling Holder that is a partnership, limited liability company, or corporation, the partners, members, retired partners, retired members, stockholders, and Affiliates of such Holder,

or the estates and Immediate Family Members of any such partners, retired partners, members, and retired members and any trusts for the benefit of any of the foregoing Persons, shall be deemed to be a single "selling Holder," and any pro rata reduction with respect to such "selling Holder" shall be based upon the aggregate number of Registrable Securities owned by all Persons included in such "selling Holder," as defined in this sentence.

(c) For purposes of Section 2.1, a registration shall not be counted as "effected" if, as a result of an exercise of the underwriter's cutback provisions in Section 2.3(a), fewer than fifty percent (50%) of the total number of Registrable Securities that Holders have requested to be included in such registration statement are actually included.

2.4 Obligations of the Company. Whenever required under this Section 2 to effect the registration of any Registrable Securities, the Company shall, as expeditiously as reasonably possible:

(a) prepare and file with the SEC a registration statement with respect to such Registrable Securities and use its commercially reasonable efforts to cause such registration statement to become effective and, upon the request of the Holders of a majority of the Registrable Securities registered thereunder, keep such registration statement effective for a period of up to one hundred twenty (120) days or, if earlier, until the distribution contemplated in the registration statement has been completed; provided, however, that (i) such one hundred twenty (120) day period shall be extended for a period of time equal to the period the Holder refrains, at the request of an underwriter of Common Stock (or other securities) of the Company, from selling any securities included in such registration, and (ii) in the case of any registration of Registrable Securities on Form S-3 that are intended to be offered on a continuous or delayed basis, subject to compliance with applicable SEC rules, such one hundred twenty (120) day period shall be extended for up to ninety (90) days, if necessary, to keep the registration statement effective until all such Registrable Securities are sold;

(b) prepare and file with the SEC such amendments and supplements to such registration statement, and the prospectus used in connection with such registration statement, as may be necessary to comply with the Securities Act in order to enable the disposition of all securities covered by such registration statement;

(c) furnish to the selling Holders such numbers of copies of a prospectus, including a preliminary prospectus, as required by the Securities Act, and such other documents as the Holders may reasonably request in order to facilitate their disposition of their Registrable Securities;

(d) use its commercially reasonable efforts to register and qualify the securities covered by such registration statement under such other securities or blue-sky laws of such jurisdictions as shall be reasonably requested by the selling Holders; provided that the Company shall not be required to qualify to do business or to file a general consent to service of process in any such states or jurisdictions, unless the Company is already subject to service in such jurisdiction and except as may be required by the Securities Act;

(e) in the event of any underwritten public offering, enter into and perform its obligations under an underwriting agreement, in usual and customary form, with the underwriter(s) of such offering;

(f) use its commercially reasonable efforts to cause all such Registrable Securities covered by such registration statement to be listed on a national securities exchange or trading system and each securities exchange and trading system (if any) on which similar securities issued by the Company are then listed;

(g) provide a transfer agent and registrar for all Registrable Securities registered pursuant to this Agreement and provide a CUSIP number for all such Registrable Securities, in each case not later than the effective date of such registration;

(h) promptly make available for inspection by the selling Holders, any managing underwriter(s) participating in any disposition pursuant to such registration statement, and any attorney or accountant or other agent retained by any such underwriter or selected by the selling Holders, all financial and other records, pertinent corporate documents, and properties of the Company, and cause the Company's officers, directors, employees, and independent accountants to supply all information reasonably requested by any such seller, underwriter, attorney, accountant, or agent, in each case, as necessary or advisable to verify the accuracy of the information in such registration statement and to conduct appropriate due diligence in connection therewith;

(i) notify each selling Holder, promptly after the Company receives notice thereof, of the time when such registration statement has been declared effective or a supplement to any prospectus forming a part of such registration statement has been filed; and

(j) after such registration statement becomes effective, notify each selling Holder of any request by the SEC that the Company amend or supplement such registration statement or prospectus.

In addition, the Company shall ensure that, at all times after any registration statement covering a public offering of securities of the Company under the Securities Act shall have become effective, its insider trading policy shall provide that the Company's directors may implement a trading program under Rule 10b5-1 of the Exchange Act.

2.5 Furnish Information. It shall be a condition precedent to the obligations of the Company to take any action pursuant to this Section 2 with respect to the Registrable Securities of any selling Holder that such Holder shall furnish to the Company such information regarding itself, the Registrable Securities held by it, and the intended method of disposition of such securities as is reasonably required to effect the registration of such Holder's Registrable Securities.

2.6 Expenses of Registration. All expenses (other than Selling Expenses) incurred in connection with registrations, filings, or qualifications pursuant to Section 2, including all registration, filing, and qualification fees; printers' and accounting fees; fees and disbursements of counsel for the Company; and the reasonable fees and disbursements, not to exceed $30,000, of one counsel for the selling Holders ("**Holder Counsel**"), shall be borne and

paid by the Company; provided, however, that the Company shall not be required to pay for any expenses of any registration proceeding begun pursuant to Subsection 2.1 if the registration request is subsequently withdrawn at the request of the Holders of a majority of the Registrable Securities to be registered (in which case all selling Holders shall bear such expenses pro rata based upon the number of Registrable Securities that were to be included in the withdrawn registration), unless the Holders of a majority of the Registrable Securities agree to forfeit their right to one registration pursuant to Subsections 2.1(a) or 2.1(b), as the case may be; provided further that if, at the time of such withdrawal, the Holders shall have learned of a material adverse change in the condition, business, or prospects of the Company from that known to the Holders at the time of their request and have withdrawn the request with reasonable promptness after learning of such information then the Holders shall not be required to pay any of such expenses and shall not forfeit their right to one registration pursuant to Section 2.1(a) or Section 2.1(b). All Selling Expenses relating to Registrable Securities registered pursuant to this Section 2 shall be borne and paid by the Holders pro rata on the basis of the number of Registrable Securities registered on their behalf.

2.7 Delay of Registration. No Holder shall have any right to obtain or seek an injunction restraining or otherwise delaying any registration pursuant to this Agreement as the result of any controversy that might arise with respect to the interpretation or implementation of this Section 2.

2.8 Indemnification. If any Registrable Securities are included in a registration statement under this Section 2:

(a) To the extent permitted by law, the Company will indemnify and hold harmless each selling Holder, and the partners, members, officers, directors, and stockholders of each such Holder; legal counsel and accountants for each such Holder; any underwriter (as defined in the Securities Act) for each such Holder; and each Person, if any, who controls such Holder or underwriter within the meaning of the Securities Act or the Exchange Act, against any Damages, and the Company will pay to each such Holder, underwriter, controlling Person, or other aforementioned Person any legal or other expenses reasonably incurred thereby in connection with investigating or defending any claim or proceeding from which Damages may result, as such expenses are incurred; provided, however, that the indemnity agreement contained in this Subsection 2.8(a) shall not apply to amounts paid in settlement of any such claim or proceeding if such settlement is effected without the consent of the Company, which consent shall not be unreasonably withheld, nor shall the Company be liable for any Damages to the extent that they arise out of or are based upon actions or omissions made in reliance upon and in conformity with written information furnished by or on behalf of any such Holder, underwriter, controlling Person, or other aforementioned Person expressly for use in connection with such registration.

(b) To the extent permitted by law, each selling Holder, severally and not jointly, will indemnify and hold harmless the Company, and each of its directors, each of its officers who has signed the registration statement, each Person (if any), who controls the Company within the meaning of the Securities Act, legal counsel and accountants for the Company, any underwriter (as defined in the Securities Act), any other Holder selling securities in such registration statement, and any controlling Person of any such underwriter or other

Holder, against any Damages, in each case only to the extent that such Damages arise out of or are based upon actions or omissions made in reliance upon and in conformity with written information furnished by or on behalf of such selling Holder expressly for use in connection with such registration; and each such selling Holder will pay to the Company and each other aforementioned Person any legal or other expenses reasonably incurred thereby in connection with investigating or defending any claim or proceeding from which Damages may result, as such expenses are incurred; provided, however, that the indemnity agreement contained in this Subsection 2.8(b) shall not apply to amounts paid in settlement of any such claim or proceeding if such settlement is effected without the consent of the Holder, which consent shall not be unreasonably withheld; and provided further that in no event shall the aggregate amounts payable by any Holder by way of indemnity or contribution under Subsections 2.8(b) and 2.8(d) exceed the proceeds from the offering received by such Holder (net of any Selling Expenses paid by such Holder), except in the case of fraud or willful misconduct by such Holder.

(c) Promptly after receipt by an indemnified party under this Subsection 2.8 of notice of the commencement of any action (including any governmental action) for which a party may be entitled to indemnification hereunder, such indemnified party will, if a claim in respect thereof is to be made against any indemnifying party under this Subsection 2.8, give the indemnifying party notice of the commencement thereof. The indemnifying party shall have the right to participate in such action and, to the extent the indemnifying party so desires, participate jointly with any other indemnifying party to which notice has been given, and to assume the defense thereof with counsel mutually satisfactory to the parties; provided, however, that an indemnified party (together with all other indemnified parties that may be represented without conflict by one counsel) shall have the right to retain one separate counsel, with the fees and expenses to be paid by the indemnifying party, if representation of such indemnified party by the counsel retained by the indemnifying party would be inappropriate due to actual or potential differing interests between such indemnified party and any other party represented by such counsel in such action. The failure to give notice to the indemnifying party within a reasonable time of the commencement of any such action shall relieve such indemnifying party of any liability to the indemnified party under this Subsection 2.8, to the extent that such failure materially prejudices the indemnifying party's ability to defend such action. The failure to give notice to the indemnifying party will not relieve it of any liability that it may have to any indemnified party otherwise than under this Subsection 2.8.

(d) To provide for just and equitable contribution to joint liability under the Securities Act in any case in which either: (i) any party otherwise entitled to indemnification hereunder makes a claim for indemnification pursuant to this Subsection 2.8 but it is judicially determined (by the entry of a final judgment or decree by a court of competent jurisdiction and the expiration of time to appeal or the denial of the last right of appeal) that such indemnification may not be enforced in such case, notwithstanding the fact that this Subsection 2.8 provides for indemnification in such case, or (ii) contribution under the Securities Act may be required on the part of any party hereto for which indemnification is provided under this Subsection 2.8, then, and in each such case, such parties will contribute to the aggregate losses, claims, damages, liabilities, or expenses to which they may be subject (after contribution from others) in such proportion as is appropriate to reflect the relative fault of each of the indemnifying party and the indemnified party in connection with the statements, omissions, or other actions that resulted in such loss, claim, damage, liability, or expense, as well as to reflect any other relevant equitable

considerations. The relative fault of the indemnifying party and of the indemnified party shall be determined by reference to, among other things, whether the untrue or allegedly untrue statement of a material fact, or the omission or alleged omission of a material fact, relates to information supplied by the indemnifying party or by the indemnified party and the parties' relative intent, knowledge, access to information, and opportunity to correct or prevent such statement or omission; provided, however, that, in any such case (x) no Holder will be required to contribute any amount in excess of the public offering price of all such Registrable Securities offered and sold by such Holder pursuant to such registration statement, and (y) no Person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) will be entitled to contribution from any Person who was not guilty of such fraudulent misrepresentation; and provided further that in no event shall a Holder's liability pursuant to thisSubsection 2.8(d), when combined with the amounts paid or payable by such Holder pursuant to Subsection 2.8(b), exceed the proceeds from the offering received by such Holder (net of any Selling Expenses paid by such Holder), except in the case of willful misconduct or fraud by such Holder.

(e) Notwithstanding the foregoing, to the extent that the provisions on indemnification and contribution contained in the underwriting agreement entered into in connection with the underwritten public offering are in conflict with the foregoing provisions, the provisions in the underwriting agreement shall control.

(f) Unless otherwise superseded by an underwriting agreement entered into in connection with the underwritten public offering, the obligations of the Company and Holders under this Subsection 2.8 shall survive the completion of any offering of Registrable Securities in a registration under this Section 2, and otherwise shall survive the termination of this Agreement.

2.9 Reports Under Exchange Act. With a view to making available to the Holders the benefits of SEC Rule 144 and any other rule or regulation of the SEC that may at any time permit a Holder to sell securities of the Company to the public without registration or pursuant to a registration on Form S-3, the Company shall:

(a) make and keep available adequate current public information, as those terms are understood and defined in SEC Rule 144, at all times after the effective date of the registration statement filed by the Company for the IPO;

(b) use commercially reasonable efforts to file with the SEC in a timely manner all reports and other documents required of the Company under the Securities Act and the Exchange Act (at any time after the Company has become subject to such reporting requirements); and

(c) furnish to any Holder, so long as the Holder owns any Registrable Securities, forthwith upon request (i) to the extent accurate, a written statement by the Company that it has complied with the reporting requirements of SEC Rule 144 (at any time after ninety (90) days after the effective date of the registration statement filed by the Company for the IPO), the Securities Act, and the Exchange Act (at any time after the Company has become subject to such reporting requirements), or that it qualifies as a registrant whose securities may be resold

pursuant to Form S-3 (at any time after the Company so qualifies); and (ii) such other information as may be reasonably requested in availing any Holder of any rule or regulation of the SEC that permits the selling of any such securities without registration (at any time after the Company has become subject to the reporting requirements under the Exchange Act) or pursuant to Form S-3 (at any time after the Company so qualifies to use such form).

2.10 Limitations on Subsequent Registration Rights. From and after the date of this Agreement, the Company shall not, without the prior written consent of the Holders of at least a majority the Registrable Securities then outstanding, enter into any agreement with any holder or prospective holder of any securities of the Company that would (i) allow such holder or prospective holder to include such securities in any registration unless, under the terms of such agreement, such holder or prospective holder may include such securities in any such registration only to the extent that the inclusion of such securities will not reduce the number of the Registrable Securities of the Holders that are included; or (ii) allow such holder or prospective holder to initiate a demand for registration of any securities held by such holder or prospective holder; provided that this limitation shall not apply to Registrable Securities acquired by any additional Investor that becomes a party to this Agreement in accordance with Subsection 6.9.

2.11 "Market Stand-off" Agreement. Each Holder hereby agrees that it will not, without the prior written consent of the managing underwriter, during the period commencing on the date of the final prospectus relating to the Company's IPO, and ending on the date specified by the Company and the managing underwriter (such period not to exceed one hundred eighty (180) days, or such other period as may be requested by the Company or an underwriter to accommodate regulatory restrictions on (1) the publication or other distribution of research reports, and (2) analyst recommendations and opinions, including, but not limited to, the restrictions contained in FINRA Rule 2711(f)(4) or NYSE Rule 472(f)(4), or any successor provisions or amendments thereto), or such other period as may be requested by the Company or an underwriter to accommodate regulatory restrictions on (1) the publication or other distribution of research reports and (2)analyst recommendations and opinions, including, but not limited to, the restrictions contained in FINRA Rule 2711(f)(4) or NYSE Rule 472(f)(4), or any successor provisions or amendments thereto, (i) lend; offer; pledge; sell; contract to sell; sell any option or contract to purchase; purchase any option or contract to sell; grant any option, right, or warrant to purchase; or otherwise transfer or dispose of, directly or indirectly, any shares of Common Stock or any securities convertible into or exercisable or exchangeable (directly or indirectly) for Common Stock held immediately before the effective date of the registration statement for such offering or (ii) enter into any swap or other arrangement that transfers to another, in whole or in part, any of the economic consequences of ownership of such securities, whether any such transaction described in clause (i) or (ii) above is to be settled by delivery of Common Stock or other securities, in cash, or otherwise. The foregoing provisions of this Subsection 2.11, shall not apply to the sale of any shares to an underwriter pursuant to an underwriting agreement, the purchase of shares pursuant to an IPO, the purchase of shares after the closing of the IPO, the purchase of shares or the transfer of any shares to any trust for the direct or indirect benefit of the Holder or the immediate family of the Holder, provided that the trustee of the trust agrees to be bound in writing by the restrictions set forth herein, and provided further that any such transfer shall not involve a disposition for value, and shall be applicable to the Holders only if all officers and directors are subject to the same restrictions and the Company uses commercially reasonable efforts to obtain a similar agreement from all stockholders individually owning more than one

percent (1%) of the Company's outstanding Common Stock (after giving effect to conversion into Common Stock of all outstanding Preferred Stock). The underwriters in connection with such registration are intended third-party beneficiaries of this Subsection 2.11 and shall have the right, power and authority to enforce the provisions hereof as though they were a party hereto. Each Holder further agrees to execute such agreements as may be reasonably requested by the underwriters in connection with such registration that are consistent with this Subsection 2.11 or that are necessary to give further effect thereto. Any discretionary waiver or termination of the restrictions of any or all of such agreements by the Company or the underwriters shall apply pro rata to all Holders subject to such agreements, based on the number of shares subject to such agreements.

2.12 Restrictions on Transfer.

(a) The Preferred Stock and the Registrable Securities shall not be sold, pledged, or otherwise transferred, and the Company shall not recognize and shall issue stop-transfer instructions to its transfer agent with respect to any such sale, pledge, or transfer, except upon the conditions specified in this Agreement, which conditions are intended to ensure compliance with the provisions of the Securities Act. A transferring Holder will cause any proposed purchaser, pledgee, or transferee of the Preferred Stock and the Registrable Securities held by such Holder to agree to take and hold such securities subject to the provisions and upon the conditions specified in this Agreement.

(b) Each certificate, instrument, or book entry representing (i) the Preferred Stock, (ii)the Registrable Securities, and (iii)any other securities issued in respect of the securities referenced in clauses (i) and (ii), upon any stock split, stock dividend, recapitalization, merger, consolidation, or similar event, shall (unless otherwise permitted by the provisions of Subsection 2.12(c)) be notated with a legend substantially in the following form:

> THE SECURITIES REPRESENTED HEREBY HAVE BEEN ACQUIRED FOR INVESTMENT AND HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933. SUCH SHARES MAY NOT BE SOLD, PLEDGED, OR TRANSFERRED IN THE ABSENCE OF SUCH REGISTRATION OR A VALID EXEMPTION FROM THE REGISTRATION AND PROSPECTUS DELIVERY REQUIREMENTS OF SAID ACT.
>
> THE SECURITIES REPRESENTED HEREBY MAY BE TRANSFERRED ONLY IN ACCORDANCE WITH THE TERMS OF AN AGREEMENT BETWEEN THE COMPANY AND THE STOCKHOLDER, A COPY OF WHICH IS ON FILE WITH THE SECRETARY OF THE COMPANY.

The Holders consent to the Company making a notation in its records and giving instructions to any transfer agent of the Restricted Securities in order to implement the restrictions on transfer set forth in this Subsection 2.12.

(c) The holder of such Restricted Securities, by acceptance of ownership thereof, agrees to comply in all respects with the provisions of this Section 2. Before any proposed sale, pledge, or transfer of any Restricted Securities, unless there is in effect a registration statement under the Securities Act covering the proposed transaction, the Holder thereof shall give notice to the Company of such Holder's intention to effect such sale, pledge, or transfer. Each such notice shall describe the manner and circumstances of the proposed sale, pledge, or transfer in sufficient detail and, if reasonably requested by the Company, shall be accompanied at such Holder's expense by either (i) a written opinion of legal counsel who shall, and whose legal opinion shall, be reasonably satisfactory to the Company, addressed to the Company, to the effect that the proposed transaction may be effected without registration under the Securities Act; (ii) a "no action' letter from the SEC to the effect that the proposed sale, pledge, or transfer of such Restricted Securities without registration will not result in a recommendation by the staff of the SEC that action be taken with respect thereto; or (iii) any other evidence reasonably satisfactory to counsel to the Company to the effect that the proposed sale, pledge, or transfer of the Restricted Securities may be effected without registration under the Securities Act, whereupon the Holder of such Restricted Securities shall be entitled to sell, pledge, or transfer such Restricted Securities in accordance with the terms of the notice given by the Holder to the Company. The Company will not require such a legal opinion or "no action' letter (x) in any transaction in compliance with SEC Rule 144; or (y) in any transaction in which such Holder distributes Restricted Securities to an Affiliate of such Holder; provided that each transferee agrees in writing to be subject to the terms of thisSubsection 2.12. Each certificate, instrument, or book entry representing the Restricted Securities transferred as above provided shall be notated with, except if such transfer is made pursuant to SEC Rule 144, the appropriate restrictive legend set forth in Subsection 2.12(b), except that such certificate instrument, or book entry shall not be notated with such restrictive legend if, in the opinion of counsel for such Holder and the Company, such legend is not required in order to establish compliance with any provisions of the Securities Act.

2.13 Termination of Registration Rights. The right of any Holder to request registration or inclusion of Registrable Securities in any registration pursuant to Subsections 2.1 or 2.2 shall terminate upon the earliest to occur of:

(a) the closing of a Deemed Liquidation Event, as such term is defined in the Restated Certificate, unless such Holder is deemed to be an "affiliate' (as such term is defined in Rule 405 of the Securities Act) of the surviving entity following the consummation of such Deemed Liquidation Event;

(b) other than in the case of an "affiliate" (as such term is defined in Rule 405 of the Securities Act), such time after consummation of the IPO as Rule 144 or another similar exemption under the Securities Act is available for the sale of all of such Holder's shares without limitation during a three-month period without registration;

(c) the tenth anniversary of the IPO.

3. Information and Observer Rights.

3.1 Delivery of Financial Statements. The Company shall, upon request, deliver to each Major Investor, provided that the Board of Directors has not reasonably determined that such Major Investor is a Competitor:

(a) as soon as practicable, but in any event within one hundred twenty (120) days after the end of each fiscal year of the Company (i) an unaudited balance sheet as of the end of such year, (ii) unaudited statements of income and of cash flows for such year;

(b) as soon as practicable, but in any event within forty-five (45) days after the end of each of the first three (3) quarters of each fiscal year of the Company, unaudited statements of income and cash flows for such fiscal quarter, and an unaudited balance sheet and a statement of stockholders' equity as of the end of such fiscal quarter, all prepared in accordance with GAAP, other than with respect to accounting for certain equity and convertible debt instruments, including the University of Pennsylvania license, which have not been accounted for in accordance with GAAP, (except that such financial statements may (i) be subject to normal year-end audit adjustments; and (ii) not contain all notes thereto that may be required in accordance with GAAP);

(c) as soon as practicable, but in any event within thirty (30) days of the end of each month, an unaudited income statement for such month, and an unaudited balance sheet as of the end of such month, all prepared in accordance with GAAP, other than with respect to accounting for certain equity and convertible debt instruments, including the University of Pennsylvania license, which have not been accounted for in accordance with GAAP, (except that such financial statements may (i) be subject to normal year-end audit adjustments and (ii) not contain all notes thereto that may be required in accordance with GAAP);

(d) as soon as practicable, but in any event fifteen (15) days before the end of each fiscal year, a budget and business plan for the next fiscal year, approved by the Board of Directors, including the approval of at least one of the Preferred Directors who are serving as members of the Board of Directors at that time and prepared on a monthly basis, including balance sheets, income statements, and statements of cash flow for such months and, promptly after prepared, any other budgets or revised budgets prepared by the Company;

(e) as soon as practicable, but in any event within forty-five (45) days after the end of each quarter of each fiscal year of the Company, a statement showing the number of shares of each class and series of capital stock and securities convertible into or exercisable for shares of capital stock outstanding at the end of the period, the Common Stock issuable upon conversion or exercise of any outstanding securities convertible or exercisable for Common Stock and the exchange ratio or exercise price applicable thereto, and the number of shares of issued stock options and stock options not yet issued but reserved for issuance, if any, all in sufficient detail as to permit the Major Investors to calculate their respective percentage equity ownership in the Company; and

(f) such other information relating to the financial condition, business, prospects, or corporate affairs of the Company as any Major Investor may from time to time reasonably request; provided, however, that the Company shall not be obligated under this Subsection 3.1 to provide information (i) that the Company reasonably determines in good faith to be a trade secret or confidential information (unless covered by an enforceable confidentiality agreement, in a form acceptable to the Company); or (ii) the disclosure of which would adversely affect the attorney-client privilege between the Company and its counsel.

If the Company has audited records of any of the foregoing, it shall provide those in lieu of unaudited versions. If, for any period, the Company has any subsidiary whose accounts are consolidated with those of the Company, then in respect of such period the financial statements delivered pursuant to the foregoing sections shall be the consolidated and consolidating financial statements of the Company and all such consolidated subsidiaries.

Notwithstanding anything herein to the contrary, in the event that the Board of Directors has reasonably determined that any Major Investor is a Competitor, the Company shall promptly notify such Major Investor of such determination and shall provide the information required to be provided under this Section 3 solely to the extent that such information does not relate, directly or indirectly, to a Competing Activity.

Notwithstanding anything else in this Subsection 3.1 to the contrary, the Company may cease providing the information set forth in this Subsection 3.1 during the period starting with the date sixty (60) days before the Company's good-faith estimate of the date of filing of a registration statement if it reasonably concludes it must do so to comply with the SEC rules applicable to such registration statement and related offering; provided that the Company's covenants under this Subsection 3.1 shall be reinstated at such time as the Company is no longer actively employing its commercially reasonable efforts to cause such registration statement to become effective.

3.2 Inspection. The Company shall permit each Major Investor (provided that the Board of Directors has not reasonably determined that such Major Investor is a Competitor), at such Major Investor's expense, to visit and inspect the Company's properties; examine its books of account and records; and discuss the Company's affairs, finances, and accounts with its officers, during normal business hours of the Company as may be reasonably requested by the Major Investor; provided, however, that the Company shall not be obligated pursuant to this Subsection 3.2 to provide access to any information that it reasonably and in good faith considers to be a trade secret or confidential information (unless covered by an enforceable confidentiality agreement, in form acceptable to the Company) or the disclosure of which would adversely affect the attorney-client privilege between the Company and its counsel.

3.3 Observer Rights.

(a) As long as Adage Capital Partners, LP ("**Adage**") (i) owns not less than twenty-five percent (25%) of the shares of the Preferred Stock purchased by it under the Series A / A-1 / A-2 Preferred Stock Purchase Agreement, dated as of October 10, 2018, by and among the Company and such Existing Investors (the "**Series A Purchase Agreement**") and the Purchase Agreement (or an equivalent amount of Common Stock issued upon conversion thereof) and (ii) does not have a representative serving on the Company's Board of Directors as a Preferred Director at such time, the Company shall invite a representative of Adage to attend all meetings of the Board of Directors in a nonvoting observer capacity and, in this respect, shall give such representative copies of all notices, minutes, consents, and other materials that it provides to its directors at the same time and in the same manner as provided to such directors; provided, however, that such representative shall agree to hold in confidence and trust and to act in a fiduciary manner with respect to all information so provided; and provided further, that the Company reserves the right to withhold any information and to exclude such representative from

any meeting or portion thereof if access to such information or attendance at such meeting could adversely affect the attorney-client privilege between the Company and its counsel or result in disclosure of trade secrets or a conflict of interest, or if such Investor or its representative is a Competitor of the Company.

(b) As long as 667, L.P. and Baker Brothers Life Sciences, L.P. acting together (collectively, "**Baker Brothers**") (i) owns not less than twenty-five percent (25%) of the shares of the Preferred Stock purchased by it under the Series A Purchase Agreement and the Purchase Agreement (or an equivalent amount of Common Stock issued upon conversion thereof) and (ii) does not have a representative serving on the Company's Board of Directors as a Preferred Director at such time, the Company shall invite a representative of Baker Brothers to attend all meetings of the Board of Directors in a nonvoting observer capacity and, in this respect, shall give such representative copies of all notices, minutes, consents, and other materials that it provides to its directors at the same time and in the same manner as provided to such directors; provided, however, that such representative shall agree to hold in confidence and trust and to act in a fiduciary manner with respect to all information so provided; and provided further, that the Company reserves the right to withhold any information and to exclude such representative from any meeting or portion thereof if access to such information or attendance at such meeting could adversely affect the attorney-client privilege between the Company and its counsel or result in disclosure of trade secrets or a conflict of interest, or if such Investor or its representative is a Competitor of the Company.

(c) As long as 5AM VENTURES V, L.P. ("**5AM**") owns not less than twenty-five percent (25%) of the shares of the Preferred Stock purchased by it under the Series A Purchase Agreement and the Purchase Agreement (or an equivalent amount of Common Stock issued upon conversion thereof), the Company shall invite a representative of 5AM to attend all meetings of the Board of Directors in a nonvoting observer capacity and, in this respect, shall give such representative copies of all notices, minutes, consents, and other materials that it provides to its directors at the same time and in the same manner as provided to such directors; provided, however, that such representative shall agree to hold in confidence and trust and to act in a fiduciary manner with respect to all information so provided; and provided further, that the Company reserves the right to withhold any information and to exclude such representative from any meeting or portion thereof if access to such information or attendance at such meeting could adversely affect the attorney-client privilege between the Company and its counsel or result in disclosure of trade secrets or a conflict of interest, or if such Investor or its representative is a Competitor of the Company.

3.4 Termination of Information and Observer Rights. The covenants set forth in Subsection 3.1, Subsection 3.2 and Subsection 3.3 shall terminate and be of no further force or effect (i) immediately before the consummation of the IPO, (ii) when the Company first becomes subject to the periodic reporting requirements of Section 12(g) or 15(d) of the Exchange Act, or (iii) upon the closing of a Deemed Liquidation Event, as such term is defined in the Restated Certificate, whichever event occurs first. Notwithstanding the foregoing, with respect to Penn, the covenants set forth in Subsections 3.1, 3.2 and 3.3 shall terminate and be of no further force or effect (i) immediately before the consummation of the IPO, (ii) when the Company first becomes subject to the periodic reporting requirements of Section 12(g) or 15(d) of the Exchange Act, (iii) upon the closing of a Deemed Liquidation Event, as such term is defined in the Restated Certificate, (iv) on the eighteen (18) month anniversary of the date of this Agreement, or (v) upon the first date on which Penn sells or otherwise transfers or disposes of any shares of Preferred Stock or Common Stock, whichever event occurs first.

3.5 Confidentiality. Each Investor agrees that such Investor will keep confidential and will not disclose, divulge, or use for any purpose (other than to monitor its investment in the Company) any confidential information obtained from the Company by virtue of such Investor's status as a stockholder or pursuant to the terms of this Agreement (including notice of the Company's intention to file a registration statement), unless such confidential information (a) is known or becomes known to the public in general (other than as a result of a breach of this Subsection 3.5 by such Investor), (b) is or has been independently developed or conceived by such Investor without use of the Company's confidential information, or (c) is or has been made known or disclosed to such Investor by a third party without a breach of any obligation of confidentiality such third party may have to the Company; provided, however, that an Investor may disclose confidential information (i)to its attorneys, accountants, consultants, and other professionals to the extent necessary to obtain their services in connection with monitoring its investment in the Company; (ii) to any prospective purchaser of any Registrable Securities from such Investor, if such prospective purchaser agrees to be bound by the provisions of this Subsection 3.5; (iii) to any existing or prospective Affiliate, partner, member, stockholder, or wholly owned subsidiary of such Investor in the ordinary course of business, provided that such Investor informs such Person that such information is confidential and directs such Person to maintain the confidentiality of such information; or (iv) as may otherwise be required by law, regulation, rule, court order or subpoena, provided that such Investor promptly notifies the Company of such disclosure and takes reasonable steps to minimize the extent of any such required disclosure.

4. Rights to Future Stock Issuances.

4.1 Right of First Offer. Subject to the terms and conditions of this Subsection 4.1 and applicable securities laws, if the Company proposes to offer or sell any New Securities, the Company shall first offer such New Securities to each Major Investor. A Major Investor shall be entitled to apportion the right of first offer hereby granted to it in such proportions as it deems appropriate, among (i) itself and (ii) its Affiliates; provided, that the Company's Board of Directors has not reasonably determined any such Affiliate is a Competitor.

(a) The Company shall give notice (the "**Offer Notice**") to each Major Investor, stating (i) its bona fide intention to offer such New Securities, (ii) the number of such New Securities to be offered, and (iii) the price and terms, if any, upon which it proposes to offer such New Securities.

(b) By notification to the Company within twenty (20) days after the Offer Notice is given, each Major Investor may elect to purchase or otherwise acquire, at the price and on the terms specified in the Offer Notice, up to that portion of such New Securities which equals the proportion that the Common Stock then held by such Major Investor (including all shares of Common Stock then issuable (directly or indirectly) upon conversion and/or exercise, as applicable, of the Preferred Stock and any other vested Derivative Securities then held by such Major Investor) bears to the total Common Stock of the Company then outstanding (assuming

full conversion and/or exercise, as applicable, of all Preferred Stock and any other Derivative Securities then outstanding). At the expiration of such twenty (20) day period, the Company shall promptly notify each Major Investor that elects to purchase or acquire all the shares available to it (each, a "**Fully Exercising Investor**") of any other Major Investor's failure to do likewise. During the ten (10) day period commencing after the Company has given such notice, each Fully Exercising Investor may, by giving notice to the Company, elect to purchase or acquire, in addition to the number of shares specified above, up to that portion of the New Securities for which Major Investors were entitled to subscribe but that were not subscribed for by the Major Investors which is equal to the proportion that the Common Stock issued and held, or issuable (directly or indirectly) upon conversion and/or exercise, as applicable, of Preferred Stock and any other vested Derivative Securities then held, by such Fully Exercising Investor bears to the Common Stock issued and held, or issuable (directly or indirectly) upon conversion and/or exercise, as applicable, of the Preferred Stock and any other vested Derivative Securities then held, by all Fully Exercising Investors who wish to purchase such unsubscribed shares. The closing of any sale pursuant to this Subsection 4.1(b) shall occur within the later of ninety (90) days of the date that the Offer Notice is given and the date of initial sale of New Securities pursuant to Subsection 4.1(c).

(c) If all New Securities referred to in the Offer Notice are not elected to be purchased or acquired as provided in Subsection 4.1(b), the Company may, during the 90 day period following the expiration of the periods provided in Subsection 4.1(b), offer and sell the remaining unsubscribed portion of such New Securities to any Person or Persons at a price not less than, and upon terms no more favorable to the offeree than, those specified in the Offer Notice. If the Company does not enter into an agreement for the sale of the New Securities within such period, or if such agreement is not consummated within thirty (30) days of the execution thereof, the right provided hereunder shall be deemed to be revived and such New Securities shall not be offered unless first reoffered to the Major Investors in accordance with this Subsection 4.1.

(d) The right of first offer in this Subsection 4.1 shall not be applicable to (i) Exempted Securities (as defined in the Restated Certificate); (ii) shares of Common Stock issued in the IPO; and (iii) the issuance of shares of Preferred Stock pursuant to the Purchase Agreement, as may be amended from time to time.

4.2 Termination. The covenants set forth in Subsection 4.1 shall terminate and be of no further force or effect (i) immediately before the consummation of the IPO, (ii) when the Company first becomes subject to the periodic reporting requirements of Section 12(g) or 15(d) of the Exchange Act, (iii) upon a Deemed Liquidation Event, as such term is defined in the Restated Certificate, whichever event occurs first.

5. Additional Covenants.

5.1 Insurance. The Company shall obtain, within ninety (90) days of the Effective Date, from financially sound and reputable insurers Directors and Officers liability insurance in an amount and on terms and conditions satisfactory to the Board of Directors, including at least one of the Preferred Directors who are members of the Board of Directors at such time, and will use commercially reasonable efforts to cause such insurance policy to be maintained until such time as the Board of Directors, including at least one of the Preferred Directors who are members of the Board of Directors at such time, determines that such insurance should be discontinued.

5.2 Employee Agreements. The Company will cause (i) each Person now or hereafter employed by it or by any subsidiary (or engaged by the Company or any subsidiary as a consultant/independent contractor) with access to confidential information and/or trade secrets to enter into a nondisclosure and proprietary rights assignment agreement; and (ii) each Key Employee to enter into a one (1) year noncompetition and nonsolicitation agreement, substantially in the form approved by the Board of Directors. In addition, the Company shall not amend, modify, terminate, waive, or otherwise alter, in whole or in part, any of the above-referenced agreements or any restricted stock agreement between the Company and any employee, without the consent of the Board of Directors, including at least one of the Preferred Directors.

5.3 Matters Requiring Investor Director Approval. So long as the holders of Preferred Stock are entitled to elect the Preferred Directors, the Company hereby covenants and agrees with each of the Investors that it shall not, without approval of the Board of Directors, which approval must include the affirmative vote of at least one of the Preferred Directors who are members of the Board of Directors at such time:

(a) make, or permit any subsidiary to make, any loan or advance to, or own any stock or other securities of, any subsidiary or other corporation, partnership, or other entity unless it is wholly owned by the Company;

(b) make, or permit any subsidiary to make, any loan or advance to any Person, including, without limitation, any employee or director of the Company or any subsidiary, except advances and similar expenditures in the ordinary course of business or under the terms of an employee stock or option plan approved by the Board of Directors;

(c) guarantee, directly or indirectly, or permit any subsidiary to guarantee, directly or indirectly, any indebtedness except for trade accounts of the Company or any subsidiary arising in the ordinary course of business;

(d) make any investment inconsistent with any investment policy approved by the Board of Directors;

(e) incur any aggregate indebtedness in excess of $500,000 that is not already included in a budget approved by the Board of Directors, other than trade credit incurred in the ordinary course of business;

(f) otherwise enter into or be a party to any transaction with any director, officer, or employee of the Company or any "associate" (as defined in Rule 12b-2 promulgated under the Exchange Act) of any such Person, except for transactions contemplated by this Agreement, the Purchase Agreement, or transactions made in the ordinary course of business and pursuant to reasonable requirements of the Company's business and upon fair and reasonable terms that are approved by a majority of the Board of Directors;

(g) hire, terminate, or change the compensation of the executive officers, including approving any option grants or stock awards to executive officers;

(h) change the principal business of the Company, enter new lines of business, or exit the current line of business;

(i) sell, assign, license, pledge, or encumber material technology or intellectual property, other than licenses granted in the ordinary course of business; or

(j) enter into any corporate strategic relationship involving the payment, contribution, or assignment by the Company or to the Company of money or assets greater than $500,000.

5.4 Employee Stock. Unless otherwise approved by the Board of Directors, all future employees and consultants of the Company who purchase, receive options to purchase, or receive awards of shares of the Company's capital stock after the Effective Date shall be required to execute restricted stock or option agreements, as applicable, providing for (i) vesting of shares over a four (4) year period, with the first twenty-five percent (25%) of such shares vesting following twelve (12) months of continued employment or service from service provider's start date, and the remaining shares vesting in equal monthly installments over the following thirty-six (36) months, and (ii) a market stand-off provision substantially similar to that in Subsection 2.11. Without the prior approval by the Board of Directors, the Company shall not amend, modify, terminate, waive or otherwise alter, in whole or in part, any stock purchase, stock restriction or option agreement with any existing employee or service provider if such amendment would cause it to be inconsistent with this Subsection 5.5. In addition, unless otherwise approved by the Board of Directors, the Company shall retain (and not waive or otherwise let lapse) a "right of first refusal" on employee transfers until the Company's IPO and shall have the right to repurchase unvested shares at cost upon termination of employment of a holder of restricted stock.

5.5 Board Matters. Unless otherwise determined by the vote of a majority of the directors then in office, the Board of Directors shall meet in person or by video conference or teleconference at least quarterly in accordance with an agreed-upon schedule. The Company shall reimburse the directors for all reasonable and actual out-of-pocket travel expenses incurred (consistent with the Company's travel policy) in connection with attending meetings of the Board of Directors. The Company shall cause to be established, as soon as practicable after the request of the Preferred Directors, and will maintain, an audit and compensation committee, each of which shall consist solely of non-management directors. Each Preferred Director shall be entitled in such persons' discretion to be a member of any Board of Directors committee established from time to time.

5.6 Successor Indemnification. If the Company or any of its successors or assignees consolidates with or merges into any other Person and is not the continuing or surviving corporation or entity of such consolidation or merger, then to the extent necessary, proper provision shall be made so that the successors and assignees of the Company assume the obligations of the Company with respect to indemnification of members of the Board of Directors as in effect immediately before such transaction, whether such obligations are contained in the Company's Bylaws, its Restated Certificate, or elsewhere, as the case may be.

5.7 Indemnification Matters. The Company hereby acknowledges that one (1) or more of the directors nominated to serve on the Board of Directors by the Investors (each a "**Fund Director**") may have certain rights to indemnification, advancement of expenses and/or insurance provided by one or more of the Investors and certain of their affiliates (collectively, the "**Fund Indemnitors**"). The Company hereby agrees (a) that it is the indemnitor of first resort (*i.e.*, its obligations to any such Fund Director are primary and any obligation of the Fund Indemnitors to advance expenses or to provide indemnification for the same expenses or liabilities incurred by such Fund Director are secondary), (b) that it shall be required to advance the full amount of expenses incurred by such Fund Director and shall be liable for the full amount of all expenses, judgments, penalties, fines and amounts paid in settlement by or on behalf of any such Fund Director to the extent legally permitted and as required by the Restated Certificate or Bylaws of the Company (or any agreement between the Company and such Fund Director), without regard to any rights such Fund Director may have against the Fund Indemnitors, and, (c) that it irrevocably waives, relinquishes and releases the Fund Indemnitors from any and all claims against the Fund Indemnitors for contribution, subrogation or any other recovery of any kind in respect thereof. The Company further agrees that no advancement or payment by the Fund Indemnitors on behalf of any such Fund Director with respect to any claim for which such Fund Director has sought indemnification from the Company shall affect the foregoing and the Fund Indemnitors shall have a right of contribution and/or be subrogated to the extent of such advancement or payment to all of the rights of recovery of such Fund Director against the Company. The Fund Directors and Fund Indemnitors are intended third party beneficiaries of this Subsection 5.8 and shall have the right, power and authority to enforce the provisions of this Subsection 5.8.

5.8 Right to Conduct Activities. The Company hereby agrees and acknowledges that each of 5AM, Adage, Baker Brothers, Deerfield Private Design Fund IV. L.P., Deerfield Special Situations Fund, L.P., Redmile Biopharma Investments I, L.P., RAF, L.P., Cormorant Private Healthcare Fund II, LP, Cormorant Global Healthcare Master Fund, LP, CRMA SPV, LP, Boxer Capital, LLC, and MVA Investors, LLC (together with their respective Affiliates) (each, a "**VC Fund**") is a professional investment manager and/or fund or venture investment arm of its Affiliates, and as such invests in and reviews the business plans and related proprietary information of many enterprises, some of which may compete directly or indirectly with the Company's business (as currently conducted or as currently propose to be conducted). The Company hereby agrees that, to the extent permitted under applicable law, no VC Fund shall be liable to the Company for any claim arising out of, or based upon, (i) the investment by any VC Fund in any entity competitive with the Company, (ii) the activities of any VC Fund's Affiliates or (iii) actions taken by any advisor, partner, officer or other representative of any VC Fund to assist any such competitive company, whether or not such action was taken as a member of the board of directors of such competitive company or otherwise, and whether or not such action has a detrimental effect on the Company; provided, however, that the foregoing shall not relieve (x) any of the Investors from liability associated with the unauthorized disclosure of the Company's confidential information obtained pursuant to this Agreement, or (y) any director or officer of the Company from any liability associated with his or her fiduciary duties to the Company.

5.9 Termination of Covenants. The covenants set forth in this Section 5, except for Subsection 5.7, shall terminate and be of no further force or effect (i) immediately before the consummation of the IPO, (ii) when the Company first becomes subject to the periodic reporting requirements of Section 12(g) or 15(d) of the Exchange Act, or (iii) upon a Deemed Liquidation Event, as such term is defined in the Restated Certificate, whichever event occurs first.

6. Miscellaneous.

6.1 Successors and Assigns. The rights under this Agreement may be assigned (but only with all related obligations) by a Holder to a transferee of Registrable Securities that (i) is an Affiliate of a Holder; (ii) is a Holder's Immediate Family Member or trust for the benefit of an individual Holder or one or more of such Holder's Immediate Family Members; or (iii) after such transfer, holds at least twenty percent (20%) of such Holder's shares of Registrable Securities (subject to appropriate adjustment for stock splits, stock dividends, combinations, and other recapitalizations); provided, however, that (x) the Company is, within a reasonable time after such transfer, furnished with written notice of the name and address of such transferee and the Registrable Securities with respect to which such rights are being transferred; and (y) such transferee agrees in a written instrument delivered to the Company to be bound by and subject to the terms and conditions of this Agreement, including the provisions of Subsection 2.11. For the purposes of determining the number of shares of Registrable Securities held by a transferee, the holdings of a transferee (1) that is an Affiliate or stockholder of a Holder; (2) who is a Holder's Immediate Family Member; or (3) that is a trust for the benefit of an individual Holder or such Holder's Immediate Family Member shall be aggregated together and with those of the transferring Holder; provided further that all transferees who would not qualify individually for assignment of rights shall, as a condition to the applicable transfer, establish a single attorney-in-fact for the purpose of exercising any rights, receiving notices, or taking any action under this Agreement. The terms and conditions of this Agreement inure to the benefit of and are binding upon the respective successors and permitted assignees of the parties. Nothing in this Agreement, express or implied, is intended to confer upon any party other than the parties hereto or their respective successors and permitted assignees any rights, remedies, obligations or liabilities under or by reason of this Agreement, except as expressly provided herein.

6.2 Governing Law. The law, including the statutes of limitation, of the State of Delaware shall govern this Agreement, the interpretation and enforcement of its terms and any claim or cause of action (in law or equity), controversy or dispute arising out of or related to it or its negotiation, execution or performance, whether based on contract, tort, statutory or other law, in each case without giving effect to any conflicts-of-law or other principle requiring the application of the law of any other jurisdiction.

6.3 Counterparts. This Agreement may be executed in two (2) or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. Counterparts may be delivered via facsimile, electronic mail (including pdf or any electronic signature complying with the U.S. federal ESIGN Act of 2000, *e.g.*, www.docusign.com) or other transmission method and any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes.

6.4 Titles and Subtitles. The titles and subtitles used in this Agreement are for convenience only and are not to be considered in construing or interpreting this Agreement.

6.5 Notices.

(a) All notices and other communications given or made pursuant to this Agreement shall be in writing and shall be deemed effectively given upon the earlier of actual receipt or (i) personal delivery to the party to be notified; (ii) when sent, if sent by electronic mail or facsimile during the recipient's normal business hours, and if not sent during normal business hours, then on the recipient's next business day; (iii) five (5) days after having been sent by registered or certified mail, return receipt requested, postage prepaid; or (iv) one (1) business day after the business day of deposit with a nationally recognized overnight courier, freight prepaid, specifying next-day delivery, with written verification of receipt. All communications shall be sent to the Investors at their addresses as set forth on Schedule A hereto, or, in the case of any parties to the Agreement, to such email address, facsimile number, or address as subsequently modified by written notice given in accordance with this Subsection 6.5. If notice is given to the Company, it shall be sent to 501 Northwick Lane, Villanova, PA 19805, *Attention:* Steven Nichtberger; and a copy (which shall not constitute notice) shall also be sent to Goodwin Procter LLP, 100 Northern Avenue, Boston, MA 02210, Attention: Mitchell S. Bloom; if notice is given to Deerfield Private Design Fund IV, L.P. or Deerfield Special Situations Fund, L.P., a copy shall also be given to Paul Hastings LLP, 200 Park Avenue, New York, NY 10166, Attention: Samuel Waxman; and if notice is given to 5AM Ventures V, L.P., a copy shall also be given to Cooley LLP, 500 Boylston Street, Boston, MA 02116, Attention: Nicole Brookshire and Ryan S. Sansom.

(b) Consent to Electronic Notice. Each Investor consents to the delivery of any stockholder notice pursuant to the Delaware General Corporation Law (the "**DGCL**"), as amended or superseded from time to time, by electronic transmission pursuant to Section232 of the DGCL (or any successor thereto) at the electronic mail address or the facsimile number as on the books of the Company. To the extent that any notice given by means of electronic transmission is returned or undeliverable for any reason, the foregoing consent shall be deemed to have been revoked until a new or corrected electronic mail address has been provided, and such attempted electronic notice shall be ineffective and deemed to not have been given. Each Investor agrees to promptly notify the Company of any change in such stockholder's electronic mail address, and that failure to do so shall not affect the foregoing.

6.6 Amendments and Waivers. Any term of this Agreement may be amended, modified or terminated and the observance of any term of this Agreement may be waived (either generally or in a particular instance, and either retroactively or prospectively) only with the written consent of the Company and the holders of at least a majority of the Registrable Securities held by the then outstanding shares of Preferred Stock, voting together as a single class and on an as-converted basis, provided that the Company may in its sole discretion waive compliance with Subsection 2.12(c) (and the Company's failure to object promptly in writing after notification of a proposed assignment allegedly in violation of Subsection 2.12(c) shall be deemed to be a waiver); and provided further that the rights of any VC Fund under Section 3.3 may be waived only with the written consent of such VC Fund, for so long as such VC Fund holds any Registrable Securities; and provided further that any provision hereof may be waived

by any waiving party on such party's own behalf, without the consent of any other party. Notwithstanding the foregoing, (a) this Agreement may not be amended, modified or terminated and the observance of any term hereof may not be waived with respect to any Investor without the written consent of such Investor, unless such amendment, modification, termination, or waiver applies to all Investors in the same fashion (it being agreed that a waiver of the provisions of Section 4 with respect to a particular transaction shall be deemed to apply to all Investors in the same fashion if such waiver does so by its terms, notwithstanding the fact that certain Investors may nonetheless, by agreement with the Company, purchase securities in such transaction) and (b) Subsections 3.1 and 3.2, Section 4 and any other section of this Agreement applicable to the Major Investors (including this clause (b)of this Subsection 6.6) may not be amended, modified, terminated or waived without the written consent of the holders of at least a majority of the Registrable Securities held by the then outstanding shares of Preferred Stock, voting together as a single class and on an as-converted basis, held by the Major Investors. The Company shall give prompt notice of any amendment, modification or termination hereof or waiver hereunder to any party hereto that did not consent in writing to such amendment, modification termination, or waiver. Any amendment, modification, termination, or waiver effected in accordance with this Subsection 6.6 shall be binding on all parties hereto, regardless of whether any such party has consented thereto. No waivers of or exceptions to any term, condition, or provision of this Agreement, in any one or more instances, shall be deemed to be or construed as a further or continuing waiver of any such term, condition, or provision.

6.7 Severability. In case any one or more of the provisions contained in this Agreement is for any reason held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision of this Agreement, and such invalid, illegal, or unenforceable provision shall be reformed and construed so that it will be valid, legal, and enforceable to the maximum extent permitted by law.

6.8 Aggregation of Stock. All shares of Registrable Securities held or acquired by Affiliates shall be aggregated together for the purpose of determining the availability of any rights under this Agreement and such Affiliated persons may apportion such rights as among themselves in any manner they deem appropriate.

6.9 Additional Investors. Notwithstanding anything to the contrary contained herein, if the Company issues additional shares of the Company's Preferred Stock after the Effective Date, any purchaser of such shares of Preferred Stock may become a party to this Agreement by executing and delivering an additional counterpart signature page to this Agreement, and thereafter shall be deemed an "Investor" for all purposes hereunder. No action or consent by the Investors shall be required for such joinder to this Agreement by such additional Investor, so long as such additional Investor has agreed in writing to be bound by all of the obligations as an "Investor" hereunder.

6.10 Entire Agreement. This Agreement constitutes the full and entire understanding and agreement among the parties with respect to the subject matter hereof, and any other written or oral agreement relating to the subject matter hereof existing between the parties is expressly canceled. Upon the effectiveness of this Agreement, the Prior Agreement shall be deemed amended and restated and superseded and replaced in its entirety by this Agreement, and shall be of no further force or effect.

6.11 Dispute Resolution. The parties (a) hereby irrevocably and unconditionally submit to the jurisdiction of the state courts of Delaware and to the jurisdiction of the United States District Court for the District of Delaware for the purpose of any suit, action or other proceeding arising out of or based upon this Agreement, (b) agree not to commence any suit, action or other proceeding arising out of or based upon this Agreement except in the state courts of Delaware or the United States District Court for the District of Delaware, and (c) hereby waive, and agree not to assert, by way of motion, as a defense, or otherwise, in any such suit, action or proceeding, any claim that it is not subject personally to the jurisdiction of the above-named courts, that its property is exempt or immune from attachment or execution, that the suit, action or proceeding is brought in an inconvenient forum, that the venue of the suit, action or proceeding is improper or that this Agreement or the subject matter hereof may not be enforced in or by such court.

> WAIVER OF JURY TRIAL: EACH PARTY HEREBY WAIVES ITS RIGHTS TO A JURY TRIAL OF ANY CLAIM OR CAUSE OF ACTION BASED UPON OR ARISING OUT OF THIS AGREEMENT, THE OTHER TRANSACTION DOCUMENTS, THE SECURITIES OR THE SUBJECT MATTER HEREOF OR THEREOF. THE SCOPE OF THIS WAIVER IS INTENDED TO BE ALL-ENCOMPASSING OF ANY AND ALL DISPUTES THAT MAY BE FILED IN ANY COURT AND THAT RELATE TO THE SUBJECT MATTER OF THIS TRANSACTION, INCLUDING, WITHOUT LIMITATION, CONTRACT CLAIMS, TORT CLAIMS (INCLUDING NEGLIGENCE), BREACH OF DUTY CLAIMS, AND ALL OTHER COMMON LAW AND STATUTORY CLAIMS. THIS SECTION HAS BEEN FULLY DISCUSSED BY EACH OF THE PARTIES HERETO AND THESE PROVISIONS WILL NOT BE SUBJECT TO ANY EXCEPTIONS. EACH PARTY HERETO HEREBY FURTHER WARRANTS AND REPRESENTS THAT SUCH PARTY HAS REVIEWED THIS WAIVER WITH ITS LEGAL COUNSEL, AND THAT SUCH PARTY KNOWINGLY AND VOLUNTARILY WAIVES ITS JURY TRIAL RIGHTS FOLLOWING CONSULTATION WITH LEGAL COUNSEL.

The prevailing party shall be entitled to reasonable attorney's fees, costs, and necessary disbursements in addition to any other relief to which such party may be entitled.

6.12 Delays or Omissions. No delay or omission to exercise any right, power, or remedy accruing to any party under this Agreement, upon any breach or default of any other party under this Agreement, shall impair any such right, power, or remedy of such nonbreaching or nondefaulting party, nor shall it be construed to be a waiver of or acquiescence to any such breach or default, or to any similar breach or default thereafter occurring, nor shall any waiver of any single breach or default be deemed a waiver of any other breach or default theretofore or thereafter occurring. All remedies, whether under this Agreement or by law or otherwise afforded to any party, shall be cumulative and not alternative.

6.13 Non-Compete. Nothing in this Agreement, including the receipt of confidential information, shall preclude, create an obligation or duty, or in any way restrict a VC Fund from evaluating or purchasing securities, including publicly traded securities, of a particular enterprise, or investing or participating in any particular enterprise, whether or not such services compete with those of the Company.

[Remainder of Page Intentionally Left Blank]

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

CABALETTA BIO, INC.

By: /s/ Steven Nichtberger
Name: Steven Nichtberger
Title: President and Chief Executive Officer

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

INVESTORS:
REDMILE BIOPHARMA INVESTMENTS I, L.P.

By: /s/ Jeremy Green
Name: Jeremy Green
Title: Managing Member of the General Partner and the Management Company

RAF, L.P.

By: /s/ Jeremy Green
Name: Jeremy Green
Title: Managing Member of the General Partner and the Management Company

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

2017 FAN PIER FUND A, LLC

By: /s/ David Henken
Name: David Henken
Title: Managing Member

2017 FAN PIER FUND B, LLC

By: /s/ David Henken
Name: David Henken
Title: Managing Member

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

ADAGE CAPITAL PARTNERS, LP
By: Adage Capital Partners, GP, LLC
Its: General Partner

By: Adage Capital Advisors, LLC
Its: Managing Member

By: /s/ Joseph Lehan
Name: Joseph Lehan
Title: Chief Compliance Officer

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

5AM VENTURES V, L.P.
By: 5AM Partners V, LLC, its general partner

By: /s/ Kush Parmar
Name: Kush Parmar
Title: Managing Member

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

/s/ Steven Nichtberger
Name: Steven Nichtberger

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

/s/ Daniel Geffken
Name: Daniel Geffken

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

/s/ Mitchell S. Bloom
Name: Mitchell S. Bloom

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

THE TRUSTEES OF THE UNIVERSITY OF PENNSYLVANIA

By: /s/ Kevin B. Mahoney
Name: Kevin B Mahoney
Title: Executive Vice President

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

INVESTORS:

Cormorant Private Healthcare Fund II, LP
By: Cormorant Private Healthcare GP II, LLC

By: /s/ Bihua Chen
Name: Bihua Chen
Title: Managing Member

Cormorant Global Healthcare Master Fund, LP
By: Cormorant Global Healthcare GP, LLC

By: /s/ Bihua Chen
Name: Bihua Chen
Title: Managing Member

CRMA SPV, LP
By: Cormorant Asset Management, LLC
Its: Attorney-In-Fact

By: /s/ Bihua Chen
Name: Bihua Chen
Title: CEO/Managing Member

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

INVESTORS:

BOXER CAPITAL, LLC

By: /s/ Aaron Davis
Name: Aaron Davis
Title: Chief Executive Officer

MVA INVESTORS, LLC

By: /s/ Aaron Davis
Name: Aaron Davis
Title: Chief Executive Officer

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

INVESTORS:

DEERFIELD PRIVATE DESIGN FUND IV., L.P.

By: Deerfield Mgmt IV, L.P. General Partner
By: J. E. Flynn Capital IV, LLC General Partner

By: /s/ David J. Clark
Name: David J. Clark
Title: Authorized Signatory

DEERFIELD SPECIAL SITUATIONS FUND, L.P.
By: Deerfield Mgmt, L.P. General Partner

By: J. E. Flynn Capital, LLC General Partner

By: /s/ David J. Clark
Name: David J. Clark
Title: Authorized Signatory

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

667, L.P.

By: BAKER BROS. ADVISORS LP, management company and investment adviser to 667, L.P., pursuant to authority granted to it by Baker Biotech Capital, L.P., general partner to 667, L.P., and not as the general partner.

By: /s/ Scott Lessing
Name: Scott Lessing
Title: President

BAKER BROTHERS LIFE SCIENCES, L.P.

By: BAKER BROS. ADVISORS LP, management company and investment adviser to 667, L.P., pursuant to authority granted to it by Baker Biotech Capital, L.P., general partner to 667, L.P., and not as the general partner.

By: /s/ Scott Lessing
Name: Scott Lessing
Title: President

CABALETTA BIO, INC.

2018 STOCK OPTION AND GRANT PLAN

SECTION 1. GENERAL PURPOSE OF THE PLAN; DEFINITIONS

The name of the plan is the Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan (the "Plan"). The purpose of the Plan is to encourage and enable the officers, employees, directors, Consultants and other key persons of Cabaletta Bio, Inc., a Delaware corporation (including any successor entity, the "Company"), and its Subsidiaries, upon whose judgment, initiative and efforts the Company largely depends for the successful conduct of its business, to acquire a proprietary interest in the Company.

The following terms shall be defined as set forth below:

"*Affiliate*" of any Person means a Person that directly or indirectly, through one or more intermediaries, controls, is controlled by or is under common control with the first mentioned Person. A Person shall be deemed to control another Person if such first Person possesses directly or indirectly the power to direct, or cause the direction of, the management and policies of the second Person, whether through the ownership of voting securities, by contract or otherwise.

"*Award*" or "*Awards,*" except where referring to a particular category of grant under the Plan, shall include Incentive Stock Options,Non-Qualified Stock Options, Restricted Stock Awards, Unrestricted Stock Awards, Restricted Stock Units or any combination of the foregoing.

"Award Agreement" means a written or electronic agreement setting forth the terms and provisions applicable to an Award granted under the Plan. Each Award Agreement may contain terms and conditions in addition to those set forth in the Plan; *provided, however,* in the event of any conflict in the terms of the Plan and the Award Agreement, the terms of the Plan shall govern**.**

"*Board*" means the Board of Directors of the Company.

"*Cause*" shall have the meaning as set forth in the Award Agreement(s). In the case that any Award Agreement does not contain a definition of "Cause," it shall mean (i) the grantee's dishonest statements or acts with respect to the Company or any Affiliate of the Company, or any current or prospective customers, suppliers vendors or other third parties with which such entity does business; (ii) the grantee's commission of (A) a felony or (B) any misdemeanor involving moral turpitude, deceit, dishonesty or fraud; (iii) the grantee's failure to perform his assigned duties and responsibilities to the reasonable satisfaction of the Company which failure continues, in the reasonable judgment of the Company, after written notice given to the grantee by the Company; (iv) the grantee's gross negligence, willful misconduct or insubordination with respect to the Company or any Affiliate of the Company; or (v) the grantee's material violation of any provision of any agreement(s) between the grantee and the Company relating to noncompetition, nonsolicitation, nondisclosure and/or assignment of inventions.

"Chief Executive Officer" means the Chief Executive Officer of the Company or, if there is no Chief Executive Officer, then the President of the Company.

"*Code*" means the Internal Revenue Code of 1986, as amended, and any successor Code, and related rules, regulations and interpretations.

"*Committee*" means the Committee of the Board referred to in Section 2.

"Consultant" means any natural person that provides bona fide services to the Company (including a Subsidiary), and such services are not in connection with the offer or sale of securities in a capital-raising transaction and do not directly or indirectly promote or maintain a market for the Company's securities.

"*Disability*" means "disability" as defined in Section 422(c) of the Code.

"*Effective Date*" means the date on which the Plan is adopted as set forth on the final page of the Plan.

"*Exchange Act*" means the Securities Exchange Act of 1934, as amended, and the rules and regulations thereunder.

"*Fair Market Value*" of the Stock on any given date means the fair market value of the Stock determined in good faith by the Committee based on the reasonable application of a reasonable valuation method not inconsistent with Section 409A of the Code. If the Stock is admitted to trade on a national securities exchange, the determination shall be made by reference to the closing price reported on such exchange. If there is no closing price for such date, the determination shall be made by reference to the last date preceding such date for which there is a closing price. If the date for which Fair Market Value is determined is the first day when trading prices for the Stock are reported on a national securities exchange, the Fair Market Value shall be the "Price to the Public" (or equivalent) set forth on the cover page for the final prospectus relating to the Company's Initial Public Offering.

"Good Reason" shall have the meaning as set forth in the Award Agreement(s). In the case that any Award Agreement does not contain a definition of "Good Reason," it shall mean (i) a material diminution in the grantee's base salary except for across-the-board salary reductions similarly affecting all or substantially all similarly situated employees of the Company or (ii) a change of more than 50 miles in the geographic location at which the grantee provides services to the Company, so long as the grantee provides at least 90 days' notice to the Company following the initial occurrence of any such event and the Company fails to cure such event within 30 days thereafter.

"*Grant Date"* means the date that the Committee designates in its approval of an Award in accordance with applicable law as the date on which the Award is granted, which date may not precede the date of such Committee approval.

"Holder" means, with respect to an Award or any Shares, the Person holding such Award or Shares, including the initial recipient of the Award or any Permitted Transferee.

"*Incentive Stock Option*" means any Stock Option designated and qualified as an "incentive stock option" as defined in Section 422 of the Code.

"*Initial Public Offering*" means the consummation of the first firm commitment underwritten public offering pursuant to an effective registration statement under the Securities Act covering the offer and sale by the Company of its equity securities, as a result of or following which the Stock shall be publicly held.

"*Non-Qualified Stock Option*" means any Stock Option that is not an Incentive Stock Option.

"*Option*" or "*Stock Option*" means any option to purchase shares of Stock granted pursuant to Section 5.

"*Permitted Transferees*" shall mean any of the following to whom a Holder may transfer Shares hereunder (as set forth in Section 9(a)(ii)(A)): the Holder's child, stepchild, grandchild, parent, stepparent, grandparent, spouse, former spouse, sibling, niece, nephew, mother-in-law, father-in-law, son-in-law, daughter-in-law, brother-in-law, or sister-in-law, including adoptive relationships, any person sharing the Holder's household (other than a tenant or employee), a trust in which these persons have more than fifty percent of the beneficial interest, a foundation in which these persons control the management of assets, and any other entity in which these persons own more than fifty percent of the voting interests*; provided, however,* that any such trust does not require or permit distribution of any Shares during the term of the Award Agreement unless subject to its terms. Upon the death of the Holder, the term Permitted Transferees shall also include such deceased Holder's estate, executors, administrators, personal representatives, heirs, legatees and distributees, as the case may be.

"*Person*" shall mean any individual, corporation, partnership (limited or general), limited liability company, limited liability partnership, association, trust, joint venture, unincorporated organization or any similar entity.

"Restricted Stock Award" means Awards granted pursuant to Section 6 and *"Restricted Stock"* means Shares issued pursuant to such Awards.

"Restricted Stock Unit" means an Award of phantom stock units to a grantee, which may be settled in cash or Shares as determined by the Committee, pursuant to Section 8.

"*Sale Event"* means the consummation of (i) the dissolution or liquidation of the Company, (ii) the sale of all or substantially all of the assets of the Company on a consolidated basis to an unrelated person or entity, (iii) a merger, reorganization or consolidation pursuant to which the holders of the Company's outstanding voting power immediately prior to such transaction do not own a majority of the outstanding voting power of the surviving or resulting entity (or its ultimate parent, if applicable), (iv) the acquisition of all or a majority of the outstanding voting stock of the Company in a single transaction or a series of related transactions by a Person or group of Persons, or (v) any other acquisition of the business of the Company, as determined by the Board; *provided, however,* that the Company's Initial Public Offering, any subsequent public offering or another capital raising event, or a merger effected solely to change the Company's domicile shall not constitute a "Sale Event."

"Section 409A" means Section 409A of the Code and the regulations and other guidance promulgated thereunder.

"*Securities Act*" means the Securities Act of 1933, as amended, and the rules and regulations thereunder.

"Service Relationship" means any relationship as a full-time employee, part-time employee, director or other key person (including Consultants) of the Company or any Subsidiary or any successor entity (e.g., a Service Relationship shall be deemed to continue without interruption in the event an individual's status changes from full-time employee to part- time employee or Consultant).

"Shares" means shares of Stock.

"*Stock*" means the Common Stock, par value $0.00001 per share, of the Company.

"*Subsidiary*" means any corporation or other entity (other than the Company) in which the Company has more than a 50 percent interest, either directly or indirectly.

"Ten Percent Owner" means an employee who owns or is deemed to own (by reason of the attribution rules of Section 424(d) of the Code) more than 10 percent of the combined voting power of all classes of stock of the Company or any parent of the Company or any Subsidiary.

"Termination Event" means the termination of the Award recipient's Service Relationship with the Company and its Subsidiaries for any reason whatsoever, regardless of the circumstances thereof, and including, without limitation, upon death, disability, retirement, discharge or resignation for any reason, whether voluntarily or involuntarily. The following shall not constitute a Termination Event: (i) a transfer to the service of the Company from a Subsidiary or from the Company to a Subsidiary, or from one Subsidiary to another Subsidiary or (ii) an approved leave of absence for military service or sickness, or for any other purpose approved by the Committee, if the individual's right to re-employment is guaranteed either by a statute or by contract or under the policy pursuant to which the leave of absence was granted or if the Committee otherwise so provides in writing.

"*Unrestricted Stock Award"* means any Award granted pursuant to Section 7 and

"Unrestricted Stock" means Shares issued pursuant to such Awards.

SECTION 2. ADMINISTRATION OF PLAN; COMMITTEE AUTHORITY TO SELECT GRANTEES AND DETERMINE AWARDS

(a) Administration of Plan. The Plan shall be administered by the Board, or at the discretion of the Board, by a committee of the Board, comprised of not less than two directors. All references herein to the "Committee" shall be deemed to refer to the group then responsible for administration of the Plan at the relevant time (i.e., either the Board of Directors or a committee or committees of the Board, as applicable).

(b) Powers of Committee. The Committee shall have the power and authority to grant Awards consistent with the terms of the Plan, including the power and authority:

(i) to select the individuals to whom Awards may from time to time be granted;

(ii) to determine the time or times of grant, and the amount, if any, of Incentive Stock Options,Non-Qualified Stock Options, Restricted Stock Awards, Unrestricted Stock Awards, Restricted Stock Units, or any combination of the foregoing, granted to any one or more grantees;

(iii) to determine the number of Shares to be covered by any Award and, subject to the provisions of the Plan, the price, exercise price, conversion ratio or other price relating thereto;

(iv) to determine and, subject to Section 12, to modify from time to time the terms and conditions, including restrictions, not inconsistent with the terms of the Plan, of any Award, which terms and conditions may differ among individual Awards and grantees, and to approve the form of Award Agreements;

(v) to accelerate at any time the exercisability or vesting of all or any portion of any Award;

(vi) to impose any limitations on Awards, including limitations on transfers, repurchase provisions and the like, and to exercise repurchase rights or obligations;

(vii) subject to Section 5(a)(ii) and any restrictions imposed by Section 409A, to extend at any time the period in which Stock Options may be exercised; and

(viii) at any time to adopt, alter and repeal such rules, guidelines and practices for administration of the Plan and for its own acts and proceedings as it shall deem advisable; to interpret the terms and provisions of the Plan and any Award (including Award Agreements); to make all determinations it deems advisable for the administration of the Plan; to decide all disputes arising in connection with the Plan; and to otherwise supervise the administration of the Plan.

All decisions and interpretations of the Committee shall be binding on all persons, including the Company and all Holders.

(c) Award Agreement. Awards under the Plan shall be evidenced by Award Agreements that set forth the terms, conditions and limitations for each Award.

(d) Indemnification. Neither the Board nor the Committee, nor any member of either or any delegate thereof, shall be liable for any act, omission, interpretation, construction or determination made in good faith in connection with the Plan, and the members of the Board and the Committee (and any delegate thereof) shall be entitled in all cases to indemnification and reimbursement by the Company in respect of any claim, loss, damage or expense (including, without limitation, reasonable attorneys' fees) arising or resulting therefrom to the fullest extent permitted by law and/or under the Company's governing documents, including its certificate of incorporation or bylaws, or any directors' and officers' liability insurance coverage which may be in effect from time to time and/or any indemnification agreement between such individual and the Company.

(e) Foreign Award Recipients. Notwithstanding any provision of the Plan to the contrary, in order to comply with the laws in other countries in which the Company and any Subsidiary operate or have employees or other individuals eligible for Awards, the Committee, in its sole discretion, shall have the power and authority to: (i) determine which Subsidiaries, if any, shall be covered by the Plan; (ii) determine which individuals, if any, outside the United States are eligible to participate in the Plan; (iii) modify the terms and conditions of any Award granted to individuals outside the United States to comply with applicable foreign laws; (iv) establish subplans and modify exercise procedures and other terms and procedures, to the extent the Committee determines such actions to be necessary or advisable (and such subplans and/or modifications shall be attached to the Plan as appendices); provided, however, that no such subplans and/or modifications shall increase the share limitation contained in Section 3(a) hereof; and (v) take any action, before or after an Award is made, that the Committee determines to be necessary or advisable to obtain approval or comply with any local governmental regulatory exemptions or approvals.

SECTION 3. STOCK ISSUABLE UNDER THE PLAN; MERGERS AND OTHER TRANSACTIONS; SUBSTITUTION

(a) Stock Issuable. The maximum number of Shares reserved and available for issuance under the Plan shall be 1,275,000 Shares, subject to adjustment as provided in Section 3(b). For purposes of this limitation, the Shares underlying any Awards that are forfeited, canceled, reacquired by the Company prior to vesting, satisfied without the issuance of Stock or otherwise terminated (other than by exercise) and Shares that are withheld upon exercise of an Option or settlement of an Award to cover the exercise price or tax withholding shall be added back to the Shares available for issuance under the Plan. Subject to such overall limitations, Shares may be issued up to such maximum number pursuant to any type or types of Award, and no more than 1,530,000 Shares may be issued pursuant to Incentive Stock Options. The Shares available for issuance under the Plan may be authorized but unissued Shares or Shares reacquired by the Company.

(b) Changes in Stock. Subject to Section 3(c) hereof, if, as a result of any reorganization, recapitalization, reclassification, stock dividend, stock split, reverse stock split or other similar change in the Company's capital stock, the outstanding Shares are increased or decreased or are exchanged for a different number or kind of shares or other securities of the Company, or additional Shares or new or different shares or other securities of the Company or other non-cash assets are distributed with respect to such Shares or other securities, in each case, without the receipt of consideration by the Company, or, if, as a result of any merger or consolidation, or sale of all or substantially all of the assets of the Company, the outstanding Shares are converted into or exchanged for other securities of the Company or any successor entity (or a parent or subsidiary thereof), the Committee shall make an appropriate and proportionate adjustment in (i) the maximum number of Shares reserved for issuance under the Plan, (ii) the number and kind of Shares or other securities subject to any then outstanding Awards under the Plan, (iii) the repurchase price, if any, per Share subject to each outstanding Award, and (iv) the exercise price for each Share subject to any then outstanding Stock Options

under the Plan, without changing the aggregate exercise price (i.e., the exercise price multiplied by the number of Stock Options) as to which such Stock Options remain exercisable. The Committee shall in any event make such adjustments as may be required by Section 25102(o) of the California Corporation Code and the rules and regulations promulgated thereunder. The adjustment by the Committee shall be final, binding and conclusive. No fractional Shares shall be issued under the Plan resulting from any such adjustment, but the Committee in its discretion may make a cash payment in lieu of fractional shares.

(c) Sale Events.

(i) Options.

(A) In the case of and subject to the consummation of a Sale Event, the Plan and all outstanding Options issued hereunder shall terminate upon the effective time of any such Sale Event unless assumed or continued by the successor entity, or new stock options or other awards of the successor entity or parent thereof are substituted therefor, with an equitable or proportionate adjustment as to the number and kind of shares and, if appropriate, the per share exercise prices, as such parties shall agree (after taking into account any acceleration hereunder and/or pursuant to the terms of any Award Agreement).

(B) In the event of the termination of the Plan and all outstanding Options issued hereunder pursuant to Section 3(c), each Holder of Options shall be permitted, within a period of time prior to the consummation of the Sale Event as specified by the Committee, to exercise all such Options which are then exercisable or will become exercisable as of the effective time of the Sale Event; *provided, however*, that the exercise of Options not exercisable prior to the Sale Event shall be subject to the consummation of the Sale Event.

(C) Notwithstanding anything to the contrary in Section 3(c)(i)(A), in the event of a Sale Event, the Company shall have the right, but not the obligation, to make or provide for a cash payment to the Holders of Options, without any consent of the Holders, in exchange for the cancellation thereof, in an amount equal to the difference between (A) the value as determined by the Committee of the consideration payable per share of Stock pursuant to the Sale Event (the "Sale Price") times the number of Shares subject to outstanding Options being cancelled (to the extent then vested and exercisable, including by reason of acceleration in connection with such Sale Event, at prices not in excess of the Sale Price) and (B) the aggregate exercise price of all such outstanding vested and exercisable Options.

(ii) Restricted Stock and Restricted Stock Unit Awards.

(A) In the case of and subject to the consummation of a Sale Event, all unvested Restricted Stock and unvested Restricted Stock Unit Awards (other than those becoming vested as a result of the Sale Event) issued hereunder shall be forfeited immediately prior to the effective time of any such Sale Event unless assumed or continued by the successor entity, or awards of the successor entity or parent thereof are substituted therefor, with an equitable or proportionate adjustment as to the number and kind of shares subject to such awards as such parties shall agree (after taking into account any acceleration hereunder and/or pursuant to the terms of any Award Agreement).

(B) In the event of the forfeiture of Restricted Stock pursuant to Section 3(c)(ii)(A), such Restricted Stock shall be repurchased from the Holder thereof at a price per share equal to the original per share purchase price paid by the Holder (subject to adjustment as provided in Section 3(b)) for such Shares.

(C) Notwithstanding anything to the contrary in Section 3(c)(ii)(A), in the event of a Sale Event, the Company shall have the right, but not the obligation, to make or provide for a cash payment to the Holders of Restricted Stock or Restricted Stock Unit Awards, without consent of the Holders, in exchange for the cancellation thereof, in an amount equal to the Sale Price times the number of Shares subject to such Awards, to be paid at the time of such Sale Event or upon the later vesting of such Awards.

SECTION 4. ELIGIBILITY

Grantees under the Plan will be such full or part-time officers and other employees, directors, Consultants and key persons of the Company and any Subsidiary who are selected from time to time by the Committee in its sole discretion; provided, however, that Awards shall be granted only to those individuals described in Rule 701(c) of the Securities Act.

SECTION 5. STOCK OPTIONS

Upon the grant of a Stock Option, the Company and the grantee shall enter into an Award Agreement. The terms and conditions of each such Award Agreement shall be determined by the Committee, and such terms and conditions may differ among individual Awards and grantees.

Stock Options granted under the Plan may be either Incentive Stock Options or Non- Qualified Stock Options. Incentive Stock Options may be granted only to employees of the Company or any Subsidiary that is a "subsidiary corporation" within the meaning of Section 424(f) of the Code. To the extent that any Option does not qualify as an Incentive Stock Option, it shall be deemed a Non-Qualified Stock Option.

(a) Terms of Stock Options. The Committee in its discretion may grant Stock Options to those individuals who meet the eligibility requirements of Section 4. Stock Options shall be subject to the following terms and conditions and shall contain such additional terms and conditions, not inconsistent with the terms of the Plan, as the Committee shall deem desirable.

(i) Exercise Price. The exercise price per share for the Shares covered by a Stock Option shall be determined by the Committee at the time of grant but shall not be less than 100 percent of the Fair Market Value on the Grant Date. In the case of an Incentive Stock Option that is granted to a Ten Percent Owner, the exercise price per share for the Shares covered by such Incentive Stock Option shall not be less than 110 percent of the Fair Market Value on the Grant Date.

(ii) Option Term. The term of each Stock Option shall be fixed by the Committee, but no Stock Option shall be exercisable more than ten years from the Grant Date. In the case of an Incentive Stock Option that is granted to a Ten Percent Owner, the term of such Stock Option shall be no more than five years from the Grant Date.

(iii) Exercisability; Rights of a Stockholder. Stock Options shall become exercisable and/or vested at such time or times, whether or not in installments, as shall be determined by the Committee at or after the Grant Date. The Award Agreement may permit a grantee to exercise all or a portion of a Stock Option immediately at grant; provided that the Shares issued upon such exercise shall be subject to restrictions and a vesting schedule identical to the vesting schedule of the related Stock Option, such Shares shall be deemed to be Restricted Stock for purposes of the Plan, and the optionee may be required to enter into an additional or new Award Agreement as a condition to exercise of such Stock Option. An optionee shall have the rights of a stockholder only as to Shares acquired upon the exercise of a Stock Option and not as to unexercised Stock Options. An optionee shall not be deemed to have acquired any Shares unless and until a Stock Option shall have been exercised pursuant to the terms of the Award Agreement and this Plan and the optionee's name has been entered on the books of the Company as a stockholder.

(iv) Method of Exercise. Stock Options may be exercised by an optionee in whole or in part, by the optionee giving written or electronic notice of exercise to the Company, specifying the number of Shares to be purchased. Payment of the purchase price may be made by one or more of the following methods (or any combination thereof) to the extent provided in the Award Agreement:

(A) In cash, by certified or bank check, by wire transfer of immediately available funds, or other instrument acceptable to the Committee;

(B) If permitted by the Committee, by the optionee delivering to the Company a promissory note, if the Board has expressly authorized the loan of funds to the optionee for the purpose of enabling or assisting the optionee to effect the exercise of his or her Stock Option; provided, that at least so much of the exercise price as represents the par value of the Stock shall be paid in cash if required by state law;

(C) If permitted by the Committee and the Initial Public Offering has occurred (or the Stock otherwise becomes publicly-traded), through the delivery (or attestation to the ownership) of Shares that have been purchased by the optionee on the open market or that are beneficially owned by the optionee and are not then subject to restrictions under any Company plan. To the extent required to avoid variable accounting treatment under ASC 718 or other applicable accounting rules, such surrendered Shares if originally purchased from the Company shall have been owned by the optionee for at least six months. Such surrendered Shares shall be valued at Fair Market Value on the exercise date;

(D) If permitted by the Committee and the Initial Public Offering has occurred (or the Stock otherwise becomes publicly-traded), by the optionee delivering to the Company a properly executed exercise notice together with irrevocable instructions to a broker to promptly deliver to the Company cash or a check payable and acceptable to the Company for the purchase price; provided that in the event the optionee chooses to pay the purchase price as so provided, the optionee and the broker shall comply with such procedures and enter into such agreements of indemnity and other agreements as the Committee shall prescribe as a condition of such payment procedure; or

(E) If permitted by the Committee, and only with respect to Stock Options that are not Incentive Stock Options, by a "net exercise" arrangement pursuant to which the Company will reduce the number of Shares issuable upon exercise by the largest whole number of Shares with a Fair Market Value that does not exceed the aggregate exercise price.

Payment instruments will be received subject to collection. No certificates for Shares so purchased will be issued to the optionee or, with respect to uncertificated Stock, no transfer to the optionee on the records of the Company will take place, until the Company has completed all steps it has deemed necessary to satisfy legal requirements relating to the issuance and sale of the Shares, which steps may include, without limitation, (i) receipt of a representation from the optionee at the time of exercise of the Option that the optionee is purchasing the Shares for the optionee's own account and not with a view to any sale or distribution of the Shares or other representations relating to compliance with applicable law governing the issuance of securities, (ii) the legending of the certificate (or notation on any book entry) representing the Shares to evidence the foregoing restrictions, and (iii) obtaining from optionee payment or provision for all withholding taxes due as a result of the exercise of the Option. The delivery of certificates representing the shares of Stock (or the transfer to the optionee on the records of the Company with respect to uncertificated Stock) to be purchased pursuant to the exercise of a Stock Option will be contingent upon (A) receipt from the optionee (or a purchaser acting in his or her stead in accordance with the provisions of the Stock Option) by the Company of the full purchase price for such Shares and the fulfillment of any other requirements contained in the Award Agreement or applicable provisions of laws and (B) if required by the Company, the optionee shall have entered into any stockholders agreements or other agreements with the Company and/or certain other of the Company's stockholders relating to the Stock. In the event an optionee chooses to pay the purchase price by previously-owned Shares through the attestation method, the number of Shares transferred to the optionee upon the exercise of the Stock Option shall be net of the number of Shares attested to.

(b) Annual Limit on Incentive Stock Options. To the extent required for "incentive stock option" treatment under Section 422 of the Code, the aggregate Fair Market Value (determined as of the Grant Date) of the Shares with respect to which Incentive Stock Options granted under the Plan and any other plan of the Company or its parent and any Subsidiary that become exercisable for the first time by an optionee during any calendar year shall not exceed $100,000 or such other limit as may be in effect from time to time under Section 422 of the Code. To the extent that any Stock Option exceeds this limit, it shall constitute a Non-Qualified Stock Option.

(c) Termination. Any portion of a Stock Option that is not vested and exercisable on the date of termination of an optionee's Service Relationship shall immediately expire and be null and void. Once any portion of the Stock Option becomes vested and exercisable, the optionee's right to exercise such portion of the Stock Option (or the optionee's representatives and legatees as applicable) in the event of a termination of the optionee's Service Relationship shall continue until the earliest of: (i) the date which is: (A) 12 months following the date on which the optionee's Service Relationship terminates due to death or Disability (or such longer period of time as determined by the Committee and set forth in the applicable Award Agreement), or (B) three months following the date on which the optionee's Service Relationship terminates if the termination is due to any reason other than death or Disability (or such longer period of time as determined by the Committee and set forth in the applicable Award Agreement), or (ii) the Expiration Date set forth in the Award Agreement; provided that notwithstanding the foregoing, an Award Agreement may provide that if the optionee's Service Relationship is terminated for Cause, the Stock Option shall terminate immediately and be null and void upon the date of the optionee's termination and shall not thereafter be exercisable.

SECTION 6. RESTRICTED STOCK AWARDS

(a) Nature of Restricted Stock Awards. The Committee may, in its sole discretion, grant (or sell at par value or such other purchase price determined by the Committee) to an eligible individual under Section 4 hereof a Restricted Stock Award under the Plan. The Committee shall determine the restrictions and conditions applicable to each Restricted Stock Award at the time of grant. Conditions may be based on continuing employment (or other Service Relationship), achievement of pre-established performance goals and objectives and/or such other criteria as the Committee may determine. Upon the grant of a Restricted Stock Award, the Company and the grantee shall enter into an Award Agreement. The terms and conditions of each such Award Agreement shall be determined by the Committee, and such terms and conditions may differ among individual Awards and grantees.

(b) Rights as a Stockholder. Upon the grant of the Restricted Stock Award and payment of any applicable purchase price, a grantee of Restricted Stock shall be considered the record owner of and shall be entitled to vote the Restricted Stock if, and to the extent, such Shares are entitled to voting rights, subject to such conditions contained in the Award Agreement. The grantee shall be entitled to receive all dividends and any other distributions declared on the Shares; provided, however, that the Company is under no duty to declare any such dividends or to make any such distribution. Unless the Committee shall otherwise determine, certificates evidencing the Restricted Stock shall remain in the possession of the Company until such Restricted Stock is vested as provided in subsection (d) below of this Section, and the grantee shall be required, as a condition of the grant, to deliver to the Company a stock power endorsed in blank and such other instruments of transfer as the Committee may prescribe.

(c) Restrictions. Restricted Stock may not be sold, assigned, transferred, pledged or otherwise encumbered or disposed of except as specifically provided herein or in the Award Agreement. Except as may otherwise be provided by the Committee either in the Award Agreement or, subject to Section 12 below, in writing after the Award Agreement is issued, if a grantee's Service Relationship with the Company and any Subsidiary terminates, the Company or its assigns shall have the right, as may be specified in the relevant instrument, to repurchase some or all of the Shares subject to the Award at such purchase price as is set forth in the Award Agreement.

(d) Vesting of Restricted Stock. The Committee at the time of grant shall specify in the Award Agreement the date or dates and/or the attainment of pre-established performance goals, objectives and other conditions on which the substantial risk of forfeiture imposed shall lapse and the Restricted Stock shall become vested, subject to such further rights of the Company or its assigns as may be specified in the Award Agreement.

SECTION 7. UNRESTRICTED STOCK AWARDS

The Committee may, in its sole discretion, grant (or sell at par value or such other purchase price determined by the Committee) to an eligible person under Section 4 hereof an Unrestricted Stock Award under the Plan. Unrestricted Stock Awards may be granted in respect of past services or other valid consideration, or in lieu of cash compensation due to such grantee.

SECTION 8. RESTRICTED STOCK UNITS

(a) Nature of Restricted Stock Units. The Committee may, in its sole discretion, grant to an eligible person under Section 4 hereof Restricted Stock Units under the Plan. The Committee shall determine the restrictions and conditions applicable to each Restricted Stock Unit at the time of grant. Vesting conditions may be based on continuing employment (or other Service Relationship), achievement of pre-established performance goals and objectives and/or other such criteria as the Committee may determine. Upon the grant of Restricted Stock Units, the grantee and the Company shall enter into an Award Agreement. The terms and conditions of each such Award Agreement shall be determined by the Committee and may differ among individual Awards and grantees. On or promptly following the vesting date or dates applicable to any Restricted Stock Unit, but in no event later than March 15 of the year following the year in which such vesting occurs, such Restricted Stock Unit(s) shall be settled in the form of cash or shares of Stock, as specified in the Award Agreement. Restricted Stock Units may not be sold, assigned, transferred, pledged, or otherwise encumbered or disposed of.

(b) Rights as a Stockholder. A grantee shall have the rights of a stockholder only as to Shares, if any, acquired upon settlement of Restricted Stock Units. A grantee shall not be deemed to have acquired any such Shares unless and until the Restricted Stock Units shall have been settled in Shares pursuant to the terms of the Plan and the Award Agreement, the Company shall have issued and delivered a certificate representing the Shares to the grantee (or transferred on the records of the Company with respect to uncertificated stock), and the grantee's name has been entered in the books of the Company as a stockholder.

(c) Termination. Except as may otherwise be provided by the Committee either in the Award Agreement or in writing after the Award Agreement is issued, a grantee's right in all Restricted Stock Units that have not vested shall automatically terminate upon the grantee's cessation of Service Relationship with the Company and any Subsidiary for any reason.

SECTION 9. TRANSFER RESTRICTIONS; COMPANY RIGHT OF FIRST REFUSAL; COMPANY REPURCHASE RIGHTS

(a) Restrictions on Transfer.

(i) Non-Transferability of Stock Options. Stock Options and, prior to exercise, the Shares issuable upon exercise of such Stock Option, shall not be transferable by the optionee otherwise than by will, or by the laws of descent and distribution, and all Stock Options shall be exercisable, during the optionee's lifetime, only by the optionee, or by the optionee's legal representative or guardian in the event of the optionee's incapacity. Notwithstanding the foregoing, the Committee, in its sole discretion, may provide in the Award Agreement regarding a given Stock Option that the optionee may transfer by gift, without consideration for the transfer, his or her Non-Qualified Stock Options to his or her family members (as defined in Rule 701 of the Securities Act), to trusts for the benefit of such family members, or to partnerships in which such family members are the only partners (to the extent such trusts or partnerships are considered "family members" for purposes of Rule 701 of the Securities Act), provided that the transferee agrees in writing with the Company to be bound by all of the terms and conditions of this Plan and the applicable Award Agreement, including the execution of a stock power upon the issuance of Shares. Stock Options, and the Shares issuable upon exercise of such Stock Options, shall be restricted as to any pledge, hypothecation, or other transfer, including any short position, any "put equivalent position" (as defined in the Exchange Act) or any "call equivalent position" (as defined in the Exchange Act) prior to exercise.

(ii) Shares. No Shares shall be sold, assigned, transferred, pledged, hypothecated, given away or in any other manner disposed of or encumbered, whether voluntarily or by operation of law, unless (i) the transfer is in compliance with the terms of the applicable Award Agreement, all applicable securities laws (including, without limitation, the Securities Act), and with the terms and conditions of this Section 9, (ii) the transfer does not cause the Company to become subject to the reporting requirements of the Exchange Act, and (iii) the transferee consents in writing to be bound by the provisions of the Plan and the Award Agreement, including this Section 9. In connection with any proposed transfer, the Committee may require the transferor to provide at the transferor's own expense an opinion of counsel to the transferor, satisfactory to the Committee, that such transfer is in compliance with all foreign, federal and state securities laws (including, without limitation, the Securities Act). Any attempted transfer of Shares not in accordance with the terms and conditions of this Section 9 shall be null and void, and the Company shall not reflect on its records any change in record ownership of any Shares as a result of any such transfer, shall otherwise refuse to recognize any such transfer and shall not in any way give effect to any such transfer of Shares. The Company shall be entitled to seek protective orders, injunctive relief and other remedies available at law or in equity including, without limitation, seeking specific performance or the rescission of any transfer not made in strict compliance with the provisions of this Section 9. Subject to the foregoing general provisions, and unless otherwise provided in the applicable Award Agreement, Shares may be transferred pursuant to the following specific terms and conditions (provided that with respect to any transfer of Restricted Stock, all vesting and forfeiture provisions shall continue to apply with respect to the original recipient):

(A) Transfers to Permitted Transferees. The Holder may transfer any or all of the Shares to one or more Permitted Transferees;*provided, however*, that following such transfer, such Shares shall continue to be subject to the terms of this Plan (including this Section 9) and such Permitted Transferee(s) shall, as a condition to any such transfer, deliver a written acknowledgment to that effect to the Company and shall deliver a stock power to the Company with respect to the Shares. Notwithstanding the foregoing, the Holder may not transfer any of the Shares to a Person whom the Company reasonably determines is a direct competitor or a potential competitor of the Company or any of its Subsidiaries.

(B) Transfers Upon Death. Upon the death of the Holder, any Shares then held by the Holder at the time of such death and any Shares acquired after the Holder's death by the Holder's legal representative shall be subject to the provisions of this Plan, and the Holder's estate, executors, administrators, personal representatives, heirs, legatees and distributees shall be obligated to convey such Shares to the Company or its assigns under the terms contemplated by the Plan and the Award Agreement.

(b) Right of First Refusal. In the event that a Holder desires at any time to sell or otherwise transfer all or any part of his or her Shares (other than shares of Restricted Stock which by their terms are not transferrable), the Holder first shall give written notice to the Company of the Holder's intention to make such transfer. Such notice shall state the number of Shares that the Holder proposes to sell (the "Offered Shares"), the price and the terms at which the proposed sale is to be made and the name and address of the proposed transferee. At any time within 30 days after the receipt of such notice by the Company, the Company or its assigns may elect to purchase all or any portion of the Offered Shares at the price and on the terms offered by the proposed transferee and specified in the notice. The Company or its assigns shall exercise this right by mailing or delivering written notice to the Holder within the foregoing 30- day period. If the Company or its assigns elect to exercise its purchase rights under this Section 9(b), the closing for such purchase shall, in any event, take place within 45 days after the receipt by the Company of the initial notice from the Holder. In the event that the Company or its assigns do not elect to exercise such purchase right, or in the event that the Company or its assigns do not pay the full purchase price within such 45-day period, the Holder shall be required to pay a transaction processing fee of $10,000 to the Company (unless waived by the Committee) and then may, within 60 days thereafter, sell the Offered Shares to the proposed transferee and at the same price and on the same terms as specified in the Holder's notice. Any Shares not sold to the proposed transferee shall remain subject to the Plan. If the Holder is a party to any stockholders agreements or other agreements with the Company and/or certain other of the Company's stockholders relating to the Shares, (i) the transferring Holder shall comply with the requirements of such stockholders agreements or other agreements relating to any proposed transfer of the Offered Shares, and (ii) any proposed transferee that purchases Offered Shares shall enter into such stockholders agreements or other agreements with the Company and/or certain of the Company's stockholders relating to the Offered Shares on the same terms and in the same capacity as the transferring Holder.

(c) Company's Right of Repurchase.

(i) Right of Repurchase for Unvested Shares Issued Upon the Exercise of an Option. Upon a Termination Event, the Company or its assigns shall have the right and option to repurchase from a Holder of Shares acquired upon exercise of a Stock Option which are still subject to a risk of forfeiture as of the Termination Event. Such repurchase rights may be exercised by the Company within the later of (A) six months following the date of such Termination Event or (B) seven months after the acquisition of Shares upon exercise of a Stock Option. The repurchase price shall be equal to the lower of the original per share price paid by the Holder, subject to adjustment as provided in Section 3(b) of the Plan, or the current Fair Market Value of such Shares as of the date the Company elects to exercise its repurchase rights.

(ii) Right of Repurchase With Respect to Restricted Stock. Upon a Termination Event, the Company or its assigns shall have the right and option to repurchase from a Holder of Shares received pursuant to a Restricted Stock Award any Shares that are still subject to a risk of forfeiture as of the Termination Event. Such repurchase right may be exercised by the Company within six months following the date of such Termination Event. The repurchase price shall be the lower of the original per share purchase price paid by the Holder, subject to adjustment as provided in Section 3(b) of the Plan, or the current Fair Market Value of such Shares as of the date the Company elects to exercise its repurchase rights.

(iii) Procedure. Any repurchase right of the Company shall be exercised by the Company or its assigns by giving the Holder written notice on or before the last day of the repurchase period of its intention to exercise such repurchase right. Upon such notification, the Holder shall promptly surrender to the Company, free and clear of any liens or encumbrances, any certificates representing the Shares being purchased, together with a duly executed stock power for the transfer of such Shares to the Company or the Company's assignee or assignees. Upon the Company's or its assignee's receipt of the certificates from the Holder, the Company or its assignee or assignees shall deliver to him, her or them a check for the applicable repurchase price; *provided, however*, that the Company may pay the repurchase price by offsetting and canceling any indebtedness then owed by the Holder to the Company.

(d) Escrow Arrangement.

(i) Escrow. In order to carry out the provisions of this Section 9 of this Plan more effectively, the Company shall hold any Shares issued pursuant to Awards granted under the Plan in escrow together with separate stock powers executed by the Holder in blank for transfer. The Company shall not dispose of the Shares except as otherwise provided in this Plan. In the event of any repurchase by the Company (or any of its assigns), the Company is hereby authorized by the Holder, as the Holder's attorney-in-fact, to date and complete the stock powers necessary for the transfer of the Shares being purchased and to transfer such Shares in accordance with the terms hereof. At such time as any Shares are no longer subject to the Company's repurchase and first refusal rights, the Company shall, at the written request of the Holder, deliver to the Holder a certificate representing such Shares with the balance of the Shares to be held in escrow pursuant to this Section.

(ii) Remedy. Without limitation of any other provision of this Plan or other rights, in the event that a Holder or any other Person is required to sell a Holder's Shares pursuant to the provisions of Sections 9(b) or (c) hereof and in the further event that he or she refuses or for any reason fails to deliver to the Company or its designated purchaser of such Shares the certificate or certificates evidencing such Shares together with a related stock power, the Company or such designated purchaser may deposit the applicable purchase price for such Shares with a bank designated by the Company, or with the Company's independent public accounting firm, as agent or trustee, or in escrow, for such Holder or other Person, to be held by such bank or accounting firm for the benefit of and for delivery to him, her, them or it, and/or, in its discretion, pay such purchase price by offsetting any indebtedness then owed by such Holder as provided above. Upon any such deposit and/or offset by the Company or its designated purchaser of such amount and upon notice to the Person who was required to sell the Shares to be sold pursuant to the provisions of Sections 9(b) or (c), such Shares shall at such time be deemed to have been sold, assigned, transferred and conveyed to such purchaser, such Holder shall have no further rights thereto (other than the right to withdraw the payment thereof held in escrow, if applicable), and the Company shall record such transfer in its stock transfer book or in any appropriate manner.

(e) Lockup Provision. If requested by the Company, a Holder shall not sell or otherwise transfer or dispose of any Shares (including, without limitation, pursuant to Rule 144 under the Securities Act) held by him or her for such period following the effective date of a public offering by the Company of Shares as the Company shall specify reasonably and in good faith. If requested by the underwriter engaged by the Company, each Holder shall execute a separate letter confirming his or her agreement to comply with this Section.

(f) Adjustments for Changes in Capital Structure. If, as a result of any reorganization, recapitalization, reclassification, stock dividend, stock split, reverse stock split or other similar change in the Common Stock, the outstanding Shares are increased or decreased or are exchanged for a different number or kind of securities of the Company, the restrictions contained in this Section 9 shall apply with equal force to additional and/or substitute securities, if any, received by Holder in exchange for, or by virtue of his or her ownership of, Shares.

(g) Termination. The terms and provisions of Section 9(b) and Section 9(c) (except for the Company's right to repurchase Shares still subject to a risk of forfeiture upon a Termination Event) shall terminate upon the closing of the Company's Initial Public Offering or upon consummation of any Sale Event, in either case as a result of which Shares are registered under Section 12 of the Exchange Act and publicly-traded on any national security exchange.

SECTION 10. TAX WITHHOLDING

(a) Payment by Grantee. Each grantee shall, no later than the date as of which the value of an Award or of any Shares or other amounts received thereunder first becomes includable in the gross income of the grantee for income tax purposes, pay to the Company, or make arrangements satisfactory to the Committee regarding payment of, any Federal, state, or local taxes of any kind required by law to be withheld by the Company with respect to such income. The Company and any Subsidiary shall, to the extent permitted by law, have the right to deduct any such taxes from any payment of any kind otherwise due to the grantee. The Company's obligation to deliver stock certificates (or evidence of book entry) to any grantee is subject to and conditioned on any such tax withholding obligations being satisfied by the grantee.

(b) Payment in Stock. The Company's minimum required tax withholding obligation may be satisfied, in whole or in part, by the Company withholding from Shares to be issued pursuant to an Award a number of Shares having an aggregate Fair Market Value (as of the date the withholding is effected) that would satisfy the minimum withholding amount due.

SECTION 11. SECTION 409A AWARDS.

To the extent that any Award is determined to constitute "nonqualified deferred compensation" within the meaning of Section 409A (a "409A Award"), the Award shall be subject to such additional rules and requirements as may be specified by the Committee from time to time. In this regard, if any amount under a 409A Award is payable upon a "separation from service" (within the meaning of Section 409A) to a grantee who is considered a "specified employee" (within the meaning of Section 409A), then no such payment shall be made prior to the date that is the earlier of (i) six months and one day after the grantee's separation from service, or (ii) the grantee's death, but only to the extent such delay is necessary to prevent such payment from being subject to interest, penalties and/or additional tax imposed pursuant to Section 409A. The Company makes no representation or warranty and shall have no liability to any grantee under the Plan or any other Person with respect to any penalties or taxes under Section 409A that are, or may be, imposed with respect to any Award.

SECTION 12. AMENDMENTS AND TERMINATION

The Board may, at any time, amend or discontinue the Plan and the Committee may, at any time, amend or cancel any outstanding Award for the purpose of satisfying changes in law or for any other lawful purpose, but no such action shall adversely affect rights under any outstanding Award without the consent of the holder of the Award. The Committee may exercise its discretion to reduce the exercise price of outstanding Stock Options or effect repricing through cancellation of outstanding Stock Options and by granting such holders new Awards in replacement of the cancelled Stock Options. To the extent determined by the Committee to be required either by the Code to ensure that Incentive Stock Options granted under the Plan are qualified under Section 422 of the Code or otherwise, Plan amendments shall be subject to approval by the Company stockholders entitled to vote at a meeting of stockholders. Nothing in this Section 12 shall limit the Board's or Committee's authority to take any action permitted pursuant to Section 3(c). The Board reserves the right to amend the Plan and/or the terms of any outstanding Stock Options to the extent reasonably necessary to comply with the requirements of the exemption pursuant to paragraph (f)(4) of Rule 12h-1 of the Exchange Act.

SECTION 13. STATUS OF PLAN

With respect to the portion of any Award that has not been exercised and any payments in cash, Stock or other consideration not received by a grantee, a grantee shall have no rights greater than those of a general creditor of the Company unless the Committee shall otherwise expressly so determine in connection with any Award.

SECTION 14. GENERAL PROVISIONS

(a) No Distribution; Compliance with Legal Requirements. The Committee may require each person acquiring Shares pursuant to an Award to represent to and agree with the Company in writing that such person is acquiring the Shares without a view to distribution thereof. No Shares shall be issued pursuant to an Award until all applicable securities law and other legal and stock exchange or similar requirements have been satisfied. The Committee may require the placing of such stop-orders and restrictive legends on certificates for Stock and Awards as it deems appropriate.

(b) Delivery of Stock Certificates. Stock certificates to grantees under the Plan shall be deemed delivered for all purposes when the Company or a stock transfer agent of the Company shall have mailed such certificates in the United States mail, addressed to the grantee, at the grantee's last known address on file with the Company; provided that stock certificates to be held in escrow pursuant to Section 9 of the Plan shall be deemed delivered when the Company shall have recorded the issuance in its records. Uncertificated Stock shall be deemed delivered for all purposes when the Company or a stock transfer agent of the Company shall have given to the grantee by electronic mail (with proof of receipt) or by United States mail, addressed to the grantee, at the grantee's last known address on file with the Company, notice of issuance and recorded the issuance in its records (which may include electronic "book entry" records).

(c) No Employment Rights**.** The adoption of the Plan and the grant of Awards do not confer upon any Person any right to continued employment or Service Relationship with the Company or any Subsidiary.

(d) Trading Policy Restrictions. Option exercises and other Awards under the Plan shall be subject to the Company's insider trading policy-related restrictions, terms and conditions as may be established by the Committee, or in accordance with policies set by the Committee, from time to time.

(e) Designation of Beneficiary. Each grantee to whom an Award has been made under the Plan may designate a beneficiary or beneficiaries to exercise any Award on or after the grantee's death or receive any payment under any Award payable on or after the grantee's death. Any such designation shall be on a form provided for that purpose by the Committee and shall not be effective until received by the Committee. If no beneficiary has been designated by a deceased grantee, or if the designated beneficiaries have predeceased the grantee, the beneficiary shall be the grantee's estate.

(f) Legend. Any certificate(s) representing the Shares shall carry substantially the following legend (and with respect to uncertificated Stock, the book entries evidencing such shares shall contain the following notation):

> The transferability of this certificate and the shares of stock represented hereby are subject to the restrictions, terms and conditions (including repurchase and restrictions against transfers) contained in the Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan and any agreements entered into thereunder by and between the company and the holder of this certificate (a copy of which is available at the offices of the company for examination).

(g) Information to Holders of Options. In the event the Company is relying on the exemption from the registration requirements of Section 12(g) of the Exchange Act contained in paragraph (f)(1) of Rule 12h-1 of the Exchange Act, the Company shall provide the information described in Rule 701(e)(3), (4) and (5) of the Securities Act to all holders of Options in accordance with the requirements thereunder. The foregoing notwithstanding, the Company shall not be required to provide such information unless the optionholder has agreed in writing, on a form prescribed by the Company, to keep such information confidential.

SECTION 15. EFFECTIVE DATE OF PLAN

The Plan shall become effective upon adoption by the Board and shall be approved by stockholders in accordance with applicable state law and the Company's articles of incorporation and bylaws within 12 months thereafter. If the stockholders fail to approve the Plan within 12 months after its adoption by the Board of Directors, then any Awards granted or sold under the Plan shall be rescinded and no additional grants or sales shall thereafter be made under the Plan. Subject to such approval by stockholders and to the requirement that no Shares may be issued hereunder prior to such approval, Stock Options and other Awards may be granted hereunder on and after adoption of the Plan by the Board. No grants of Stock Options and other Awards may be made hereunder after the tenth anniversary of the date the Plan is adopted by the Board or the date the Plan is approved by the Company's stockholders, whichever is earlier.

SECTION 16. GOVERNING LAW

This Plan, all Awards and any controversy arising out of or relating to this Plan and all Awards shall be governed by and construed in accordance with the General Corporation Law of the State of Delaware as to matters within the scope thereof, and as to all other matters shall be governed by and construed in accordance with the internal laws of the State of Delaware, without regard to conflict of law principles that would result in the application of any law other than the law of the State of Delaware.

DATE ADOPTED BY THE BOARD OF DIRECTORS:	September 7, 2018
DATE APPROVED BY THE STOCKHOLDERS:	September 7, 2018

CABALETTA BIO, INC.

AMENDMENT NO. 1 TO THE
2018 STOCK OPTION AND GRANT PLAN

The Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan (the "Plan") is hereby amended by the Board of Directors and stockholders of Cabaletta Bio, Inc., a Delaware corporation, as follows:

The first sentence of Section 3(a) of the Plan is hereby amended by deleting it and replacing it with the following:

"Stock Issuable. The maximum number of Shares reserved and available for issuance under the Plan shall be 2,727,000 Shares, subject to adjustment as provided in Section 3(b). For purposes of this limitation, the Shares underlying any Awards that are forfeited, canceled, reacquired by the Company prior to vesting, satisfied without the issuance of Stock or otherwise terminated (other than by exercise) and Shares that are withheld upon exercise of an Option or settlement of an Award to cover the exercise price or tax withholding shall be added back to the Shares available for issuance under the Plan. Subject to such overall limitations, Shares may be issued up to such maximum number pursuant to any type or types of Award, and no more than 3,227,000 Shares may be issued pursuant to Incentive Stock Options. The Shares available for issuance under the Plan may be authorized but unissued Shares or Shares reacquired by the Company."

ADOPTED BY BOARD OF DIRECTORS:	October 10, 2018
ADOPTED BY STOCKHOLDERS:	October 10, 2018

CABALETTA BIO, INC.

AMENDMENT NO. 2 TO THE
2018 STOCK OPTION AND GRANT PLAN

The Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan (the "Plan") is hereby amended by the Board of Directors and stockholders of Cabaletta Bio, Inc., a Delaware corporation, as follows:

The first sentence of Section 3(a) of the Plan is hereby amended by deleting it and replacing it with the following:

"Stock Issuable. The maximum number of Shares reserved and available for issuance under the Plan shall be 3,870,680 Shares, subject to adjustment as provided in Section 3(b). For purposes of this limitation, the Shares underlying any Awards that are forfeited, canceled, reacquired by the Company prior to vesting, satisfied without the issuance of Stock or otherwise terminated (other than by exercise) and Shares that are withheld upon exercise of an Option or settlement of an Award to cover the exercise price or tax withholding shall be added back to the Shares available for issuance under the Plan. Subject to such overall limitations, Shares may be issued up to such maximum number pursuant to any type or types of Award, and no more than 4,370,680 Shares may be issued pursuant to Incentive Stock Options. The Shares available for issuance under the Plan may be authorized but unissued Shares or Shares reacquired by the Company."

ADOPTED BY BOARD OF DIRECTORS: July 21, 2019

ADOPTED BY STOCKHOLDERS: July 26, 2019

INCENTIVE STOCK OPTION GRANT NOTICE
UNDER THE CABALETTA BIO, INC.
2018 STOCK OPTION AND GRANT PLAN

Pursuant to the Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan (the "Plan"), Cabaletta Bio, Inc., a Delaware corporation (together with any successor, the "Company"), has granted to the individual named below, an option (the "Stock Option") to purchase on or prior to the Expiration Date, or such earlier date as is specified herein, all or any part of the number of shares of Common Stock, par value $0.00001 per share ("Common Stock"), of the Company indicated below (the "Shares"), at the Option Exercise Price per share, subject to the terms and conditions set forth in this Incentive Stock Option Grant Notice (the "Grant Notice"), the attached Incentive Stock Option Agreement (the "Agreement") and the Plan. This Stock Option is intended to qualify as an "incentive stock option" as defined in Section 422(b) of the Internal Revenue Code of 1986, as amended from time to time (the "Code"). To the extent that any portion of the Stock Option does not so qualify, it shall be deemed a non-qualified stock option.

Name of Optionee:	_____ (the "Optionee")
No. of Shares:	_____ Shares of Common Stock
Grant Date:	_____
Vesting Commencement Date:	_____ (the "Vesting Commencement Date")
Expiration Date:	_____ (the "Expiration Date")
Option Exercise Price/Share:	$_____ (the "Option Exercise Price")
Vesting Schedule:	[25 percent of the Shares shall vest and become exercisable on the first anniversary of the Vesting Commencement Date; provided that the Optionee continues to have a Service Relationship with the Company at such time. Thereafter, the remaining 75 percent of the Shares shall vest and become exercisable in 36 equal monthly installments following the first anniversary of the Vesting Commencement Date, provided the Optionee continues to have a Service Relationship with the Company on each vesting date. Notwithstanding anything in the Agreement to the contrary, in the case of a Sale Event, this Stock Option and the Shares shall be treated as provided in Section 3(c) of the Plan.**]**

Attachments: Incentive Stock Option Agreement, 2018 Stock Option and Grant Plan

INCENTIVE STOCK OPTION AGREEMENT
UNDER THE CABALETTA BIO, INC.
2018 STOCK OPTION AND GRANT PLAN

All capitalized terms used herein and not otherwise defined shall have the respective meanings set forth in the Grant Notice and the Plan.

1. Vesting, Exercisability and Termination.

(a) No portion of this Stock Option may be exercised until such portion shall have vested and become exercisable.

(b) Except as set forth below, and subject to the determination of the Committee in its sole discretion to accelerate the vesting schedule hereunder, this Stock Option shall be vested and exercisable on the respective dates indicated below:

(i) This Stock Option shall initially be unvested and unexercisable.

(ii) This Stock Option shall vest and become exercisable in accordance with the Vesting Schedule set forth in the Grant Notice.

(c) Termination. Except as may otherwise be provided by the Committee, if the Optionee's Service Relationship is terminated, the period within which to exercise this Stock Option will be subject to earlier termination as set forth below (and if not exercised within such period, shall thereafter terminate subject, in each case, to Section 3(c) of the Plan):

(i) Termination Due to Death or Disability. If the Optionee's Service Relationship terminates by reason of such Optionee's death or Disability, this Stock Option may be exercised, to the extent exercisable on the date of such termination, by the Optionee, the Optionee's legal representative or legatee for a period of 12 months from the date of death or Disability or until the Expiration Date, if earlier.

(ii) Other Termination. If the Optionee's Service Relationship terminates for any reason other than death or Disability, and unless otherwise determined by the Committee, this Stock Option may be exercised, to the extent exercisable on the date of termination, for a period of 90 days from the date of termination or until the Expiration Date, if earlier; provided however, if the Optionee's Service Relationship is terminated for Cause, this Stock Option shall terminate immediately upon the date of such termination.

For purposes hereof, the Committee's determination of the reason for termination of the Optionee's Service Relationship shall be conclusive and binding on the Optionee and his or her representatives or legatees. Any portion of this Stock Option that is not vested and exercisable on the date of termination of the Service Relationship shall terminate immediately and be null and void.

(d) It is understood and intended that this Stock Option is intended to qualify as an "incentive stock option" as defined in Section 422 of the Code to the extent permitted under applicable law. Accordingly, the Optionee understands that in order to obtain the benefits of an incentive stock option under Section 422 of the Code, no sale or other disposition may be made of Shares for which incentive stock option treatment is desired within the one-year period beginning on the day after the day of the transfer of such Shares to him or her, nor within thetwo-year period beginning on the day after Grant Date of this Stock Option and further that this Stock Option must be exercised within three months after termination of employment as an employee (or 12 months in the case of death or disability) to qualify as an incentive stock option. If the Optionee disposes (whether by sale, gift, transfer or otherwise) of any such Shares within either of these periods, he or she will notify the Company within 30 days after such disposition. The Optionee also agrees to provide the Company with any information concerning any such dispositions required by the Company for tax purposes. Further, to the extent this Stock Option and any other incentive stock options of the Optionee having an aggregate Fair Market Value in excess of $100,000 (determined as of the Grant Date) first become exercisable in any year, such options will not qualify as incentive stock options.

2. Exercise of Stock Option.

(a) The Optionee may exercise this Stock Option only in the following manner: Prior to the Expiration Date, the Optionee may deliver a Stock Option exercise notice (an "Exercise Notice") in the form of Appendix A hereto indicating his or her election to purchase some or all of the Shares with respect to which this Stock Option is then exercisable. Such notice shall specify the number of Shares to be purchased. Payment of the purchase price may be made by one or more of the methods described in Section 5 of the Plan, subject to the limitations contained in such Section of the Plan, including the requirement that the Committee specifically approve in advance certain payment methods.

(b) Notwithstanding any other provision hereof or of the Plan, no portion of this Stock Option shall be exercisable after the Expiration Date.

3. Incorporation of Plan. Notwithstanding anything herein to the contrary, this Stock Option shall be subject to and governed by all the terms and conditions of the Plan.

4. Transferability of Stock Option. This Stock Option is personal to the Optionee and is not transferable by the Optionee in any manner other than by will or by the laws of descent and distribution. The Stock Option may be exercised during the Optionee's lifetime only by the Optionee (or by the Optionee's guardian or personal representative in the event of the Optionee's incapacity). The Optionee may elect to designate a beneficiary by providing written notice of the name of such beneficiary to the Company, and may revoke or change such designation at any time by filing written notice of revocation or change with the Company; such beneficiary may exercise the Optionee's Stock Option in the event of the Optionee's death to the extent provided herein. If the Optionee does not designate a beneficiary, or if the designated beneficiary predeceases the Optionee, the legal representative of the Optionee may exercise this Stock Option to the extent provided herein in the event of the Optionee's death.

5. Restrictions on Transfer of Shares. The Shares acquired upon exercise of the Stock Option shall be subject to certain transfer restrictions and other limitations including, without limitation, the provisions contained in Section 9 of the Plan.

6. Miscellaneous Provisions.

(a) Equitable Relief. The parties hereto agree and declare that legal remedies may be inadequate to enforce the provisions of this Agreement and that equitable relief, including specific performance and injunctive relief, may be used to enforce the provisions of this Agreement.

(b) Adjustments for Changes in Capital Structure. If, as a result of any reorganization, recapitalization, reincorporation, reclassification, stock dividend, stock split, reverse stock split or other similar change in the Common Stock, the outstanding shares of Common Stock are increased or decreased or are exchanged for a different number or kind of securities of the Company, the restrictions contained in this Agreement shall apply with equal force to additional and/or substitute securities, if any, received by the Optionee in exchange for, or by virtue of his or her ownership of, this Stock Option or Shares acquired pursuant thereto.

(c) Change and Modifications. This Agreement may not be orally changed, modified or terminated, nor shall any oral waiver of any of its terms be effective. This Agreement may be changed, modified or terminated only by an agreement in writing signed by the Company and the Optionee.

(d) Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Delaware, applied without regard to conflict of law principles.

(e) Headings. The headings are intended only for convenience in finding the subject matter and do not constitute part of the text of this Agreement and shall not be considered in the interpretation of this Agreement.

(f) Saving Clause. If any provision(s) of this Agreement shall be determined to be illegal or unenforceable, such determination shall in no manner affect the legality or enforceability of any other provision hereof.

(g) Notices. All notices, requests, consents and other communications shall be in writing and be deemed given when delivered personally, by telex or facsimile transmission or when received if mailed by first class registered or certified mail, postage prepaid. Notices to the Company or the Optionee shall be addressed as set forth underneath their signatures below, or to such other address or addresses as may have been furnished by such party in writing to the other.

(h) Benefit and Binding Effect. This Agreement shall be binding upon and shall inure to the benefit of the parties hereto, their respective successors, assigns, and legal representatives. The Company has the right to assign this Agreement, and such assignee shall become entitled to all the rights of the Company hereunder to the extent of such assignment.

(i) Counterparts. For the convenience of the parties and to facilitate execution, this Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same document.

(j) Integration. This Agreement constitutes the entire agreement between the parties with respect to this Stock Option and supersedes all prior agreements and discussions between the parties concerning such subject matter.

7. Dispute Resolution.

(a) Except as provided below, any dispute arising out of or relating to the Plan or this Stock Option, this Agreement, or the breach, termination or validity of the Plan, this Stock Option or this Agreement, shall be finally settled by binding arbitration conducted expeditiously in accordance with the J.A.M.S./Endispute Comprehensive Arbitration Rules and Procedures (the "J.A.M.S. Rules"). The arbitration shall be governed by the United States Arbitration Act, 9 U.S.C. Sections 1 16, and judgment upon the award rendered by the arbitrators may be entered by any court having jurisdiction thereof. The place of arbitration shall be Pennsylvania.

(b) The arbitration shall commence within 60 days of the date on which a written demand for arbitration is filed by any party hereto. In connection with the arbitration proceeding, the arbitrator shall have the power to order the production of documents by each party and any third-party witnesses. In addition, each party may take up to three depositions as of right, and the arbitrator may in his or her discretion allow additional depositions upon good cause shown by the moving party. However, the arbitrator shall not have the power to order the answering of interrogatories or the response to requests for admission. In connection with any arbitration, each party to the arbitration shall provide to the other, no later than seven business days before the date of the arbitration, the identity of all persons that may testify at the arbitration and a copy of all documents that may be introduced at the arbitration or considered or used by a party's witness or expert. The arbitrator's decision and award shall be made and delivered within six months of the selection of the arbitrator. The arbitrator's decision shall set forth a reasoned basis for any award of damages or finding of liability. The arbitrator shall not have power to award damages in excess of actual compensatory damages and shall not multiply actual damages or award punitive damages, and each party hereby irrevocably waives any claim to such damages.

(c) The Company, the Optionee, each party to the Agreement and any other holder of Shares issued pursuant to this Agreement (each, a "Party") covenants and agrees that such party will participate in the arbitration in good faith. This Section 7 applies equally to requests for temporary, preliminary or permanent injunctive relief, except that in the case of temporary or preliminary injunctive relief any party may proceed in court without prior arbitration for the limited purpose of avoiding immediate and irreparable harm.

(d) Each Party (i) hereby irrevocably submits to the jurisdiction of any United States District Court of competent jurisdiction for the purpose of enforcing the award or decision in any such proceeding, (ii) hereby waives, and agrees not to assert, by way of motion, as a defense, or otherwise, in any such suit, action or proceeding, any claim that it is not subject personally to the jurisdiction of the above named courts, that its property is exempt or immune

from attachment or execution (except as protected by applicable law), that the suit, action or proceeding is brought in an inconvenient forum, that the venue of the suit, action or proceeding is improper or that this Agreement or the subject matter hereof may not be enforced in or by such court, and (iii) hereby waives and agrees not to seek any review by any court of any other jurisdiction which may be called upon to grant an enforcement of the judgment of any such court. Each Party hereby consents to service of process by registered mail at the address to which notices are to be given. Each Party agrees that its, his or her submission to jurisdiction and its, his or her consent to service of process by mail is made for the express benefit of each other Party. Final judgment against any Party in any such action, suit or proceeding may be enforced in other jurisdictions by suit, action or proceeding on the judgment, or in any other manner provided by or pursuant to the laws of such other jurisdiction.

8. Waiver of Statutory Information Rights. The Optionee understands and agrees that, but for the waiver made herein, the Optionee would be entitled, upon written demand under oath stating the purpose thereof, to inspect for any proper purpose, and to make copies and extracts from, the Company's stock ledger, a list of its stockholders, and its other books and records, and the books and records of subsidiaries of the Company, if any, under the circumstances and in the manner provided in Section 220 of the General Corporation Law of Delaware (any and all such rights, and any and all such other rights of the Optionee as may be provided for in Section 220, the "Inspection Rights"). In light of the foregoing, until the first sale of Stock of the Company to the general public pursuant to a registration statement filed with and declared effective by the Securities and Exchange Commission under the Securities Act, the Optionee hereby unconditionally and irrevocably waives the Inspection Rights, whether such Inspection Rights would be exercised or pursued directly or indirectly pursuant to Section 220 or otherwise, and covenants and agrees never to directly or indirectly commence, voluntarily aid in any way, prosecute, assign, transfer, or cause to be commenced any claim, action, cause of action, or other proceeding to pursue or exercise the Inspection Rights. The foregoing waiver shall not affect any rights of a director, in his or her capacity as such, under Section 220. The foregoing waiver shall not apply to any contractual inspection rights of the Optionee under any other written agreement between the Optionee and the Company.

[SIGNATURE PAGE FOLLOWS]

The foregoing Agreement is hereby accepted and the terms and conditions thereof hereby agreed to by the undersigned as of the date first above written.

CABALETTA BIO, INC.

By: _____
Name:
Title:

Address:

Cabaletta Bio, Inc.
c/o Steven Nichtberger
501 Northwick Lane
Villanova, PA 19085

The undersigned hereby acknowledges receiving and reviewing a copy of the Plan, including, without limitation, Section 9 thereof, and understands that this Stock Option is subject to the terms of the Plan and of this Agreement. This Agreement is hereby accepted, and the terms and conditions of the Plan, the Grant Notice and this Agreement, SPECIFICALLY INCLUDING THE ARBITRATION PROVISIONS SET FORTH IN SECTION 7 AND THE WAIVER OF STATUTORY INFORMATION RIGHTS SET FORTH IN SECTION 8 OF THIS AGREEMENT, are hereby agreed to, by the undersigned as of the date first above written.

OPTIONEE:

_____
Name:

Address:

_____
_____
_____

SPOUSE'S CONSENT

I acknowledge that I have read the foregoing Incentive Stock Option Agreement and understand the contents thereof.

_____

DESIGNATED BENEFICIARY:

Beneficiary's Address:

Appendix A

STOCK OPTION EXERCISE NOTICE

Cabaletta Bio, Inc.
Attention:

Pursuant to the terms of the grant notice and stock option agreement between the undersigned and Cabaletta Bio, Inc. (the "Company") dated _____ (the "Agreement") under the Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan, I,_____, hereby [Circle One] partially/fully exercise such option by including herein payment in the amount of $_____ representing the purchase price for_____ Shares. I have chosen the following form(s) of payment:

[ ] 1. Cash

[ ] 2. Certified or bank check payable to Cabaletta Bio, Inc.

[ ] 3. Other (as referenced in the Agreement and described in the Plan (please describe))
_____.

In connection with my exercise of the option as set forth above, I hereby represent and warrant to the Company as follows:

(i) I am purchasing the Shares for my own account for investment only, and not for resale or with a view to the distribution thereof.

(ii) I have had such an opportunity as I have deemed adequate to obtain from the Company such information as is necessary to permit me to evaluate the merits and risks of my investment in the Company and have consulted with my own advisers with respect to my investment in the Company.

(iii) I have sufficient experience in business, financial and investment matters to be able to evaluate the risks involved in the purchase of the Shares and to make an informed investment decision with respect to such purchase.

(iv) I can afford a complete loss of the value of the Shares and am able to bear the economic risk of holding such Shares for an indefinite period of time.

(v) I understand that the Shares may not be registered under the Securities Act of 1933 (it being understood that the Shares are being issued and sold in reliance on the exemption provided in Rule 701 thereunder) or any applicable state securities or "blue sky" laws and may not be sold or otherwise transferred or disposed of in the absence of an effective registration statement under the Securities Act of 1933 and under any applicable state securities or "blue sky" laws (or exemptions from the registration requirement thereof). I further acknowledge that certificates representing Shares will bear restrictive legends reflecting the foregoing and/or that book entries for uncertificated Shares will include similar restrictive notations.

(vi) I have read and understand the Plan and acknowledge and agree that the Shares are subject to all of the relevant terms of the Plan, including without limitation, the transfer restrictions set forth in Section 9 of the Plan.

(vii) I understand and agree that the Company has a right of first refusal with respect to the Shares pursuant to Section 9(b) of the Plan.

(viii) I understand and agree that the Company has certain repurchase rights with respect to the Shares pursuant to Section 9(c) of the Plan.

(ix) I understand and agree that I may not sell or otherwise transfer or dispose of the Shares for a period of time following the effective date of a public offering by the Company as described in Section 9(f) of the Plan.

(x) I understand and agree to the waiver of statutory information rights as set forth in Section 8 of the Agreement.

Sincerely yours,

_____

Name:

Address:

_____

_____

_____

Date: _____

NON-QUALIFIED STOCK OPTION GRANT NOTICE
UNDER THE CABALETTA BIO, INC.
2018 STOCK OPTION AND GRANT PLAN

Pursuant to the Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan (the "Plan"), Cabaletta Bio, Inc., a Delaware corporation (together with any successor, the "Company"), has granted to the individual named below, an option (the "Stock Option") to purchase on or prior to the Expiration Date, or such earlier date as is specified herein, all or any part of the number of shares of Common Stock, par value $0.00001 per share ("Common Stock"), of the Company indicated below (the "Shares"), at the Option Exercise Price per share, subject to the terms and conditions set forth in this Non-Qualified Stock Option Grant Notice (the "Grant Notice"), the attached Non-Qualified Stock Option Agreement (the "Agreement") and the Plan. This Stock Option is not intended to qualify as an "incentive stock option" as defined in Section 422(b) of the Internal Revenue Code of 1986, as amended from time to time (the "Code").

Name of Optionee:	_____ (the "Optionee")
No. of Shares:	_____ Shares of Common Stock
Grant Date:	_____
Vesting Commencement Date:	_____ (the "Vesting Commencement Date")
Expiration Date:	_____ (the "Expiration Date")
Option Exercise Price/Share:	$_____ (the "Option Exercise Price")
Vesting Schedule:	[25 percent of the Shares shall vest and become exercisable on the first anniversary of the Vesting Commencement Date; provided that the Optionee continues to have a Service Relationship with the Company at such time. Thereafter, the remaining 75 percent of the Shares shall vest and become exercisable in 36 equal monthly installments following the first anniversary of the Vesting Commencement Date, provided the Optionee continues to have a Service Relationship with the Company on each vesting date. Notwithstanding anything in the Agreement to the contrary, in the case of a Sale Event, this Stock Option and the Shares shall be treated as provided in Section 3(c) of the Plan.**]**

Attachments: Non-Qualified Stock Option Agreement, 2018 Stock Option and Grant Plan

NON-QUALIFIED STOCK OPTION AGREEMENT
UNDER THE CABALETTA BIO, INC.
2018 STOCK OPTION AND GRANT PLAN

All capitalized terms used herein and not otherwise defined shall have the respective meanings set forth in the Grant Notice and the Plan.

1. Vesting, Exercisability and Termination.

(a) No portion of this Stock Option may be exercised until such portion shall have vested and become exercisable.

(b) Except as set forth below, and subject to the determination of the Committee in its sole discretion to accelerate the vesting schedule hereunder, this Stock Option shall be vested and exercisable on the respective dates indicated below:

(i) This Stock Option shall initially be unvested and unexercisable.

(ii) This Stock Option shall vest and become exercisable in accordance with the Vesting Schedule set forth in the Grant Notice.

(c) Termination. Except as may otherwise be provided by the Committee, if the Optionee's Service Relationship is terminated, the period within which to exercise this Stock Option will be subject to earlier termination as set forth below (and if not exercised within such period, shall thereafter terminate subject, in each case, to Section 3(c) of the Plan):

(i) Termination Due to Death or Disability. If the Optionee's Service Relationship terminates by reason of such Optionee's death or Disability, this Stock Option may be exercised, to the extent exercisable on the date of such termination, by the Optionee, the Optionee's legal representative or legatee for a period of 12 months from the date of death or Disability or until the Expiration Date, if earlier.

(ii) Other Termination. If the Optionee's Service Relationship terminates for any reason other than death or Disability, and unless otherwise determined by the Committee, this Stock Option may be exercised, to the extent exercisable on the date of termination, for a period of 90 days from the date of termination or until the Expiration Date, if earlier; provided however, if the Optionee's Service Relationship is terminated for Cause, this Stock Option shall terminate immediately upon the date of such termination.

For purposes hereof, the Committee's determination of the reason for termination of the Optionee's Service Relationship shall be conclusive and binding on the Optionee and his or her representatives or legatees and any Permitted Transferee. Any portion of this Stock Option that is not vested and exercisable on the date of termination of the Service Relationship shall terminate immediately and be null and void.

2. Exercise of Stock Option.

(a) The Optionee may exercise this Stock Option only in the following manner: Prior to the Expiration Date, the Optionee may deliver a Stock Option exercise notice (an "Exercise Notice") in the form of Appendix A hereto indicating his or her election to purchase some or all of the Shares with respect to which this Stock Option is then exercisable. Such notice shall specify the number of Shares to be purchased. Payment of the purchase price may be made by one or more of the methods described in Section 5 of the Plan, subject to the limitations contained in such Section of the Plan, including the requirement that the Committee specifically approve in advance certain payment methods.

(b) Notwithstanding any other provision hereof or of the Plan, no portion of this Stock Option shall be exercisable after the Expiration Date.

3. Incorporation of Plan. Notwithstanding anything herein to the contrary, this Stock Option shall be subject to and governed by all the terms and conditions of the Plan.

4. Transferability of Stock Option. This Stock Option is personal to the Optionee and is not transferable by the Optionee in any manner other than by will or by the laws of descent and distribution. The Stock Option may be exercised during the Optionee's lifetime only by the Optionee (or by the Optionee's guardian or personal representative in the event of the Optionee's incapacity). The Optionee may elect to designate a beneficiary by providing written notice of the name of such beneficiary to the Company, and may revoke or change such designation at any time by filing written notice of revocation or change with the Company; such beneficiary may exercise the Optionee's Stock Option in the event of the Optionee's death to the extent provided herein. If the Optionee does not designate a beneficiary, or if the designated beneficiary predeceases the Optionee, the legal representative of the Optionee may exercise this Stock Option to the extent provided herein in the event of the Optionee's death.

5. Restrictions on Transfer of Shares. The Shares acquired upon exercise of the Stock Option shall be subject to certain transfer restrictions and other limitations including, without limitation, the provisions contained in Section 9 of the Plan.

6. Miscellaneous Provisions.

(a) Equitable Relief. The parties hereto agree and declare that legal remedies may be inadequate to enforce the provisions of this Agreement and that equitable relief, including specific performance and injunctive relief, may be used to enforce the provisions of this Agreement.

(b) Adjustments for Changes in Capital Structure. If, as a result of any reorganization, recapitalization, reincorporation, reclassification, stock dividend, stock split, reverse stock split or other similar change in the Common Stock, the outstanding shares of Common Stock are increased or decreased or are exchanged for a different number or kind of securities of the Company, the restrictions contained in this Agreement shall apply with equal force to additional and/or substitute securities, if any, received by the Optionee in exchange for, or by virtue of his or her ownership of, this Stock Option or Shares acquired pursuant thereto.

(c) Change and Modifications. This Agreement may not be orally changed, modified or terminated, nor shall any oral waiver of any of its terms be effective. This Agreement may be changed, modified or terminated only by an agreement in writing signed by the Company and the Optionee.

(d) Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Delaware, applied without regard to conflict of law principles.

(e) Headings. The headings are intended only for convenience in finding the subject matter and do not constitute part of the text of this Agreement and shall not be considered in the interpretation of this Agreement.

(f) Saving Clause. If any provision(s) of this Agreement shall be determined to be illegal or unenforceable, such determination shall in no manner affect the legality or enforceability of any other provision hereof.

(g) Notices. All notices, requests, consents and other communications shall be in writing and be deemed given when delivered personally, by telex or facsimile transmission or when received if mailed by first class registered or certified mail, postage prepaid. Notices to the Company or the Optionee shall be addressed as set forth underneath their signatures below, or to such other address or addresses as may have been furnished by such party in writing to the other.

(h) Benefit and Binding Effect. This Agreement shall be binding upon and shall inure to the benefit of the parties hereto, their respective successors, assigns, and legal representatives. The Company has the right to assign this Agreement, and such assignee shall become entitled to all the rights of the Company hereunder to the extent of such assignment.

(i) Counterparts. For the convenience of the parties and to facilitate execution, this Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same document.

(j) Integration. This Agreement constitutes the entire agreement between the parties with respect to this Stock Option and supersedes all prior agreements and discussions between the parties concerning such subject matter.

7. Dispute Resolution.

(a) Except as provided below, any dispute arising out of or relating to the Plan or this Stock Option, this Agreement, or the breach, termination or validity of the Plan, this Stock Option or this Agreement, shall be finally settled by binding arbitration conducted expeditiously in accordance with the J.A.M.S./Endispute Comprehensive Arbitration Rules and Procedures (the "J.A.M.S. Rules"). The arbitration shall be governed by the United States Arbitration Act, 9 U.S.C. Sections 1-16, and judgment upon the award rendered by the arbitrators may be entered by any court having jurisdiction thereof. The place of arbitration shall be Pennsylvania.

(b) The arbitration shall commence within 60 days of the date on which a written demand for arbitration is filed by any party hereto. In connection with the arbitration proceeding, the arbitrator shall have the power to order the production of documents by each party and any third-party witnesses. In addition, each party may take up to three depositions as of right, and the arbitrator may in his or her discretion allow additional depositions upon good cause shown by the moving party. However, the arbitrator shall not have the power to order the answering of interrogatories or the response to requests for admission. In connection with any arbitration, each party to the arbitration shall provide to the other, no later than seven business days before the date of the arbitration, the identity of all persons that may testify at the arbitration and a copy of all documents that may be introduced at the arbitration or considered or used by a party's witness or expert. The arbitrator's decision and award shall be made and delivered within six months of the selection of the arbitrator. The arbitrator's decision shall set forth a reasoned basis for any award of damages or finding of liability. The arbitrator shall not have power to award damages in excess of actual compensatory damages and shall not multiply actual damages or award punitive damages, and each party hereby irrevocably waives any claim to such damages.

(c) The Company, the Optionee, each party to the Agreement and any other holder of Shares issued pursuant to this Agreement (each, a "Party") covenants and agrees that such party will participate in the arbitration in good faith. This Section 7 applies equally to requests for temporary, preliminary or permanent injunctive relief, except that in the case of temporary or preliminary injunctive relief any party may proceed in court without prior arbitration for the limited purpose of avoiding immediate and irreparable harm.

(d) Each Party (i) hereby irrevocably submits to the jurisdiction of any United States District Court of competent jurisdiction for the purpose of enforcing the award or decision in any such proceeding, (ii) hereby waives, and agrees not to assert, by way of motion, as a defense, or otherwise, in any such suit, action or proceeding, any claim that it is not subject personally to the jurisdiction of the above named courts, that its property is exempt or immune from attachment or execution (except as protected by applicable law), that the suit, action or proceeding is brought in an inconvenient forum, that the venue of the suit, action or proceeding is improper or that this Agreement or the subject matter hereof may not be enforced in or by such court, and (iii) hereby waives and agrees not to seek any review by any court of any other jurisdiction which may be called upon to grant an enforcement of the judgment of any such court. Each Party hereby consents to service of process by registered mail at the address to which notices are to be given. Each Party agrees that its, his or her submission to jurisdiction and its, his or her consent to service of process by mail is made for the express benefit of each other Party. Final judgment against any Party in any such action, suit or proceeding may be enforced in other jurisdictions by suit, action or proceeding on the judgment, or in any other manner provided by or pursuant to the laws of such other jurisdiction.

8. Waiver of Statutory Information Rights. The Optionee understands and agrees that, but for the waiver made herein, the Optionee would be entitled, upon written demand under oath stating the purpose thereof, to inspect for any proper purpose, and to make copies and extracts from, the Company's stock ledger, a list of its stockholders, and its other books and records, and the books and records of subsidiaries of the Company, if any, under the circumstances and in the manner provided in Section 220 of the General Corporation Law of

Delaware (any and all such rights, and any and all such other rights of the Optionee as may be provided for in Section 220, the "Inspection Rights"). In light of the foregoing, until the first sale of Stock of the Company to the general public pursuant to a registration statement filed with and declared effective by the Securities and Exchange Commission under the Securities Act, the Optionee hereby unconditionally and irrevocably waives the Inspection Rights, whether such Inspection Rights would be exercised or pursued directly or indirectly pursuant to Section 220 or otherwise, and covenants and agrees never to directly or indirectly commence, voluntarily aid in any way, prosecute, assign, transfer, or cause to be commenced any claim, action, cause of action, or other proceeding to pursue or exercise the Inspection Rights. The foregoing waiver shall not affect any rights of a director, in his or her capacity as such, under Section 220. The foregoing waiver shall not apply to any contractual inspection rights of the Optionee under any other written agreement between the Optionee and the Company.

[SIGNATURE PAGE FOLLOWS]

The foregoing Agreement is hereby accepted and the terms and conditions thereof hereby agreed to by the undersigned as of the date first above written.

CABALETTA BIO, INC.

By: _____
Name:
Title:

Address:

Cabaletta Bio, Inc.
c/o Steven Nichtberger
501 Northwick Lane
Villanova, PA 19085

The undersigned hereby acknowledges receiving and reviewing a copy of the Plan, including, without limitation, Section 9 thereof, and understands that this Stock Option is subject to the terms of the Plan and of this Agreement. This Agreement is hereby accepted, and the terms and conditions of the Plan, the Grant Notice and this Agreement, SPECIFICALLY INCLUDING THE ARBITRATION PROVISIONS SET FORTH IN SECTION 7 AND THE WAIVER OF STATUTORY INFORMATION RIGHTS SET FORTH IN SECTION 8 OF THIS AGREEMENT, are hereby agreed to, by the undersigned as of the date first above written.

OPTIONEE:

_____

Name:

Address:

_____

_____

_____

SPOUSE'S CONSENT
I acknowledge that I have read the foregoing Non-Qualified Stock Option Agreement and understand the contents thereof.

DESIGNATED BENEFICIARY:

Beneficiary's Address:

Appendix A

STOCK OPTION EXERCISE NOTICE

Cabaletta Bio, Inc.
Attention:

Pursuant to the terms of the grant notice and stock option agreement between the undersigned and Cabaletta Bio, Inc. (the "Company") dated _____ (the "Agreement") under the Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan, I,_____, hereby [Circle One] partially/fully exercise such option by including herein payment in the amount of $_____ representing the purchase price for_____ Shares. I have chosen the following form(s) of payment:

[ ] 1. Cash

[ ] 2. Certified or bank check payable to Cabaletta Bio, Inc.

[ ] 3. Other (as referenced in the Agreement and described in the Plan (please describe))
_____.

In connection with my exercise of the option as set forth above, I hereby represent and warrant to the Company as follows:

(i) I am purchasing the Shares for my own account for investment only, and not for resale or with a view to the distribution thereof.

(ii) I have had such an opportunity as I have deemed adequate to obtain from the Company such information as is necessary to permit me to evaluate the merits and risks of my investment in the Company and have consulted with my own advisers with respect to my investment in the Company.

(iii) I have sufficient experience in business, financial and investment matters to be able to evaluate the risks involved in the purchase of the Shares and to make an informed investment decision with respect to such purchase.

(iv) I can afford a complete loss of the value of the Shares and am able to bear the economic risk of holding such Shares for an indefinite period of time.

(v) I understand that the Shares may not be registered under the Securities Act of 1933 (it being understood that the Shares are being issued and sold in reliance on the exemption provided in Rule 701 thereunder) or any applicable state securities or "blue sky" laws and may not be sold or otherwise transferred or disposed of in the absence of an effective registration statement under the Securities Act of 1933 and under any applicable state securities or "blue sky" laws (or exemptions from the registration requirement thereof). I further acknowledge that certificates representing Shares will bear restrictive legends reflecting the foregoing and/or that book entries for uncertificated Shares will include similar restrictive notations.

(vi) I have read and understand the Plan and acknowledge and agree that the Shares are subject to all of the relevant terms of the Plan, including without limitation, the transfer restrictions set forth in Section 9 of the Plan.

(vii) I understand and agree that the Company has a right of first refusal with respect to the Shares pursuant to Section 9(b) of the Plan.

(viii) I understand and agree that the Company has certain repurchase rights with respect to the Shares pursuant to Section 9(c) of the Plan.

(ix) I understand and agree that I may not sell or otherwise transfer or dispose of the Shares for a period of time following the effective date of a public offering by the Company as described in Section 9(f) of the Plan.

(x) I understand and agree to the waiver of statutory information rights as set forth in Section 8 of the Agreement.

Sincerely yours,

_____

Name:

Address:

_____

_____

_____

Date: _____

RESTRICTED STOCK AWARD NOTICE
UNDER THE CABALETTA BIO, INC.
2018 STOCK OPTION AND GRANT PLAN

Pursuant to the Cabaletta Bio, Inc. 2018 Stock Option and Grant Plan (the "Plan"), Cabaletta Bio, Inc., a Delaware corporation (together with any successor, the "Company"), hereby grants, sells and issues to the individual named below, the Shares at the Per Share Purchase Price, subject to the terms and conditions set forth in this Restricted Stock Award Notice (the "Award Notice"), the attached Restricted Stock Agreement (the "Agreement") and the Plan. The Grantee agrees to the provisions set forth herein and acknowledges that each such provision is a material condition of the Company's agreement to issue and sell the Shares to him or her. The Company hereby acknowledges receipt of $**[_____]** in full payment for the Shares. All references to share prices and amounts herein shall be equitably adjusted to reflect stock splits, stock dividends, recapitalizations, mergers, reorganizations and similar changes affecting the capital stock of the Company, and any shares of capital stock of the Company received on or in respect of Shares in connection with any such event (including any shares of capital stock or any right, option or warrant to receive the same or any security convertible into or exchangeable for any such shares or received upon conversion of any such shares) shall be subject to this Agreement on the same basis and extent at the relevant time as the Shares in respect of which they were issued, and shall be deemed Shares as if and to the same extent they were issued at the date hereof.

Name of Grantee:	_____ (the "Grantee")
No. of Shares:	_____ Shares of Common Stock (the "Shares")
Grant Date:	_____, ____
Date of Purchase of Shares:	_____, ____
Vesting Commencement Date:	_____, ____ (the "Vesting Commencement Date") Per
Share Purchase Price:	$_____ (the "Per Share Purchase Price")
Vesting Schedule:	[25 percent of the Shares shall vest on the first anniversary of the Vesting Commencement Date; provided that the Grantee continues to have a Service Relationship with the Company at such time. Thereafter, the remaining 75 percent of the Shares shall vest in 36 equal monthly installments following the first anniversary of the Vesting Commencement Date, provided the Grantee continues to have a Service Relationship with the Company at such time. Notwithstanding anything in the Agreement to the contrary in the case of a Sale Event, the Shares of Restricted Stock shall be treated as provided in Section 3(c) of the Plan.]

Attachments: Restricted Stock Agreement, 2018 Stock Option and Grant Plan

RESTRICTED STOCK AGREEMENT
UNDER THE CABALETTA BIO, INC.
2018 STOCK OPTION AND GRANT PLAN

All capitalized terms used herein and not otherwise defined shall have the respective meanings set forth in the Award Notice and the Plan.

1. Purchase and Sale of Shares; Vesting; Investment Representations.

(a) Purchase and Sale. The Company hereby sells to the Grantee, and the Grantee hereby purchases from the Company, the number of Shares set forth in the Award Notice for the Per Share Purchase Price.

(b) Vesting. Initially, all of the Shares are non-transferable and subject to a substantial risk of forfeiture and are Shares of Restricted Stock. The risk of forfeiture shall lapse with respect to the Shares on the respective dates indicated on the Vesting Schedule set forth in the Award Notice.

(c) Investment Representations. In connection with the purchase and sale of the Shares contemplated by Section 1(a) above, the Grantee hereby represents and warrants to the Company as follows:

(i) The Grantee is purchasing the Shares for the Grantee's own account for investment only, and not for resale or with a view to the distribution thereof.

(ii) The Grantee has had such an opportunity as he or she has deemed adequate to obtain from the Company such information as is necessary to permit him or her to evaluate the merits and risks of the Grantee's investment in the Company and has consulted with the Grantee's own advisers with respect to the Grantee's investment in the Company.

(iii) The Grantee has sufficient experience in business, financial and investment matters to be able to evaluate the risks involved in the purchase of the Shares and to make an informed investment decision with respect to such purchase.

(iv) The Grantee can afford a complete loss of the value of the Shares and is able to bear the economic risk of holding such Shares for an indefinite period.

(v) The Grantee understands that the Shares are not registered under the Act (it being understood that the Shares are being issued and sold in reliance on the exemption provided in Rule 701 thereunder) or any applicable state securities or "blue sky" laws and may not be sold or otherwise transferred or disposed of in the absence of an effective registration statement under the Act and under any applicable state securities or "blue sky" laws (or exemptions from the registration requirements thereof). The Grantee further acknowledges that certificates representing the Shares will bear restrictive legends reflecting the foregoing and/or that book entries for uncertificated Shares will include similar restrictive notations.

(vi) The Grantee has read and understands the Plan and acknowledges and agrees that the Shares are subject to all of the relevant terms of the Plan, including without limitation, the transfer restrictions set forth in Section 9 of the Plan.

(vii) The Grantee understands and agrees that the Company has a right of first refusal with respect to the Shares pursuant to Section 9(b) of the Plan.

(viii) The Grantee understands and agree that the Company has certain repurchase rights with respect to the Shares pursuant to Section 9(c) of the Plan.

(ix) The Grantee understands and agrees that the Grantee may not sell or otherwise transfer or dispose of the Shares for a period of time following the effective date of a public offering by the Company as described in Section 9(f) of the Plan.

2. Repurchase Right. Upon a Termination Event, the Company shall have the right to repurchase Shares of Restricted Stock that are unvested as of the date of such Termination Event as set forth in Section 9(c) of the Plan.

3. Restrictions on Transfer of Shares. The Shares (whether or not vested) shall be subject to certain transfer restrictions and other limitations including, without limitation, the provisions contained in Section 9 of the Plan

4. Incorporation of Plan. Notwithstanding anything herein to the contrary, this Restricted Stock Award shall be subject to and governed by all the terms and conditions of the Plan.

5. Miscellaneous Provisions.

(a) Record Owner; Dividends. The Grantee and any Permitted Transferees, during the duration of this Agreement, shall be considered the record owners of and shall be entitled to vote the Shares if and to the extent the Shares are entitled to voting rights. The Grantee and any Permitted Transferees shall be entitled to receive all dividends and any other distributions declared on the Shares; provided, however, that the Company is under no duty to declare any such dividends or to make any such distribution.

(b) Section 83(b) Election. The Grantee shall consult with the Grantee's tax advisor to determine whether it would be appropriate for the Grantee to make an election under Section 83(b) of the Code with respect to this Award. Any such election must be filed with the Internal Revenue Service within 30 days of the date of this Award. If the Grantee makes an election under Section 83(b) of the Code, the Grantee shall give prompt notice to the Company (and provide a copy of such election to the Company). A sample Section 83(b) election is attached to this Agreement as Exhibit A.

(c) Equitable Relief. The parties hereto agree and declare that legal remedies may be inadequate to enforce the provisions of this Agreement and that equitable relief, including specific performance and injunctive relief, may be used to enforce the provisions of this Agreement.

(d) Change and Modifications. This Agreement may not be orally changed, modified or terminated, nor shall any oral waiver of any of its terms be effective. This Agreement may be changed, modified or terminated only by an agreement in writing signed by the Company and the Grantee.

(e) Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Delaware, applied without regard to conflict of law principles.

(f) Headings. The headings are intended only for convenience in finding the subject matter and do not constitute part of the text of this Agreement and shall not be considered in the interpretation of this Agreement.

(g) Saving Clause. If any provision(s) of this Agreement shall be determined to be illegal or unenforceable, such determination shall in no manner affect the legality or enforceability of any other provision hereof.

(h) Notices. All notices, requests, consents and other communications shall be in writing and be deemed given when delivered personally, by telex or facsimile transmission or when received if mailed by first class registered or certified mail, postage prepaid. Notices to the Company or the Grantee shall be addressed as set forth underneath their signatures below, or to such other address or addresses as may have been furnished by such party in writing to the other.

(i) Benefit and Binding Effect. This Agreement shall be binding upon and shall inure to the benefit of the parties hereto, their respective successors, assigns, and legal representatives. The Company has the right to assign this Agreement, and such assignee shall become entitled to all the rights of the Company hereunder to the extent of such assignment.

(j) Counterparts. For the convenience of the parties and to facilitate execution, this Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same document.

(k) Integration. This Agreement constitutes the entire agreement between the parties with respect to this Award and supersedes all prior agreements and discussions between the parties concerning such subject matter.

6. Dispute Resolution.

(a) Except as provided below, any dispute arising out of or relating to the Plan or the Shares, this Agreement, or the breach, termination or validity of the Plan, the Shares or this Agreement, shall be finally settled by binding arbitration conducted expeditiously in accordance with the J.A.M.S./Endispute Comprehensive Arbitration Rules and Procedures (the "J.A.M.S. Rules"). The arbitration shall be governed by the United States Arbitration Act, 9 U.S.C. Sections 1 - 16, and judgment upon the award rendered by the arbitrators may be entered by any court having jurisdiction thereof. The place of arbitration shall be Pennsylvania.

(b) The arbitration shall commence within 60 days of the date on which a written demand for arbitration is filed by any party hereto. In connection with the arbitration proceeding, the arbitrator shall have the power to order the production of documents by each party and any third-party witnesses. In addition, each party may take up to three depositions as of right, and the arbitrator may in his or her discretion allow additional depositions upon good cause shown by the moving party. However, the arbitrator shall not have the power to order the answering of interrogatories or the response to requests for admission. In connection with any arbitration, each party to the arbitration shall provide to the other, no later than seven business days before the date of the arbitration, the identity of all persons that may testify at the arbitration and a copy of all documents that may be introduced at the arbitration or considered or used by a party's witness or expert. The arbitrator's decision and award shall be made and delivered within six months of the selection of the arbitrator. The arbitrator's decision shall set forth a reasoned basis for any award of damages or finding of liability. The arbitrator shall not have power to award damages in excess of actual compensatory damages and shall not multiply actual damages or award punitive damages, and each party hereby irrevocably waives any claim to such damages.

(c) The Company, the Grantee, each party to the Agreement and any other holder of Shares issued pursuant to this Agreement (each, a "Party") covenants and agrees that such party will participate in the arbitration in good faith. This Section 6 applies equally to requests for temporary, preliminary or permanent injunctive relief, except that in the case of temporary or preliminary injunctive relief any party may proceed in court without prior arbitration for the limited purpose of avoiding immediate and irreparable harm.

(d) Each Party (i) hereby irrevocably submits to the jurisdiction of any United States District Court of competent jurisdiction for the purpose of enforcing the award or decision in any such proceeding, (ii) hereby waives, and agrees not to assert, by way of motion, as a defense, or otherwise, in any such suit, action or proceeding, any claim that it is not subject personally to the jurisdiction of the above named courts, that its property is exempt or immune from attachment or execution (except as protected by applicable law), that the suit, action or proceeding is brought in an inconvenient forum, that the venue of the suit, action or proceeding is improper or that this Agreement or the subject matter hereof may not be enforced in or by such court, and (iii) hereby waives and agrees not to seek any review by any court of any other jurisdiction which may be called upon to grant an enforcement of the judgment of any such court. Each Party hereby consents to service of process by registered mail at the address to which notices are to be given. Each Party agrees that its, his or her submission to jurisdiction and its, his or her consent to service of process by mail is made for the express benefit of each other Party. Final judgment against any Party in any such action, suit or proceeding may be enforced in other jurisdictions by suit, action or proceeding on the judgment, or in any other manner provided by or pursuant to the laws of such other jurisdiction.

7. Waiver of Statutory Information Rights. The Grantee understands and agrees that, but for the waiver made herein, the Grantee would be entitled, upon written demand under oath stating the purpose thereof, to inspect for any proper purpose, and to make copies and extracts from, the Company's stock ledger, a list of its stockholders, and its other books and records, and the books and records of subsidiaries of the Company, if any, under the circumstances and in the manner provided in Section 220 of the General Corporation Law of Delaware (any and all such rights, and any and all such other rights of the Grantee as may be provided for in Section 220, the "Inspection Rights"). In light of the foregoing, until the first sale of Stock of the Company to the general public pursuant to a registration statement filed with and declared effective by the Securities and Exchange Commission under the Securities Act, the Grantee hereby unconditionally and irrevocably waives the Inspection Rights, whether such Inspection Rights would be exercised or pursued directly or indirectly pursuant to Section 220 or otherwise, and covenants and agrees never to directly or indirectly commence, voluntarily aid in any way, prosecute, assign, transfer, or cause to be commenced any claim, action, cause of action, or other proceeding to pursue or exercise the Inspection Rights. The foregoing waiver shall not affect any rights of a director, in his or her capacity as such, under Section 220. The foregoing waiver shall not apply to any contractual inspection rights of the Grantee under any other written agreement between the Grantee and the Company.

[SIGNATURE PAGE FOLLOWS]

The foregoing Restricted Stock Agreement is hereby accepted and the terms and conditions thereof are hereby agreed to by the undersigned as of the date of purchase of Shares above written.

CABALETTA BIO, INC.

By: _____
Name:
Title:

Address:

Cabaletta Bio, Inc.
c/o Steven Nichtberger
501 Northwick Lane
Villanova, PA 19085

The undersigned hereby acknowledges receiving and reviewing a copy of the Plan, including, without limitation, Section 9 thereof and understands that the Shares granted hereby are subject to the terms of the Plan and of this Agreement. This Agreement is hereby accepted, and the terms and conditions of the Plan, the Award Notice and this Agreement, SPECIFICALLY INCLUDING THE ARBITRATION PROVISIONS SET FORTH IN SECTION 6 AND THE WAIVER OF STATUTORY INFORMATION RIGHTS SET FORTH IN SECTION 7 OF THIS AGREEMENT, are hereby agreed to, by the undersigned as of the date first above written.

GRANTEE:

_____
Name:

Address:

_____
_____
_____

SPOUSE'S CONSENT
I acknowledge that I have read the foregoing Restricted Stock Agreement and understand the contents thereof.

EXHIBIT A
Section 83(b) Election

(see attached)

LEASE

THIS LEASE ("Lease") is entered into as of February 11, 2019 between BRANDYWINE CIRA, L.P., a Pennsylvania limited partnership ("Landlord"), and CABALETTA BIO, INC., a Delaware corporation ("Tenant").

In consideration of the mutual covenants stated below, and intending to be legally bound, Landlord and Tenant covenant and agree as follows:

1. KEY DEFINED TERMS.

(a) "Abatement Period" means the period that begins on the Commencement Date and ends on the day immediately prior to the three (3)-month anniversary of the Commencement Date. Nothing contained herein may be deemed to diminish or relieve Tenant of its obligation to pay in accordance with the terms of this Lease all sums owed by Tenant to Landlord during the Abatement Period other than Fixed Rent.

(b) "Additional Rent" means all rents, costs, and expenses other than Fixed Rent that Tenant is obligated to pay Landlord pursuant to this Lease.

(c) "Broker" means CBRE, Inc.

(d) "Building" means the building known as Cira Centre located at 2929 Arch Street, Philadelphia, Pennsylvania 19104 containing approximately 730,187 rentable square feet.

(e) "Business Hours" means the hours of 8:00 a.m. to 6:00 p.m. on weekdays, and 8:00 a.m. to 1:00 p.m. on Saturdays, excluding Building holidays.

(f) "Commencement Date" means the date that is the earlier of: (i) the date on which Tenant first conducts any business in all or any portion of the Premises; or (ii) Substantial Completion (as defined in Exhibit C).

(g) "Common Areas" means, to the extent applicable, the lobby, parking facilities, passenger elevators, rooftop terrace, fitness or health center, plaza and sidewalk areas, multi-tenanted floor restrooms, and other similar areas of unrestricted access at the Project or designated for the benefit of Building tenants, and the areas on multi-tenant floors in the Building devoted to corridors, elevator lobbies, and other similar facilities serving the Premises.

(h) "Expiration Date" means the last day of the Term, or such earlier date of termination of this Lease pursuant to the terms hereof.

(i) "Fixed Rent" means fixed rent in the amounts set forth below:

TIME PERIOD	FIXED RENT PER R.S.F.	ANNUALIZED FIXED RENT	MONTHLY INSTALLMENT
Commencement Date - end of Abatement Period	$ 0.00	$ 0.00	$ 0.00
Fixed Rent Start Date - end of Rent Period 1	$ 34.00	$ 260,848.00	$ 21,737.33
Rent Period 2	$ 34.68	$ 266,064.96	$ 22,172.08
Rent Period 3 - End of Initial Term	$ 35.37	$ 271,358.64	$ 22,613.22

(j) "Fixed Rent Start Date" means the day immediately following the end of the Abatement Period.

(k) "Initial Term" means the period commencing on the Commencement Date, and ending at 11:59 p.m. on: (i) if the Fixed Rent Start Date is the first day of a calendar month, the day immediately prior to the thirty-six (36)-month anniversary of the Fixed Rent Start Date; or (ii) if the Fixed Rent Start Date is not the first day of a calendar month, the last day of the calendar month containing the thirty-six (36)-month anniversary of the Fixed Rent Start Date.

(l) "Laws" means federal, state, county, and local governmental and municipal laws, statutes, ordinances, rules, regulations, codes, decrees, orders, and other such requirements, and decisions by courts in cases where such decisions are considered binding precedents in the state or commonwealth in which the Premises are located ("State"), and decisions of federal courts applying the laws of the State, including without limitation Title III of the Americans with Disabilities Act of 1990,42 U.S.C. §12181 et seq. and its regulations.

(m) "Premises" means the space presently known as Suite 600 in the Building, as shown onExhibit A attached hereto, which is deemed to contain 7,672 rentable square feet. Landlord represents that, to the best of its knowledge, the Premises consist of 7,672 rentable square feet.

(n) "Project" means the Building, together with the parcel of land owned by Landlord upon which the Building is located, and all Common Areas.

(o) "Rent" means Fixed Rent and Additional Rent. Landlord may apply payments received from Tenant to any obligations of Tenant then due and owing without regard to any contrary Tenant instructions or requests. Additional Rent shall be paid by Tenant in the same manner as Fixed Rent, without setoff, deduction, or counterclaim (except as otherwise provided herein).

(p) "Rent Period" means, with respect to the first Rent Period, the period that begins on the Fixed Rent Start Date and ends on the last day of the calendar month preceding the month in which the first anniversary of the Fixed Rent Start Date occurs; thereafter each succeeding Rent Period shall commence on the day following the end of the preceding Rent Period, and shall extend for twelve (12) consecutive months.

(q) "Security Deposit" means $21,737.33.

(r) "Tenant's NAICS Code" means Tenant's six (6)-digit North American Industry Classification number under the North American Industry Classification System as promulgated by the Executive Office of the President, Office of Management and Budget, which is 325412.

(s) "Term" means the Initial Term together with any extension of the term of this Lease agreed to by the parties in writing.

2. PREMISES. Landlord leases to Tenant, and Tenant leases from Landlord, the Premises for the Term subject to the terms and conditions of this Lease. Except for the representations and warranties of Landlord as set forth in this Lease, Tenant accepts the Premises in their "AS IS", "WHERE IS", "WITH ALL FAULTS" condition, except that: (i) Landlord shall complete the Leasehold Improvements pursuant to Exhibit C attached hereto, and deliver the Premises to Tenant in compliance with all applicable Laws, and with all HVAC, mechanical, plumbing, and electrical systems serving the Premises in good working order; (ii) Landlord shall remain responsible for any latent defects provided notice of such defect is provided to Landlord within twelve (12) months after the Commencement Date; and (iii) nothing in this Section shall release Landlord from its repair and other obligations under this Lease.

3. TERM. The Term shall commence on the Commencement Date. The terms and provisions of this Lease are binding on the parties upon Tenant's and Landlord's execution of this Lease notwithstanding a later Commencement Date for the Term. The rentable area of the Premises and the Building on the Commencement Date shall be deemed to be as stated in Section 1. By the Confirmation of Lease Term substantially in the form ofExhibit B attached hereto ("COLT"). Landlord shall notify Tenant of the Commencement Date and all other matters stated therein. The COLT shall be conclusive and binding on Tenant as to all matters set forth therein unless, within thirty (30) days following delivery of the COLT to Tenant, Tenant contests any of the matters contained therein by notifying Landlord in writing of Tenant's objections.

4. FIXED RENT: SECURITY DEPOSIT: LATE FEE.

(a) Tenant covenants and agrees to pay to Landlord during the Term, without notice, demand, setoff, deduction, or counterclaim (except as otherwise provided herein), Fixed Rent in the amounts set forth in Section l(i). The Monthly Installment of Fixed Rent, the monthly amount of Estimated Operating Expenses as set forth in Section 5, and any estimated amount of utilities as set forth inSection 6, shall be payable to Landlord in advance on or before the first day of each month of the Term. If the Fixed Rent Start Date is not the first day of a calendar month, then the Fixed Rent due for the partial month commencing on the Fixed Rent Start Date shall be prorated based on the number of days in such month. All Rent payments shall be made by electronic funds transfer as follows (or as otherwise directed in writing by Landlord to Tenant from time to time): (i) ACH debit of funds, provided Tenant shall first complete Landlord's then-current forms authorizing Landlord to automatically debit Tenant's bank account; or (ii) ACH credit of immediately available funds to an account designated by Landlord. "ACH" means Automated Clearing House network or similar system designated by Landlord. All Rent payments shall include the Building number and the Lease number, which numbers will be provided to Tenant in the COLT.

(b) Contemporaneously with Tenant's execution and delivery of this Lease, Tenant shall pay to Landlord the Security Deposit. No interest shall be paid to Tenant on the Security Deposit, and Landlord shall have the right to commingle the Security Deposit with other funds of Landlord. If Tenant fails to perform any of its obligations under this Lease that are not cured within the applicable notice and/or cure periods provided herein, Landlord may use, apply or retain the whole or any part of the Security Deposit for the payment of: (A) any rent or other sums that Tenant has not paid when due; (B) any sum expended by Landlord in accordance with the provisions of this Lease; and/or (C) any sum that Landlord expends or is required to expend in connection with an Event of Default (as defined in Section 17). Landlord's use of the Security Deposit shall not prevent Landlord from exercising any other remedy available to Landlord under this Lease, at law or in equity and shall not operate as either liquidated damages or as a limitation on any recovery to which Landlord may otherwise be entitled. If any portion of the Security Deposit is used, applied, or retained by Landlord, Tenant shall, within ten (10) days after the written demand therefor, deposit cash with Landlord in an amount sufficient to restore the Security Deposit to its original amount. Landlord shall return the Security Deposit or the balance thereof (as applicable) to Tenant within one (1) month after the later of the Expiration Date, Tenant's surrender of possession of the Premises to Landlord in the condition required under this Lease, and Tenant's payment of all outstanding Rent. Upon the return of the Security Deposit or the balance thereof (as applicable) to Tenant, Landlord shall be completely relieved of liability with respect to the Security Deposit. If the originally named Tenant has assigned this Lease, Landlord may return the Security Deposit or the balance thereof (as applicable) to the current Tenant unless Landlord receives reasonably satisfactory evidence of the originally named Tenant's right to receive the Security Deposit. If Landlord conveys ownership of the Building, Landlord shall deliver the Security Deposit to the transferee, and (provided that such transferee assumes all of Landlord's obligations under this Lease) Landlord shall thereupon be released from all liability for the return of such Security Deposit and Tenant shall look solely to the transferee for the return of the Security Deposit.

(c) If Landlord does not receive the full payment from Tenant of any Rent when due under this Lease (without regard to any notice and/or cure period to which Tenant might be entitled), Tenant shall also pay to Landlord as Additional Rent a late fee in the amount of five percent (5%) of such overdue amount. Notwithstanding the foregoing, Landlord shall waive the above-referenced late fee two (2) times during any twelve (12) consecutive months of the Term provided Tenant makes the required payment within five (5) days after receipt of notice of such late payment. With respect to any Rent payment (whether it be by check, ACH/wire, or other method) that is returned unpaid for any reason, Landlord shall have the right to assess a reasonable fee to Tenant as Additional Rent, which fee is currently $40.00 per returned payment.

5. OPERATING EXPENSES.

(a) Certain Definitions.

(i) "Janitorial Expenses" means all reasonable costs associated with trash and garbage removal, recycling, cleaning, and sanitizing the Building, and the items of work set forth in Exhibit D attached hereto.

(ii) "Operating Expenses" means collectively Project Expenses and Taxes.

(iii) "Project Expenses" means all reasonable costs and expenses paid, incurred, or accrued by Landlord in connection with the maintenance, operation, repair, and replacement of the Project including, without limitation: a management fee not to exceed three percent (3%) of gross rents and revenues from the Project; all costs associated with the removal of snow and ice from the Project; property management office rent; conference room and fitness center costs to the extent such amenities are made available to Tenant at no charge; transportation program costs, such as a shuttle made available to Tenant at no charge; security measures; Janitorial Expenses; Project Utility Costs (as defined in Section 6 below); capital expenditures, repairs, and replacements, but only to the extent of the amortized costs of such capital item over the useful life of the improvement, in accordance with generally accepted accounting principles, provided such capital items are: (I) incurred to comply with Laws that are amended, become effective, or are interpreted differently after the execution of this Lease, or insurance or security requirements; (II) are intended to have cost-saving benefits over the Term of this Lease or reduce the rate of increase in Operating Expenses; or (III) is a reasonably prudent measure to improve the safe operation of the Project, or improve or maintain the access to, quality, appearance or integrity of, the Building; all insurance premiums and deductibles paid or payable by Landlord with respect to the Project; and the cost of providing those services required to be furnished by Landlord under this Lease. Notwithstanding the foregoing, "Project Expenses" shall not include any of the following: (A) repairs or other work occasioned by fire, windstorm, or other insured casualty or by the exercise of the right of eminent domain to the extent Landlord actually receives insurance proceeds or condemnation awards therefor (or which would have been received had Landlord maintained the insurance required hereunder); (B) leasing commissions, accountants', consultants', auditors or attorneys' fees, costs and disbursements and other expenses incurred in connection with negotiations or disputes with other tenants or prospective tenants or other occupants, or associated with the enforcement of any other leases or the defense of Landlord's title to or interest in the real property or any part thereof; (C) costs incurred by Landlord in connection with the original construction of the Building and related facilities; (D) costs (including permit, license, and inspection fees) incurred in renovating or otherwise improving or decorating, painting, or redecorating leased space for other tenants or other occupants or vacant space; (E) interest on debt or amortization payments on any mortgage or deeds of trust or any other borrowings and any ground rent; (F) any compensation paid to clerks, attendants or other persons in commercial concessions operated by Landlord; (G) any fines or fees for Landlord's failure to comply with Laws; (H) legal, accounting, and other expenses related to Landlord's financing, refinancing, mortgaging, or selling the Building or the Project; (I) any increase in an insurance premium caused by the non-general office use, occupancy, or act of another tenant; (J) costs for sculpture, decorations, painting, or other objects of art in excess of amounts typically spent for such items in office buildings of comparable quality in the competitive area of the Building; (K) cost of any political, charitable, or civic contribution or donation; (L) reserves for repairs, maintenance, and replacements; (M) Taxes; (N) cost of utilities directly metered or submetered to Building tenants and paid separately by such tenants; (O) fines, interest, penalties, or liens arising by reason of Landlord's failure to pay any Project Expenses when due, except that Project Expenses shall include interest or similar charges if the collecting authority permits such Project Expenses to be paid in installments with interest thereon, such payments are not considered overdue by such

authority and Landlord pays the Project Expenses in such installments; (P) costs and expenses associated with hazardous waste or hazardous substances not generated or brought to the Project by Tenant or its agents including but not limited to the cleanup of such hazardous waste or hazardous substances and the costs of any litigation (including, but not limited to reasonable attorneys' fees) arising out of the discovery of such hazardous waste or hazardous substances; (Q) the portion of any wages, salaries, fees, or fringe benefits paid to personnel above the level of regional property manager; (R) costs of extraordinary services provided to other tenants of the Building or services to which Tenant is not entitled (including, without limitation, costs specially billed to and paid by specific tenants); (S) all costs relating to activities for the solicitation and execution of leases of space in the Building, including legal fees, real estate brokers' commissions, expenses, fees, and advertising, moving expenses, design fees, rental concessions, rental credits, tenant improvement allowances, lease assumptions or any other cost and expenses incurred in the connection with the leasing of any space in the Building; (T) costs representing an amount paid to an affiliate of Landlord (exclusive of any management fee permitted under the Operating Expense inclusions) to the extent in excess of market rates for comparable services if rendered by unrelated third parties; (U) costs arising from Landlord's default under this Lease or any other lease for space in the Building; (V) costs of selling the Project or any portion thereof or interest therein; (W) costs or expenses arising from the gross negligence of Landlord or its agents or employees; (X) costs incurred to remedy, repair, or otherwise correct violations of Laws that exist on the Commencement Date; (Y) ground rents or rentals payable by Landlord pursuant to any over-lease; (Z) repairs for which Landlord is covered by a manufacturer's, materialman's, vendor's or contractor's warranty; (AA) ground lease payments; (BB) any administrative or management fees, except as otherwise set forth above; (CC) costs to maintain, repair or replace the Building structure; (DD) any expense that, pursuant to generally accepted accounting principles, is not properly characterized as an "operating expense"; and (EE) costs incurred in operating, maintaining, or owning any conference center or fitness center in the Project that is not made available to Tenant at no charge.

(iv) "Taxes" means all taxes, assessments, and other governmental charges, whether general or special, ordinary or extraordinary, foreseen or unforeseen, including without limitation business improvement district charges, improvement contributions paid to business improvement districts or similar organizations, and special assessments for public improvements or traffic districts, that are levied or assessed against, or with respect to the ownership of, all or any portion of the Project during the Term or, if levied or assessed prior to the Term, are properly allocable to the Term, business property operating license charges, and real estate tax appeal expenditures incurred by Landlord. "Taxes" shall not include: (i) any inheritance, estate, succession, transfer, gift, franchise, corporation, net income or profit tax or capital levy that is or may be imposed upon Landlord; or (ii) any transfer tax or recording charge resulting from a transfer of the Building or the Project; provided, however, if at any time during the Term the method of taxation prevailing at the commencement of the Term shall be altered such that in lieu of or as a substitute in whole or in part for any Taxes now levied, assessed, or imposed on real estate there shall be levied, assessed, or imposed: (A) a tax on the rents received from such real estate; or (B) a license fee measured by the rents receivable by Landlord from the Premises or any portion thereof; or (C) a tax or license fee imposed upon the Premises or any portion thereof, then the same shall be included in Taxes. Tenant may not file or participate in any Tax appeals for any tax lot in the Project. Further, "Taxes" shall not include any sales, use, use and occupancy, transaction privilege, or other excise tax that may at any time be levied or

imposed upon Tenant, or measured by any amount payable by Tenant under this Lease, whether such tax exists on the date of this Lease or is adopted hereafter (collectively, "Other Taxes"), including without limitation the Philadelphia use and occupancy tax. Tenant shall pay all Other Taxes monthly or otherwise when due, whether collected by Landlord or collected directly by the applicable governmental agency; if applicable Law requires Landlord to collect any Other Taxes, such Other Taxes shall be payable to Landlord as Additional Rent.

(v) "Tenant's Share" means the rentable square footage of the Premises divided by the rentable square footage of the Building on the date of calculation, which on the date of this Lease is stipulated to be 1.05%.

(b) Commencing on the Commencement Date and continuing thereafter during the Term, Tenant shall pay to Landlord in advance on a monthly basis, payable pursuant to Section 5(c) below, Tenant's Share of Operating Expenses. If the Building is operated as part of a complex of buildings or in conjunction with other buildings or parcels of land, then Landlord may prorate the common expenses and costs with respect to each such building or parcel of land in such manner as Landlord, in its sole but reasonable judgment, shall determine. Landlord shall calculate Operating Expenses using generally accepted accounting principles, and may allocate certain categories of Operating Expenses to the applicable tenants on a commercially reasonable basis. For purposes of calculating Tenant's Share of Controllable Project Expenses (as defined below), the total Controllable Project Expenses for each year subsequent to the first full calendar year of the Term ("First Lease Year") shall not exceed the applicable Cap Amount (as defined below) for the applicable subsequent calendar year. The "Cap Amount" for each subsequent year shall be equal to the Controllable Project Expenses for the First Lease Year, increased on a compounded basis by five percent (5%) annually (that is, the Cap Amount for the first subsequent year shall be equal to 1.05 multiplied by the First Lease Year Controllable Project Expenses, the Cap Amount for the second subsequent year shall be equal to (1.05 x 1.05) multiplied by the First Lease Year Controllable Project Expenses and so on, throughout the Term). The cap on Controllable Project Expenses set forth herein shall also be calculated on a cumulative basis so that if in any year subsequent to the First Lease Year, the Controllable Project Expenses exceed the applicable Cap Amount ("Deferred Amount"), the Deferred Amount(s) shall be carried over to the following year(s) and will be charged to Tenant in the following year(s) to the extent Controllable Project Expenses are less than the Cap Amount for the year(s) in question. "Controllable Project Expenses" means all Project Expenses that are within the reasonable control of Landlord, such as landscaping and regular common area maintenance, but specifically excluding utility costs, Taxes, snow and ice removal, insurance, costs resulting from a Force Majeure Event, wage increases due to collective bargaining agreements and/or increases in the minimum wage, management fees, and costs resulting from a change in Law occurring after the date of this Lease.

(c) For each calendar year (or portion thereof) for which Tenant has an obligation to pay any Operating Expenses, Landlord shall send to Tenant a statement of the monthly amount of projected Operating Expenses due from Tenant for such calendar year ("Estimated Operating' Expenses"), and Tenant shall pay to Landlord such monthly amount of Estimated Operating Expenses as provided in Section 5(b). without further notice, demand, setoff, deduction, or counterclaim (except as otherwise provided herein). As soon as administratively available after each calendar year (but in any event Landlord shall use

commercially reasonable efforts to provide such statement within 180 days after each calendar year), Landlord shall send to Tenant a reconciliation statement of the actual Operating Expenses for the prior calendar year including Tenant's Share thereof and an itemized list of costs ("Reconciliation Statement"). If the amount actually paid by Tenant as Estimated Operating Expenses exceeds the amount due per the Reconciliation Statement, Tenant shall receive a credit in an amount equal to the overpayment, which credit shall be applied towards future Rent until fully credited. If the credit exceeds the aggregate future Rent owed by Tenant (or if the Term has expired), and there is no Event of Default, Landlord shall pay the excess amount to Tenant within thirty (30) days after delivery of the Reconciliation Statement. If Landlord has undercharged Tenant, then Landlord shall either send Tenant an invoice setting forth the additional amount due or indicate the amount due as part of the Reconciliation Statement, which amount shall be paid in full by Tenant within thirty (30) days after receipt of such invoice. Notwithstanding the foregoing, if Landlord fails to provide a Reconciliation Statement for any final expense within two (2) years after such expense was incurred and billed to Landlord, Landlord shall be deemed to have waived its right to collect any underpayments by Tenant of such amounts.

(d) If, during the Term, less than ninety-five percent (95%) of the rentable area of the Building is or was occupied by tenants, Project Expenses shall be deemed for such year to be an amount equal to the costs that would have been incurred had the occupancy of the Building been at least ninety-five percent (95%) throughout such year, as reasonably determined by Landlord and taking into account that certain expenses fluctuate with the Building's occupancy level (e.g., Janitorial Expenses) and certain expenses do not so fluctuate (e.g., landscaping). In addition, if Landlord is not obligated or otherwise does not offer to furnish an item or a service to a particular tenant or portion of the Building (e.g., if a tenant separately contracts with an office cleaning firm to clean such tenant's premises) and the cost of such item or service would otherwise be included in Project Expenses, Landlord shall equitably adjust the Project Expenses so the cost of the item or service is shared only by tenants actually receiving such item or service. All payment calculations under this Section shall be prorated for any partial calendar years during the Term and all calculations shall be based upon Project Expenses as grossed-up in accordance with the terms of this Lease. Tenant's obligations under this Section shall survive the Expiration Date.

(e) If Landlord or any affiliate of Landlord has elected to qualify as a real estate investment trust ("REIT"), any service required or permitted to be performed by Landlord pursuant to this Lease, the charge or cost of which may be treated as impermissible tenant service income under the laws governing a REIT, may be performed by an independent contractor of Landlord, Landlord's property manager, or a taxable REIT subsidiary that is affiliated with either Landlord or Landlord's property manager (each, a "Service Provider"), so long as the rates charged by the Service Provider are substantially similar to other independent contractors' rates charged in the Philadelphia, Pennsylvania area. If Tenant is subject to a charge under this Lease for any such service, then at Landlord's direction Tenant shall pay the charge for such service either to Landlord for further payment to the Service Provider or directly to the Service Provider and, in either case: (a) Landlord shall credit such payment against any charge for such service made by Landlord to Tenant under this Lease; and (b) Tenant's payment of the Service Provider shall not relieve Landlord from any obligation under this Lease concerning the provisions of such services.

(f) Provided there is no outstanding monetary default by Tenant under this Lease (that continues beyond the expiration of all applicable notice and/or cure periods), Tenant shall have the right, at its sole cost and expense, to cause Landlord's records related to a Reconciliation Statement to be audited provided: (i) Tenant provides notice of its intent to audit such Reconciliation Statement within four (4) months after receipt of the Reconciliation Statement; (ii) the audit is performed by Tenant's accountant or a certified public accountant that has not been retained on a contingency basis or other basis where its compensation relates to the cost savings of Tenant; (iii) any such audit may not occur more frequently than once during each twelve (12)-month period of the Term, nor apply to any year prior to the year of the then-current Reconciliation Statement being reviewed; (iv) the audit is completed within two (2) months after the date that Landlord makes all of the necessary and applicable records available to Tenant or Tenant's auditor; (v) the contents of Landlord's records shall be kept confidential by Tenant, its auditor, and its other professional advisors, other than as required by applicable Law, or in connection with any litigation or other proceeding arising in connection with this Lease, and if requested by Landlord, Tenant and its auditor shall execute Landlord's standard confidentiality agreement (which shall be in a form reasonably acceptable to Tenant) as a condition to Tenant's audit rights under this paragraph; and (vi) if Tenant's accountant or Tenant's auditor determines that an overpayment is due Tenant, Tenant's auditor shall produce a detailed report addressed to both Landlord and Tenant, which report shall be delivered within thirty (30) days after Tenant's auditor's completion of the audit. During completion of Tenant's audit, Tenant shall nonetheless timely pay all of Tenant's Share of Operating Expenses without setoff or deduction. If Tenant's audit report discloses any discrepancy, Landlord and Tenant shall use good faith efforts to resolve the dispute. If the parties are unable to reach agreement within twenty (20) days after Landlord's receipt of the audit report, Tenant shall have the right to refer the matter to a mutually acceptable independent certified public accountant, who shall work in good faith with Landlord and Tenant to resolve the discrepancy; provided if Tenant does not do so within ten (10) days after the expiration of such twenty (20)-day period, Landlord's calculations and the Reconciliation Statement at issue shall be deemed final and accepted by Tenant. The fees and costs of such independent accountant to which such dispute is referred shall be borne by the unsuccessful party and shall be shared pro rata to the extent each party is unsuccessful as determined by such independent certified public accountant, whose decision shall be final and binding. Within thirty (30) days after resolution of the dispute, whether by agreement of the parties or a final decision of an independent accountant, Landlord shall pay or credit to Tenant, or Tenant shall pay to Landlord, as the case may be, all unpaid Operating Expenses due and owing. Notwithstanding anything to the contrary contained herein, in the event, by agreement or as a result of the findings of such independent accountant or as a result of a final judicial determination, it is determined that the actual Operating Expenses exceeded those claimed by Landlord by more than five percent (5%), then Landlord shall reimburse Tenant within thirty (30) days after receipt of an invoice with reasonable supporting documentation for the reasonable, third-party costs of Tenant's audit, not to exceed $2,500.

6. UTILITIES.

(a) Commencing on the Commencement Date, and continuing throughout the Term, Tenant shall pay for utility services as follows without setoff, deduction, or counterclaim (except as otherwise provided herein): (i) Tenant shall pay directly to the applicable utility service provider for any utilities that are separately metered (not submetered) to the Premises;

(ii) Tenant shall pay Landlord for any utilities serving the Premises that are separately submetered based upon Tenant's submetered usage; and (iii) Tenant shall pay Landlord for Tenant's Share of Project Utility Costs, as set forth in Section 5 above. "Project Utility Costs" means the total cost for all utilities serving the Project, excluding the costs of utilities that are directly metered or submetered to Building tenants or paid separately by such tenants. Notwithstanding anything to the contrary in this Lease, Landlord shall have the right, upon reasonable advance written notice to Tenant, to install meters, submeters, or other energy-reducing systems in the Premises at any time to measure any or all utilities serving the Premises, at no cost to Tenant. In exercising such right, Landlord shall use its commercially reasonable efforts to avoid interfering with Tenant's use and occupancy of the Premises. For those utilities set forth in subsection (ii) above, Landlord shall invoice Tenant for such utilities as Additional Rent (payable within thirty (30) days after receipt of an invoice therefor). For those utilities set forth in subsection (ii) above, Landlord shall have the right to either invoice Tenant for such utilities as Additional Rent (payable within thirty (30) days after receipt of an invoice therefor), or together with Operating Expenses. Landlord shall have the right to estimate the utility charge, which estimated amount shall be payable to Landlord within thirty (30) days after receipt of an invoice therefor and may be included along with the invoice for Project Expenses, provided Landlord shall be required to reconcile on an annual basis based on utility invoices received for such period. The cost of utilities payable by Tenant under this Section shall include all applicable taxes and Landlord's then-current reasonable charges for reading the applicable meters, provided Landlord shall have the right to engage a third party to read the submeters, and Tenant shall reimburse Landlord for both the utilities consumed as evidenced by the meters plus the reasonable costs for reading the meters within thirty (30) days after receipt of an invoice therefor. Tenant shall pay such rates as Landlord may establish from time to time, which shall not be in excess of any applicable rates chargeable by Law, or in excess of the general service rate or other such rate that would apply to Tenant's consumption if charged by the utility or municipality serving the Building or general area in which the Building is located. If Tenant fails to pay timely any direct-metered utility charges from the applicable utility provider, Landlord shall have the right but not the obligation to pay such charges on Tenant's behalf and bill Tenant for such costs plus the Administrative Fee (as defined in Section 17), which amount shall be payable to Landlord as Additional Rent within thirty (30) days after receipt of an invoice therefor. Tenant shall at all times comply with the rules, regulations, terms, policies, and conditions applicable to the service, equipment, wiring, and requirements of the utility supplying electricity to the Building.

(b) For any separately metered utilities, Landlord is hereby authorized to request and obtain, on behalf of Tenant, Tenant's utility consumption data from the applicable utility provider for informational purposes and to enable Landlord to obtain full building Energy Star scoring for the Building. Landlord shall have the right, upon reasonable advance written notice to Tenant (except in the case of an emergency) to shut down the Building systems (including electricity and HVAC systems) for required maintenance, safety inspections, any other commercially acceptable reason, including without limitation in cases of emergency. In exercising such right, Landlord shall use its commercially reasonable efforts to avoid materially interfering with Tenant's use and occupancy of the Premises. Landlord shall not be liable for any interruption in providing any utility that Landlord is obligated to provide under this Lease, unless such interruption or delay: (i) renders the Premises or any material portion thereof untenantable for the normal conduct of Tenant's business at the Premises, and Tenant has ceased

using such untenantable portion, provided Tenant shall first endeavor to use any generator that serves the Premises or of which Tenant has the beneficial use; (ii) results from Landlord's negligence or willful misconduct; and (iii) extends for a period longer than five (5) consecutive days, in which case, Tenant's obligation to pay Rent shall be abated with respect to the untenantable portion of the Premises that Tenant has ceased using for the period beginning on the 6th consecutive day after such conditions are met and ending on the earlier of: (A) the date Tenant recommences using the Premises or the applicable portion thereof; or (B) the date on which the service(s) is substantially restored. The rental abatement described above shall be Tenant's sole remedy in the event of a utility interruption, and Tenant hereby waives any other rights against Landlord in connection therewith. Landlord shall have the right to change the utility providers to the Project at any time, and all providers selected by Landlord must provide service at competitive market prices. In the event of a casualty or condemnation affecting the Building and/or the Premises, the terms of Sections 14 and 15, respectively, shall control over the provisions of this Section.

(c) If Landlord reasonably determines that: (i) Tenant exceeds the design conditions for the heating, ventilation, and air conditioning ("HVAC") system serving the Premises, introduces into the Premises equipment that overloads such system, or causes such system to not adequately perform its proper functions; or (ii) the heavy concentration of personnel, motors, machines, or equipment used in the Premises, including telephone and computer equipment, or any other condition in the Premises caused by Tenant (for example, more than one shift per day or twenty-four (24)-hour use of the Premises), adversely affects the temperature or humidity otherwise maintained by such system, then Landlord shall notify Tenant in writing and Tenant shall have thirty (30) days to remedy the situation to Landlord's reasonable satisfaction (or such longer period as is reasonably required to remedy the situation provided Tenant promptly commences and diligently continues to effectuate a remedy). If Tenant fails to timely remedy the situation to Landlord's reasonable satisfaction, Landlord shall have the right to install one or more supplemental air conditioning units in the Premises with the reasonable cost thereof, including the cost of installation, operation and maintenance, being payable by Tenant to Landlord within thirty (30) days after Landlord's written demand. Tenant shall not change or adjust any closed or sealed thermostat or other element of the HVAC system serving the Premises without Landlord's express prior written consent, which consent shall not be unreasonably withheld, conditioned or delayed. Landlord may install and operate meters or any other reasonable system for monitoring or estimating any services or utilities used by Tenant in excess of those required to be provided by Landlord (including a system for Landlord's engineer reasonably to estimate any such excess usage). If such system indicates such excess services or utilities, Tenant shall pay Landlord's reasonable charges for installing and operating such system and any supplementary air conditioning, ventilation, heat, electrical, or other systems or equipment (or adjustments or modifications to the existing Building systems and equipment), and Landlord's reasonable charges for such amount of excess services or utilities used by Tenant. All Tenant's Supplemental HVAC (as defined in Section 11(a) below) shall be separately metered to the Premises at Tenant's cost, and Tenant shall be solely responsible for all electricity registered by, and the maintenance and replacement of, such meters. Landlord has no obligation to keep cool any of Tenant's information technology equipment that is placed together in one room, on a rack, or in any similar manner ("IT Equipment"), and Tenant waives any claim against Landlord in connection with Tenant's IT Equipment. Landlord shall have the option to require that the computer room and/or information technology closet in the Premises shall be

separately submetered at Tenant's expense, and Tenant shall pay Landlord for all electricity registered in such submeter. Within one (1) month after written request, Tenant shall provide to Landlord electrical load information reasonably requested by Landlord with respect to any computer room and/or information technology closet in the Premises.

7. LANDLORD SERVICES.

(a) Subject to Section 5 and Section 6, Landlord shall provide the following to the Premises during the Term: (i) HVAC service in the respective seasons during Business Hours; provided HVAC service to the Premises on Saturdays will be provided only upon Tenant's prior request to Landlord received no later than noon on the preceding business day; (ii) electricity for lighting and standard office equipment for comparable buildings in the market in which the Project is located; (iii) water, sewer, and, to the extent applicable to the Building, gas, oil, and steam service; and (iv) cleaning services meeting the minimum specifications set forth in Exhibit D attached hereto. Tenant, at Tenant's expense, shall make arrangements with the applicable utility companies and public bodies to provide, in Tenant's name, telephone, cable, and any other utility service not provided by Landlord that Tenant desires at the Premises.

(b) Landlord shall not be obligated to furnish any services, supplies, or utilities other than as set forth in this Lease; provided, however, upon Tenant's prior request sent in accordance with Section 25(p) below, Landlord may furnish additional services, supplies, or utilities, in which case Tenant shall pay to Landlord, within thirty (30) days after demand, Landlord's then-current actual charge for such additional services, supplies, or utilities, or Tenant's *pro rata* share thereof, if applicable, as reasonably determined by Landlord. Landlord's current rate for HVAC service outside of Business Hours requested with at least twenty (24) hours' prior notice (or by noon for weekend service) is $10.00 per hour, per zone, with a two (2)-hour minimum if the service does not commence immediately following the end of a day's Business Hours.

8. USE: SIGNS: COMMON AREAS.

(a) Tenant shall use the Premises for general office use (non-medical) befitting a class A office building and storage incidental thereto, and for no other purpose ("Permitted Use"). Tenant's use of the Premises for the Permitted Use shall be subject to all applicable Laws, and to all reasonable requirements of the insurers of the Building. Tenant represents and warrants to Landlord, for informational purposes only, that Tenant's current NAICS Code is set forth in Section 1 hereof, provided the foregoing shall not be construed in any manner as a restriction on the Permitted Use. Landlord represents and warrants to Tenant to its actual knowledge without independent investigation or inquiry, as of the date of this Lease that Tenant's use of the Premises for the Permitted Use does not violate any restrictions under any leases or agreements applicable to the Project.

(b) Landlord shall provide Tenant with: (i) Building-standard identification signage at the main entrance to the Premises, the costs of which shall be paid for by Landlord; and (ii) Building-standard directional signage in the multi-tenant elevator lobby on the 6th floor of the Building, the costs of which shall be paid for by Landlord for the originally named Tenant, otherwise by Tenant as Additional Rent within ten (10) days after written demand. Tenant shall not place, erect, or maintain any signs at the Premises, the Building, or the Project that are visible from outside of the Premises.

(c) Subject to the Building rules and regulations set forth on Exhibit E attached hereto (as the same may be modified pursuant to Section 19 herein), Tenant shall have the nonexclusive right in common with others to use the Common Areas for their intended purposes.

(d) Landlord shall have the right in its sole discretion to, from time to time, construct, maintain, operate, repair, close, limit, take out of service, alter, change, and modify all or any part of the Common Areas, provided, however, in no event shall the Common Areas be altered in such a way that will materially and negatively affect Tenant's visibility, ingress/egress and/or use and occupancy of the Premises. Landlord, Landlord's agents, approved contractors, and utility service providers shall have the right to install, use, and maintain ducts, pipes, wiring, and conduits in and through the Premises provided Landlord avoids material interference to the conduct of Tenant's business operations in the Premises and such use does not cause the usable area of the Premises to be reduced beyond a de minimis amount.

(e) Subject to Landlord's reasonable security measures and Force Majeure Events (as defined in Section 25(g)), Landlord shall provide Tenant with access to the Building and, if applicable, passenger elevator service for use in common with others for access to and from the Premises twenty (24) hours per day, seven (7) days per week, except during emergencies. Landlord shall have the right to limit the number of elevators (if any) to be operated during repairs and during non-Business Hours and on weekends. If applicable, Landlord shall provide Tenant with access to the freight elevator(s) of the Building from time to time following receipt of Tenant's prior request, and Tenant shall pay Landlord's then-current charge for use of such freight elevators.

9. TENANT'S ALTERATIONS.

(a) Except as otherwise set forth herein, Tenant shall not, and shall not permit any Tenant Agent to, cut, drill into, or secure any fixture, apparatus, or equipment, or make alterations, improvements, or physical additions of any kind to any part of the Premises (collectively, "Alterations") without first obtaining the written consent of Landlord, which consent shall not be unreasonably withheld, conditioned, or delayed. "Tenant Agent" means any agent, employee, subtenant, assignee, contractor, client, family member, licensee, customer, invitee, or guest of Tenant. All Alterations shall be completed in compliance with all applicable Laws, and Landlord's reasonable rules and regulations for construction, and sustainable guidelines and procedures, using new or comparable materials only, by a contractor reasonably approved in writing by Landlord, and on days and at times reasonably approved in writing by Landlord. Notwithstanding the foregoing, Landlord's consent shall not be required for any Alteration costing less than $25,000.00 and that: (i) is interior and nonstructural; (ii) does not impact any of the Building systems, involve electrical or drywall work, require a building permit, materially affect the air quality in the Building, or require Landlord to incur additional costs as a result thereof; and (iii) is not visible from outside of the Premises.

(b) Throughout the performance of Alterations, Tenant shall carry, or cause any contractor, subcontractor, or design professional to carry, via written contract, workers' compensation insurance in statutory limits together with employer's liability insurance, commercial general liability insurance, automobile liability, and umbrella/excess liability insurance in like form and limits in accordance with the terms and conditions required of Tenant under Section 12 below, and such other insurance coverage and limits as Landlord may otherwise reasonably require, which may include, without limitation, reasonable amounts of professional liability insurance with respect to design professionals, as well as contractor's pollution liability with respect to contractors and subcontractors. Tenant shall also require any such contractor, subcontractor, or design professional to satisfy the same additional coverage terms as required of Tenant under Section 12 below with respect to naming each Additional Insured (as defined in Section 12) as an additional insured by way of endorsement ISO CG 20 37 together with CG 20 10 or their equivalent, which insurance shall be primary, and any other insurance that may be available to Landlord and any such additional insured will be excess and noncontributory, and waiving all rights of recovery and subrogation. In addition, Tenant shall carry "all risk" Builder's Risk insurance covering the Alterations, unless otherwise agreed upon in writing by Landlord and Tenant. Tenant shall provide to Landlord prior written notice of its intention to perform any Alteration, together with a certificate of insurance from each contractor and design professional evidencing that the insurance required under this Lease is in effect during all construction activities.

(c) Except to the extent included in the Leasehold Improvements, Tenant shall be solely responsible for the installation and maintenance of its data, telecommunication, and security systems and wiring at the Premises, which shall be done in compliance with all applicable Laws, and Landlord's reasonable rules and regulations. Upon Landlord's request, Tenant shall provide Landlord with a release of liens from all contractors, subcontractors, and design professionals associated with all Alterations. Tenant shall be responsible for all elements of Alterations (including, without limitation, compliance with Laws, and functionality of the design), and Landlord's approval of any Alteration and the plans therefor shall in no event relieve Tenant of the responsibility for such design, or create responsibility or liability on Landlord's part for their completeness, design sufficiency, or compliance with Laws. With respect to all improvements and Alterations made after the date hereof, Tenant acknowledges that: (A) Tenant is not, under any circumstance, acting as the agent of Landlord; (B) Landlord did not cause or request such Alterations to be made; (C) Landlord has not ratified such work; and (D) Landlord did not authorize such Alterations within the meaning of applicable State statutes. Nothing in this Lease or in any consent to the making of Alterations or improvements shall be deemed or construed in any way as constituting a request by Landlord, express or implied, to any contractor, subcontractor, or supplier for the performance of any labor or the furnishing of any materials for the use or benefit of Landlord. Tenant shall not overload any floor or part thereof in the Premises or the Building, including any public corridors or elevators, by bringing in, placing, storing, installing or removing any large or heavy articles, and Landlord may prohibit, or may direct and control the location and size of, safes and all other heavy articles, and may require, at Tenant's sole cost and expense, supplementary supports of such material and dimensions as Landlord may deem reasonably necessary to properly distribute the weight.

10. ASSIGNMENT AND SUBLETTING.

(a) Except as expressly permitted pursuant to Section 10(c), neither Tenant nor Tenant's legal representatives or successors-in-interest by operation of law or otherwise, shall sell, assign, transfer, hypothecate, mortgage, encumber, grant concessions or licenses, sublet, or otherwise dispose of all or any interest in this Lease or the Premises, or permit any person or entity other than Tenant to occupy any portion of the Premises (each of the foregoing is a "Transfer" to a "Transferee"), without Landlord's prior written consent, which consent shall not be unreasonably withheld, conditioned, or delayed. Any Transfer undertaken without Landlord's prior written consent (other than pursuant to Section 10(c)) shall constitute an Event of Default and shall, at Landlord's option, be void and/or terminate this Lease. For purposes of this Lease, a Transfer shall include, without limitation, any assignment by operation of law, and any merger, consolidation, or asset sale involving Tenant. Consent by Landlord to any one Transfer shall be held to apply only to the specific Transfer authorized, and shall not be construed as a waiver of the duty of Tenant, or Tenant's legal representatives or assigns, to obtain from Landlord consent to any other or subsequent Transfers pursuant to the foregoing, or as modifying or limiting the rights of Landlord under the foregoing covenant by Tenant.

(b) Without limiting the bases upon which Landlord may reasonably withhold its consent to a proposed Transfer, it shall not be unreasonable for Landlord to withhold its consent if: (i) the proposed Transferee shall have a net worth that is not acceptable to Landlord in Landlord's reasonable discretion, taking into account the remaining obligations under this Lease and the fact that Tenant is not released; (ii) the proposed Transferee, in Landlord's reasonable opinion, is not reputable and of good character; (iii) the portion of the Premises requested to be subleased renders the balance of the Premises unleasable as a separate area; (iv) Tenant is proposing a sublease at a rental or sub-rental rate that is less than the then-fair market rental rate for the portion of the Premises being subleased; (v) Tenant is proposing to Transfer to an existing tenant of the Building or another property owned by Landlord or Landlord's affiliate(s) (and Landlord and/or Landlord's affiliate(s), as applicable, then has comparable space in the Building and/or other property, as applicable, available for lease), or to another prospect with whom Landlord or Landlord's affiliate(s) are then negotiating in the market of which the Building is a part; or (vi) the nature of such Transferee's proposed business operation would or might reasonably violate the terms of this Lease or of any other lease for the Building (including any exclusivity provisions), or would, in Landlord's reasonable judgment, otherwise be incompatible with other tenancies in the Building.

(c) Notwithstanding anything to the contrary in this Lease, Tenant shall have the right without the prior consent of Landlord, but after prior written notice to Landlord, to make a Transfer to any Affiliate (as defined below), or an entity into which Tenant merges or that acquires substantially all of the assets or stock or ownership interests of Tenant ("Surviving Entity") (the Surviving Entity or Affiliate are also referred to as a "Permitted Transferee"); provided: (i) Tenant delivers to Landlord the Transfer Information (as defined below); (ii) the Surviving Entity shall have a tangible net worth at least equal to the net worth of Tenant on the date of this Lease or otherwise reasonably acceptable to Landlord taking into account the fact that the originally named Tenant is not being released; (iii) the originally named Tenant shall not be released or discharged from any liability under this Lease by reason of such Transfer, and the Permitted Transferee shall assume in writing all of the obligations and liabilities of Tenant under this Lease; (iv) the use of the Premises shall not change, and the Permitted Transferee, in Landlord's reasonable opinion, shall be reputable and of good character befitting a class A office

building; and (v) such Transfer is for a good business purpose and not principally for the purpose of transferring the leasehold estate created by this Lease. An "Affiliate" means a corporation, limited liability company, partnership, or other registered entity, fifty percent (50%) or more of whose equity interest is owned by the same persons or entities owning fifty percent (50%) or more of Tenant's equity interests, a subsidiary, or a parent corporation.

(d) If at any time during the Term Tenant desires to complete a Transfer that requires Landlord's consent, Tenant shall give written notice to Landlord of such desire together with the Transfer Information. If Tenant desires to sublease less than the entire Premises other than to pursuant to Section 10(c), Landlord shall have the right to accelerate the Expiration Date with respect to (that is, recapture) the portion of the Premises that Tenant proposes to sublease. If Landlord elects to accelerate the Expiration Date pursuant to this paragraph, Tenant shall have the right to rescind its request for Landlord's consent to the proposed assignment or sublease by giving written notice of such rescission to Landlord within ten (10) business days after Tenant's receipt of Landlord's acceleration election notice, in which case this Lease shall continue in full force and effect as if Landlord had not exercised such acceleration right. If Tenant does not so rescind its request: (A) Tenant shall deliver the applicable portion thereof to Landlord in the same condition as Tenant is, by the terms of this Lease, required to deliver the Premises to Landlord upon the Expiration Date; and (B) Fixed Rent and Tenant's Share shall be reduced on a per rentable square foot basis for the area of the Premises that Tenant no longer leases. If Landlord elects to accelerate the Expiration Date for less than the entire Premises, the cost of erecting any demising walls, entrances, and entrance corridors, and any other improvements required in connection therewith shall be performed by Landlord, with the cost thereof being divided evenly between Landlord and Tenant.

(e) The "Transfer Information" means the following information: (i) a copy of the fully executed assignment and assumption agreement, or sublease agreement, as applicable (with respect to a Permitted Transfer, such agreement to be delivered to Landlord within ten (10) business days after the transaction closes and with respect to all other Transfers, such agreement shall be provided in draft form and shall not be executed until Landlord's consent has been given); (ii) a copy of the then-current financials of the Transferee (either audited or certified by the chief financial officer of the Transferee); and (iii) such other reasonably requested information by Landlord needed to confirm or determine Tenant's compliance with the terms and conditions of this Section.

(f) Fifty percent (50%) of any sums or other economic consideration received by Tenant as a result of any Transfer which requires Landlord's consent (except rental or other payments received that are attributable to the amortization of the cost of leasehold improvements made to the transferred portion of the Premises by Tenant for the Transferee, and other reasonable expenses incident to the Transfer, including standard leasing commissions) whether denominated rentals under the sublease or otherwise, that exceed, in the aggregate, the total sums which Tenant is obligated to pay Landlord under this Lease (prorated to reflect obligations allocable to that portion of the Premises subject to such Transfer) shall, at Landlord's option, either be retained by Tenant or paid to Landlord, with Landlord's portion being payable to Landlord as Additional Rent without affecting or reducing any other obligation of Tenant hereunder.

(g) Regardless of Landlord's consent to a proposed Transfer, no Transfer shall release Tenant from Tenant's obligations or alter Tenant's primary liability to fully and timely pay all Rent when due from time to time under this Lease and to fully and timely perform all of Tenant's other obligations under this Lease, and the originally named Tenant and all assignees shall be jointly and severally liable for all Tenant obligations under this Lease. The acceptance of rental by Landlord from any other person shall not be deemed to be a waiver by Landlord of any provision hereof. If a Transferee defaults in the performance of any of the terms of this Lease, Landlord may proceed directly against the originally named Tenant without the necessity of exhausting remedies against such Transferee. If there has been a Transfer and an Event of Default occurs, Landlord may collect Rent from the Transferee and apply the net amount collected to the Rent herein reserved; but no such collection shall be deemed a waiver of the provisions of this Section, an acceptance of such Transferee as tenant hereunder or a release of Tenant from further performance of the covenants herein contained.

11. REPAIRS AND MAINTENANCE.

(a) Except with respect to Landlord Repairs (as defined below), Tenant, at Tenant's expense, shall keep and maintain the interior, nonstructural portions of the Premises in good order and condition including promptly making all repairs necessary to keep and maintain such in good order and condition (other than ordinary wear and tear, provided "ordinary wear and tear" does not, and shall not be deemed to, include any damage or deterioration that could have been prevented through proper maintenance, or by Tenant's full and timely performance of its obligations under this Lease) (except to the extent such maintenance, repair or replacement is required as a result of the negligence of Landlord or Landlord's contractors, employees or agents, in which event it shall be the obligation of Landlord to maintain, repair and/or replace same). When used in this Lease, "repairs" shall include repairs and any reasonably necessary replacements. For purposes of this Section, "nonstructural portions of the Premises" shall be deemed to exclude, without limitation, all plumbing, electric and HVAC systems, whether located in or outside of the Premises (except for the Tenant's Supplemental HVAC and Premises Hot Water Heaters). Tenant shall have the option of replacing lights, ballasts, tubes, ceiling tiles, outlets and similar equipment itself or advising Landlord of Tenant's desire to have Landlord make such repairs, in which case Tenant shall pay to Landlord for such repairs at Landlord's then-standard rate (such rate to be competitive with the market rate for such services). To the extent that Tenant requests that Landlord make any other repairs that are Tenant's obligation to make under this Lease, Landlord may elect to make such repairs on Tenant's behalf, at Tenant's reasonable expense, and Tenant shall pay to Landlord such expense along with the Administrative Fee. All Tenant repairs shall comply with Laws and utilize materials and equipment that are at least equal in quality, number, and usefulness to those originally used in constructing the Building and the Premises. In addition, Tenant shall maintain, at Tenant's expense, Tenant's Supplemental HVAC, and/or Alterations in a clean and safe manner and in proper operating condition throughout the Term. "Tenant's Supplemental HVAC" means any supplemental HVAC system serving exclusively the Premises and installed by or on behalf of Tenant after the Commencement Date. "Premises Hot Water Heater" means any hot water heater serving exclusively the Premises, including without limitation expansion tanks and any associated piping, but excluding the under-sink water heater existing on the date of this Lease. Tenant shall maintain Tenant's Supplemental HVAC under a service contract with a firm and upon such terms as may be reasonably satisfactory to Landlord, including inspection and

maintenance on at least a semiannual basis, and provide Landlord with a copy thereof. Within five (5) days after Landlord's request, Tenant shall provide Landlord with evidence that such contract is in place. All repairs to the Building and/or the Project made necessary by reason of the installation, maintenance, and operation of Tenant's Supplemental HVAC, Premises Hot Water Heaters, and Alterations shall be Tenant's expense. In the event of an emergency, such as a burst waterline or act of God, Landlord shall have the right to make repairs for which Tenant is responsible hereunder (at Tenant's reasonable cost) without giving Tenant prior notice, but in such case Landlord shall provide notice to Tenant as soon as practicable thereafter, and Landlord shall take commercially reasonable steps to minimize the costs incurred. Further, Landlord shall have the right to make repairs for which Tenant is responsible hereunder (at Tenant's reasonable cost) with prior notice to Tenant if Landlord believes in its sole and absolute discretion that the repairs are necessary to prevent harm or damage to the Building, and Landlord shall take commercially reasonable steps to minimize the costs incurred.

(b) Landlord, at Landlord's expense (except to the extent such expenses are includable in Project Expenses), shall make all necessary repairs to: (i) the footings and foundations and the structural elements of the Building; (ii) the roof of the Building; (iii) the HVAC, plumbing, elevators (if any), electric, fire protection, fire alert and other utility systems servicing the Building and the Premises, but specifically excluding Tenant's Supplemental HVAC, Premises Hot Water Heaters, Alterations, and any systems servicing exclusively the Premises; (iv) the Building exterior; and (v) the Common Areas (collectively, "Landlord Repairs"). Any provision of this Lease to the contrary notwithstanding, any repairs to the Project or any portion thereof made necessary by the negligent or willful act or omission of, or default under this Lease by, Tenant or any Tenant Agent shall be made at Tenant's expense, subject to the waivers set forth in Section 12(g).

(c) The parties agree it is in their mutual best interest that the Building and Premises be operated and maintained in a manner that is environmentally responsible, fiscally prudent, and provides a safe and productive work environment. Accordingly, Tenant shall use commercially reasonable efforts, at no additional material cost to Tenant, to conduct its operations in the Building and within the Premises to: (1) minimize to the extent reasonably feasible: (i) direct and indirect energy consumption and greenhouse gas emissions; (ii) water consumption; (iii) the amount of material entering the waste stream; and (iv) negative impacts upon the indoor air quality of the Building; and (2) permit the Building to maintain its LEED rating and an Energy Star label, to the extent applicable. Landlord shall use commercially reasonable efforts to operate and maintain the Common Areas of the Building to: (1) minimize to the extent reasonably feasible: (i) direct and indirect energy consumption and greenhouse gas emissions; (ii) water consumption; (iii) the amount of material entering the waste stream; and (iv) negative impacts upon the indoor air quality of the Building; and (2) permit the Building to maintain its LEED rating and an Energy Star label, to the extent applicable, the costs of which shall be included in Project Expenses (except to the extent otherwise not permitted).

12. INSURANCE: SUBROGATION RIGHTS.

(a) Tenant shall not violate, or permit the violation of, any condition imposed by any insurance policy then issued in respect of the Project and shall not do, or permit anything to be done, or keep or permit anything to be kept in the Premises, that would subject Landlord to

any liability or responsibility for personal injury or death or property damage, increase any insurance rate in respect of the Project over the rate that would otherwise then be in effect, result in insurance companies of good standing refusing to insure the Project in amounts reasonably satisfactory to Landlord, or result in the cancellation of, or the assertion of any defense by the insurer in whole or in part to claims under, any policy of insurance in respect of the Project. If, by reason of any failure of Tenant to comply with this Lease, the premiums on Landlord's insurance on the Project are higher than they otherwise would be, Tenant shall reimburse Landlord, on demand, for that part of such premiums attributable to such failure on the part of Tenant. Landlord hereby acknowledges and agrees that Tenant's use of the Premises for the Permitted Use will not cause an increase in Landlord's insurance premiums.

(b) Tenant, at Tenant's expense, shall obtain and keep in full force and effect at all times as of the Commencement Date (or Tenant's earlier accessing of the Premises), all of the following insurance policies:

(i) commercial general liability insurance written on an ISO CG 00 01 occurrence policy form or its equivalent, including a Separation of Insureds clause, coverage for contractual liability covering Tenant's contractual obligations under this Lease as ah insured contract, personal injury liability, host liquor liability, premises-operations and hazards thereto, as well as liability arising out of this Lease in respect of the Premises and the conduct or operation of business therein. The minimum limits of coverage shall be no less than $1,000,000 per occurrence and $2,000,000 general aggregate (applying per location) for bodily injury (including death and mental anguish) and property damage and $1,000,000 personal and advertising injury.

(ii) business automobile liability insurance covering liability arising from any auto (including, owned, non-owned, and hired auto, provided such non-owned and hired auto liability may be satisfied by endorsement to the commercial general liability policy) in an amount of no less than $1,000,000 combined single limit per accident for bodily injury and property damage.

(iii) workers' compensation in statutory limits together with employer's liability insurance in amounts of no less than $1,000,000 each accident, $1,000,000 disease policy limit, and $1,000,000 disease each employee.

(iv) umbrella/excess liability insurance on a follow form basis in amounts of no less than $5,000,000 per occurrence and $5,000,000 annual aggregate (applying per location) in excess of commercial general liability, employer's liability, and automobile liability insurance policies, concurrent to, and no more restrictive than such underlying insurance policies. Such policy shall be endorsed to provide that this insurance is primary to, and noncontributory with, any other insurance in which Landlord and any Additional Insured is an insured, whether such other insurance is primary, excess, self-insurance, or insurance on any other basis, which must cause the umbrella/excess coverage to be vertically exhausted, whereby such coverage is not subject to any "Other Insurance" provision under Tenant's umbrella/excess liability policy. The limits of liability may be satisfied by a combination of primary and excess liability insurance.

(v) property insurance written on an ISO CP 10 30-Cause of Loss-Special Form, commonly referred to as the "all risk" policy form, or its equivalent, including, but not limited to, coverage against sprinkler leakage and other damage due to water, fire, windstorm, cyclone, tornado, hail, earthquake, explosion, riot, civil commotion, aircraft, vehicle, smoke damage, vandalism, and malicious mischief insuring all present and future Tenant's Property leased by or in the care, custody, and control of Tenant and located in the Premises in an amount of no less than the full replacement cost thereof, with an agreed amount endorsement (waiving applicable co-insurance clause). "Tenant's Property" means Tenant's trade fixtures, equipment, personal property, signage, and Specialty Alterations (as defined in Section 18(b)). Tenant shall not self-insure. Tenant shall neither have, nor make, any claim against Landlord for any loss or damage to Tenant's Property, regardless of the cause of the loss or damage, including, without limitation, fire, explosion, falling plaster, steam, gas, air contaminants or emissions, electricity, electrical or electronic emanations or disturbance, water, rain, snow, or leaks from any part the Building or from the pipes, appliances, equipment, or plumbing works or from the roof or from any other place, nor shall Landlord be liable for any loss of or damage to property of Tenant or of others entrusted to employees of Landlord.

(vi) business interruption insurance covering any loss due to the occurrence of any of the hazards required to be insured against by Tenant pursuant to this Lease, in an amount sufficient to cover Tenant's monetary obligations under this Lease for a period of at least twelve (12) months.

(vii) boiler and machinery, if there is a boiler, supplemental air conditioning unit, or pressure object or similar equipment in the Premises. When applicable, this insurance coverage requirement may be satisfied through the all-risk coverage required in Section 12(b)(v).

(c) All insurance policies required of Tenant under this Lease, exclusive of workers' compensation, shall name Landlord, Landlord's property manager, Brandywine Realty Trust, and any other applicable party whose name and address have been furnished to Tenant, each as an additional insured (collectively, "Additional Insureds"). All such coverages shall be primary and any other insurance that may be available to Landlord and any Additional Insured will be excess and noncontributory. Each Additional Insured shall be afforded coverage as broad as if this Lease had expressly covered the claim against the Additional Insured, and for the greater of the minimum amount called for by this Lease or Tenant's actual policy limit.

(d) Prior to the Commencement Date (or Tenant's earlier accessing of the Premises), Tenant shall provide Landlord and/or Landlord's designated agent with certificates that evidence that all insurance coverages required under this Lease are in place for the policy periods. Tenant shall also furnish to Landlord and/or Landlord's designated agent throughout the Term replacement certificates at least thirty (30) days prior to the expiration dates of the then- current policy or policies or, upon request by Landlord and/or Landlord's designated agent from time to time, sufficient information to evidence that the insurance required under this Section is in full force and effect. In addition, all such policies shall contain a provision whereby the same cannot be canceled or materially altered so as to no longer comply with the minimum insurance coverage requirements in this Section 12 without at least thirty (30) days' prior written notice of such cancellation or material alteration provided to Landlord, which shall be afforded by policy

endorsement extending such notice to Landlord. Tenant shall include a waiver of the insurer's right of subrogation against Landlord and Additional Insureds during the Term in each of Tenant's liability and workers' compensation policies. If Tenant fails to provide Landlord and/or Landlord's designated agent with a requested insurance certificate as required under this Lease within thirty (30) days after receipt of Landlord's written request therefor, Tenant shall pay to Landlord a fee equal to $25.00 for each day that elapses after such thirty (30)-day period until Landlord and/or Landlord's designated agent receives the requested certificate. In no event will any acceptance of certificates of insurance by Landlord, or failure of Tenant to provide certificates of insurance as required hereunder, be construed as a waiver or limitation of Tenant's obligations to maintain insurance coverage pursuant to this Section 12. All insurance required under this Lease shall be issued by an insurance company that has been in business for at least five (5) years, is authorized to do business in the State, and is rated "A-/X" or greater by A.M. Best's Insurance Reports or any successor publication of comparable standing. The limits of any such required insurance shall not in any way limit Tenant's liability under this Lease or otherwise. If Tenant fails to maintain such insurance, Landlord may, but shall not be required to, procure and maintain the same, at Tenant's reasonable expense, which expense shall be reimbursed by Tenant as Additional Rent within thirty (30) days after written demand. The deductible or self-insured retention amount required under any insurance policy maintained by Tenant shall be the sole responsibility of Tenant and not exceed $25,000, unless otherwise approved by Landlord in writing.

(e) When Alterations are in process, Tenant shall carry, or cause, any contractor, subcontractor, and design professional to carry the insurance specified in Section 9. In addition, Tenant shall require its movers and other vendors to procure insurance in like forms and amounts as required herein and deliver to Landlord and/or Landlord's designated agent a certificate of insurance naming each Additional Insured as an additional insured, which policies shall be primary and any other insurance that may be available to Landlord and any Additional Insured will be excess and noncontributory.

(f) Landlord shall obtain and maintain, or cause to be obtained or maintained, the following insurance during the Term: (i) replacement cost insurance including "all risk" property insurance on the Building and the Project, including without limitation leasehold improvements (exclusive of Tenant's Property); (ii) commercial general liability insurance (including bodily injury and property damage) covering Landlord's operations at the Project in amounts reasonably required by Landlord or any Mortgagee (as defined in Section 16); and (iii) such other insurance as reasonably required by Landlord or any Mortgagee.

(g) Landlord and Tenant shall each include in each of its insurance policies (insuring the Building in case of Landlord, and insuring Tenant's Property in the case of Tenant, against loss, damage, or destruction by fire or other casualty) a waiver of the insurer's right of subrogation against the other party during the Term, and consent to a waiver of right of recovery pursuant to the terms of this paragraph. Both Landlord and Tenant agree to promptly give each insurance company which has issued to it policies of insurance written notice of the terms of such mutual waivers and to cause such insurance policies to be properly endorsed, if necessary, to prevent the invalidation thereof by reason of such waivers. Notwithstanding anything to the contrary in this Lease: (I) each party hereby waives, releases, and agrees not to make any claim against or seek to recover from, the other party with respect to any claim (including a claim for

negligence) that such party might otherwise have against the other party for loss, damage, or destruction with respect to its property occurring during the Term to the extent to which such party is, or is required to be, insured under a policy or policies containing a waiver of subrogation or permission to release liability; and (II) all waivers of subrogation and rights of recovery required hereunder shall also apply to each of the waiving party's insurance policies' deductible(s)/self-insured retention(s). Nothing contained in this Section 12(g) shall be deemed to relieve either party of any duty imposed elsewhere in this Lease to repair, restore, or rebuild, or nullify any abatement of rents provided for elsewhere in this Lease.

13. INDEMNIFICATION.

(a) Except to the extent the release of liability and waiver of subrogation provided in Section 12 above applies, Tenant shall defend, indemnify, and hold harmless Landlord, Landlord's property manager, Brandywine Realty Trust, and each of Landlord's directors, officers, members, partners, trustees, employees, and agents (collectively, "Landlord Indemnitees") from and against any and all third-party claims, actions, damages, liabilities, and expenses (including all reasonable costs and expenses (including reasonable attorneys' fees)) to the extent arising out of or from or related to: (i) any breach or default of any of Tenant's obligations under this Lease; (that continues beyond the expiration of all applicable notice and/or cure periods); (ii) any negligence or willful act or omission of Tenant, any Tenant Indemnitees (as defined below), or any Tenant Agent; and (iii) except to the extent arising from Landlord's or the Landlord Indemnitee's or Landlord's contractor's negligence or willfill misconduct, any acts or omissions occurring at, or the condition, use, or operation of, the Premises. If Tenant fails to promptly defend a Landlord Indemnitee following written demand by the Landlord Indemnitee, the Landlord Indemnitee shall defend the same at Tenant's expense, by retaining or employing counsel reasonably satisfactory to such Landlord Indemnitee.

(b) Except to the extent the release of liability and waiver of subrogation provided in Section 12 above applies, Landlord shall defend, indemnify, and hold harmless Tenant and each of Tenant's directors, officers, members, partners, trustees, employees, and agents (collectively, "Tenant Indemnitees") from and against any and all third-party claims, actions, damages, liabilities, and expenses (including all reasonable costs and expenses (including reasonable attorneys' fees)) to the extent arising out of or from or related to: (i) any breach or default of any of Landlord's obligations under this Lease (that continues beyond the expiration of all applicable notice and/or cure periods); and (ii) any negligence or willful misconduct of Landlord or any Landlord Indemnitees or Landlord's contractors. If Landlord fails to promptly defend a Tenant Indemnitee following written demand by the Tenant Indemnitee, the Tenant Indemnitee shall defend the same at Landlord's expense, by retaining or employing counsel reasonably satisfactory to such Tenant Indemnitee.

(c) Landlord's and Tenant's obligations under this Section shall not be limited by the amount or types of insurance maintained or required to be maintained under this Lease. The provisions of this Section shall survive the Expiration Date.

14. CASUALTY DAMAGE. If there occurs any casualty to the Project and: (i) insurance proceeds are unavailable to Landlord or are insufficient to restore the Project to substantially its pre-casualty condition; or (ii) more than thirty percent (30%) of the total area of the Building is damaged, Landlord shall have the right to terminate this Lease and all the unaccrued obligations of the parties hereto, by sending written notice of such termination to Tenant within sixty (60) days after such casualty. Such notice shall specify a termination date not fewer than thirty (30) nor more than ninety (90) days after such notice is given to Tenant. If there occurs any casualty to the Premises and: (i) in Landlord's reasonable judgment, the repair and restoration work would require more than 210 consecutive days to complete after the casualty (assuming normal work crews not engaged in overtime); or (ii) the casualty occurs during the last twelve (12) months of the Term, Landlord and Tenant shall each have the right to terminate this Lease and all the unaccrued obligations of the parties hereto, by sending written notice of such termination to the other party within sixty (60) days after the date of such casualty. Such notice shall specify a termination date not fewer than thirty (30) nor more than ninety (90) days after such notice is given to the other party, but in no event shall the termination date be after the last day of the Term. Notwithstanding the foregoing, if the casualty was caused by the criminal act of Tenant or any principal or officer of Tenant, Tenant shall have no right to terminate this Lease due to the casualty. If there occurs any casualty to the Premises and neither party terminates this Lease, then Landlord shall use commercially reasonable efforts to cause the damage to be repaired (exclusive of Tenant's Property) to a condition as nearly as practicable to that existing prior to the damage, with commercially reasonable speed and diligence, subject to delays that may arise by reason of adjustment of the loss under insurance policies, Laws, and Force Majeure Events. If this Lease is not terminated pursuant to this paragraph and Landlord fails to complete the repair or restoration work within ninety (90) days after Landlord's estimated date for completion of the repair and restoration work (subject to extension for delays caused by Tenant and Force Majeure Events), then Tenant shall have the right to terminate this Lease by sending at least thirty (30) days' prior written notice to Landlord within thirty (30) days after such estimated date of completion, provided this Lease shall remain in full force and effect and Tenant shall no longer have the right to terminate this Lease if Landlord delivers possession of the Premises to Tenant within thirty (30) days after Landlord's receipt of Tenant's termination notice. Landlord shall not be liable for any inconvenience or annoyance to Tenant or Tenant Indemnitees, injury to Tenant's business, or pain and suffering, resulting in any way from such damage or the repair thereof. Notwithstanding the foregoing, Tenant's obligation to pay Fixed Rent and Additional Rent shall be equitably adjusted or abated during the period (if any) during which Tenant is not reasonably able to use the Premises or an applicable portion thereof as a result of such casualty. Tenant shall have no right to terminate this Lease as a result of any damage or destruction of the Premises, except as expressly provided in this Section. The provisions of this Lease, including this Section, constitute an express agreement between Landlord and Tenant with respect to any and all damage to, or destruction of, all or any part of the Premises, and any Law with respect to any rights or obligations concerning damage or destruction in the absence of an express agreement between the parties, and any other statute or regulation, now or hereafter in effect, shall have no application to this Lease or any damage or destruction to all or any part of the Premises.

15. CONDEMNATION. If a taking renders the Building reasonably unsuitable for the Permitted Use, this Lease shall, at either party's option exercised by written notice to the other within thirty (30) days after such taking, terminate as of the date title to condemned real estate vests in the condemner, the Rent herein reserved shall be apportioned and paid in full by Tenant to Landlord to such date, all Rent prepaid for period beyond that date shall forthwith be repaid by Landlord to Tenant, and neither party shall thereafter have any liability for any

unaccrued obligations hereunder; provided, however, a condition to the exercise by Tenant of such right to terminate shall be that the portion of the Premises taken shall be of such extent and nature as materially to handicap, impede, or impair Tenant's use of the balance of the Premises for its normal business operations. If this Lease is not terminated after a condemnation, then notwithstanding anything to the contrary in this Lease, Fixed Rent and Additional Rent shall be equitably reduced in proportion to the area of the Premises that has been taken for the balance of the Term. Tenant shall have the right to make a claim against the condemner for moving expenses, business dislocation damages and loss of business to the extent that such claim does not reduce the sums otherwise payable by the condemner to Landlord.

16. SUBORDINATION: ESTOPPEL CERTIFICATE.

(a) Provided that Tenant's right of possession of the Premises shall not be disturbed by the Mortgagee so long as there is no Event of Default under this Lease, this Lease shall be subordinate at all times to the lien of any mortgages and deeds of trust now or hereafter placed upon the Premises, Building, and/or Project and land of which they are a part (a "Mortgage") without the necessity of any further instrument or act on the part of Tenant to effectuate such subordination. Notwithstanding the foregoing, to the extent that there is a subordination, non-disturbance, and attornment agreement executed by Tenant and Mortgagee, the terms of the subordination, non-disturbance, and attornment agreement shall control. Tenant further agrees to execute and deliver within twenty (20) days after demand such further instrument evidencing such subordination and attornment as shall be reasonably required by any Mortgagee. If Landlord shall be or is alleged to be in default of any of its obligations owing to Tenant under this Lease, Tenant shall give to the holder (the "Mortgagee") of any mortgage or deed of trust now or hereafter placed upon the Premises, Building, and/or Project whose name and address has been furnished to Tenant, notice by overnight mail of any such default that Tenant shall have served upon Landlord. Tenant shall not be entitled to exercise any right or remedy as there may be because of any default by Landlord without having given such notice to the Mortgagee. If Landlord shall fail to cure such default, the Mortgagee shall have thirty (30) additional days within which to cure such default or such longer period as may be reasonably necessary to complete the cure provided Mortgagee is proceeding diligently to cure such default. Notwithstanding the foregoing, any Mortgagee may at any time subordinate its mortgage to this Lease, without Tenant's consent, by notice in writing to Tenant, and thereupon this Lease shall be deemed prior to such Mortgage without regard to their respective dates of execution and delivery, and in that event the Mortgagee shall have the same rights with respect to this Lease as though it had been executed prior to the execution and delivery of the Mortgage.

(b) Tenant shall attorn to any foreclosing mortgagee, purchaser at a foreclosure sale or by power of sale, or purchaser by deed in lieu of foreclosure. If the holder of a superior mortgage shall succeed to the rights of Landlord, then at the request of such party so succeeding to Landlord's rights (herein sometimes called successor landlord), Tenant shall attorn to and recognize such successor landlord as Tenant's landlord under this Lease and shall promptly, without payment to Tenant of any consideration therefor, execute and deliver any instrument that such successor landlord may reasonably request to evidence such attornment. Upon such attornment, this Lease shall continue in full force and effect as, or as if it were, a direct lease between the successor landlord and Tenant upon all of the terms, conditions, and covenants as are set forth in this Lease and shall be applicable after such attornment, except that

the successor landlord shall not be bound by any modification of this Lease not approved by the successor landlord, or by any previous prepayment of more than one month's rent, unless such modification or prepayment shall have been expressly approved in writing by the holder of the superior mortgage through or by reason of which the successor landlord shall have succeeded to the rights of Landlord. With respect to any assignment by Landlord of Landlord's interest in this Lease, or the rents payable hereunder, conditional in nature or otherwise, which assignment is made to any Mortgagee, Tenant agrees that the execution thereof by Landlord, and the acceptance thereof by the Mortgagee, shall never be deemed an assumption by such Mortgagee of any of the obligations of Landlord hereunder, unless such Mortgagee shall, by written notice sent to Tenant, specifically elect, or unless such Mortgagee shall foreclose the Mortgage and take possession of the Premises. Tenant, upon receipt of written notice from a Mortgagee that such Mortgagee is entitled to collect Rent hereunder may in good faith remit such Rent to Mortgagee without incurring liability to Landlord for the nonpayment of such Rent. The provisions for attornment set forth in this Section 16(b) shall be self-operative and shall not require the execution of any further instrument. However, if Landlord reasonably requests a further instrument confirming such attornment, Tenant shall execute and deliver such instrument within 10 days after receipt of such request.

(c) Tenant must at any time and from time to time, within ten (10) business days after receipt of Landlord's written request, execute and deliver to Landlord an estoppel certificate certifying all reasonably requested information pertaining to this Lease.

17. DEFAULT AND REMEDIES.

(a) An "Event of Default" shall be deemed to exist and Tenant shall be in default hereunder if: (i) Tenant fails to pay any Rent when due and such failure continues for more than five (5) business days after Landlord has given Tenant written notice of such failure (such notice being in lieu of, and not in addition to, any applicable statutory notice); provided, however, in no event shall Landlord have any obligation to give Tenant more than two (2) such notices in any twelve (12)-month period, after which there shall be an Event of Default if Tenant fails to pay any Rent when due, regardless of Tenant's receipt of notice of such nonpayment, and, provided further, there shall be an automatic Event of Default if Tenant fails to pay any Rent when due and the automatic stay of bankruptcy precludes issuance of a default notice; (ii) Tenant fails to bond over a mechanic's or materialmen's lien within thirty (30) days after Landlord's demand; (iii) there is any assignment or subletting (regardless of whether the same might be void under this Lease) in violation of the terms of this Lease; (iv) the occurrence of any default beyond any applicable notice and/or cure period under any guaranty executed in connection with this Lease; (v) Tenant fails to deliver any Landlord-requested estoppel certificate or subordination agreement within five (5) business days after receipt of notice that such document was not received within the time period required under this Lease; (vi) there is a filing of a voluntary petition for relief by Tenant or any guarantor, or the filing of a petition against Tenant or any guarantor in a proceeding under the federal bankruptcy or other insolvency laws that is not withdrawn or dismissed within forty-five (45) days thereafter, or Tenant's rejection of this Lease after such a filing, or, under the provisions of any law providing for reorganization or winding up of corporations, the assumption by any court of competent jurisdiction of jurisdiction, custody, or control of Tenant or any substantial part of its property, or of any guarantor, where such jurisdiction, custody, or control remains in force, unrelinquished,

unstayed, or unterminated for a period of forty-five (45) days, or the death or ceasing of existence of Tenant or any guarantor, or the commencement of steps or proceedings toward the dissolution, winding up, or other termination of the existence of Tenant or any guarantor, or toward the liquidation of either of their respective assets, or the evidence of the inability of Tenant or any guarantor to pay its debts as they come due, including without limitation an admission in writing of its inability to pay its debts when due, or any judgment docketed against any guarantor which is not paid, bonded, or otherwise discharged within forty-five (45) days; or (vii) Tenant fails to observe or perform any of Tenant's other agreements or obligations under this Lease and such failure continues for more than thirty (30) days after Landlord gives Tenant written notice of such failure(not to exceed sixty (60) days), provided Tenant immediately commences and thereafter proceeds with all due diligence and in good faith to cure such failure.

(b) Upon the occurrence of an Event of Default, Landlord, in addition to the other rights or remedies it may have under this Lease, at law, or in equity, and without prejudice to any of the same, shall have the option, without any notice to Tenant and with or without judicial process, to pursue any one or more of the following remedies:

(i) Landlord shall have the right to terminate this Lease, in which event Tenant shall immediately surrender the Premises to Landlord, and Tenant shall pay Landlord upon demand for all losses and damages that Landlord suffers or incurs by reason of such termination, including damages in an amount equal to the total of: (A) the costs of repossessing the Premises and all other expenses incurred by Landlord in connection with Tenant's default, plus the Administrative Fee; (B) the unpaid Rent earned as of the date of termination; (C) all Rent for the period that would otherwise have constituted the remainder of the Term minus the fair market rental value of the Premises (as reasonably determined by Landlord as of the time of such termination) for the remainder of the Term, with such resulting amount being discounted to present value at a rate of 4% per annum; and (D) all other sums of money and damages owing by Tenant to Landlord. The "Administrative Fee" means fifteen percent (15%) of the reasonable costs incurred by Landlord in curing Tenant's default or performing Tenant's obligations hereunder.

(ii) Landlord shall have the right to terminate Tenant's right of possession (but not this Lease) and may repossess the Premises by forcible detainer or forcible entry and detainer suit or otherwise, without demand or notice of any kind to Tenant and without terminating this Lease. If Tenant receives written notice of a termination of its right to possession, such notice will serve as both a notice to vacate, notice to pay or quit, and a demand for possession of, the Premises, and Landlord may immediately thereafter initiate a forcible detainer action without any further demand or notice of any kind to Tenant.

(iii) Landlord shall have the right to enter and take possession of all or any portion of the Premises without electing to terminate this Lease, in which case Landlord shall have the right to relet all, or any portion of the Premises on such terms as Landlord deems advisable. Landlord will not be required to incur any expenses to relet all or any portion of the Premises, although Landlord may at its option incur customary leasing commissions or other costs for the account of Tenant as Landlord shall deem necessary or appropriate to relet. In no event will the failure of Landlord to relet all or any portion of the Premises reduce Tenant's liability for Rent or damages. Upon the occurrence of an Event of Default, Landlord shall use

commercially reasonable efforts to mitigate its damages. However, Landlord shall not be required to give any special preference or priority to reletting the Premises over other vacant space in the Building, Landlord shall be deemed to have used commercially reasonable efforts if it uses the same efforts in marketing the Premises as used in marketing other vacant space at the Building, and in no event shall Landlord be responsible or liable for any failure to relet the Premises or any part thereof, or for any failure to collect any rent due upon a reletting. Landlord's rejection of a prospective replacement tenant based on an offer of rentals below Landlord's published rates for new leases of comparable space at the Building at the time in question, or below the rates provided in this Lease or containing terms less favorable than those contained herein, shall not give rise to a claim by Tenant that Landlord failed to mitigate its damages.

(iv) Landlord shall have the right to enter the Premises without terminating this Lease and without being liable for prosecution or any claim for damages therefor and maintain the Premises and repair or replace any damage thereto or do anything for which Tenant is responsible hereunder. Tenant shall reimburse Landlord immediately upon demand for any reasonable out-of-pocket costs which Landlord incurs in thus effecting Tenant's compliance under this Lease, and Landlord shall not be liable to Tenant for any damages with respect thereto.

(v) Landlord shall have the right to continue this Lease in full force and effect, whether or not Tenant shall have abandoned the Premises. If Landlord elects to continue this Lease in full force and effect pursuant to this Section, then Landlord shall be entitled to enforce all of its rights and remedies under this Lease, including the right to recover Rent as it becomes due. Landlord's election not to terminate this Lease pursuant to this Section or pursuant to any other provision of this Lease, at law or in equity, shall not preclude Landlord from showing the Premises to potential tenants, subsequently electing to terminate this Lease, or pursuing any of its other remedies.

(c) Upon the occurrence of an Event of Default, Tenant shall be liable to Landlord for, and Landlord shall be entitled to recover: (i) all Rent accrued and unpaid as of the termination date; (ii) all reasonable costs and expenses incurred by Landlord in recovering possession of the Premises, including legal fees, and removal and storage of Tenant's property; (iii) the costs and expenses of restoring the Premises to the condition in which the same were to have been surrendered by Tenant as of the Expiration Date; (iv) the costs of reletting commissions; (v) all reasonable legal fees and court costs incurred by Landlord in connection with the Event of Default; and (vi) the unamortized portion (as reasonably determined by Landlord) of brokerage commissions and consulting fees incurred by Landlord, and tenant concessions including free rent given by Landlord, in connection with this Lease. Upon the occurrence of an Event of Default and notwithstanding Section 1(a) above, the monthly Fixed Rent payable for the Abatement Period shall equal the amount of Fixed Rent payable immediately following the Fixed Rent Start Date.

(d) Any amount payable by Tenant under this Lease that is not paid within thirty (30) days when due shall bear interest at the rate of one percent (1%) per month until paid by Tenant to Landlord. If Tenant fails to pay Rent when due on three (3) or more occasions during the Term, Landlord shall have the right to require Tenant to pay all future Rent by ACH debit of funds, in which case Tenant shall complete Landlord's then-current forms authorizing Landlord to automatically debit Tenant's bank account.

(e) Neither any delay or forbearance by Landlord in exercising any right or remedy hereunder nor Landlord's undertaking or performing any act that Landlord is not expressly required to undertake under this Lease shall be construed to be a waiver of Landlord's rights or to represent any agreement by Landlord to thereafter undertake or perform such act. Landlord's waiver of any breach by Tenant of any covenant or condition herein contained (which waiver shall be effective only if so expressed in writing by Landlord) or Landlord's failure to exercise any right or remedy in respect of any such breach shall not constitute a waiver or relinquishment for the future of Landlord's right to have any such covenant or condition duly performed or observed by Tenant, or of Landlord's rights arising because of any subsequent breach of any such covenant or condition, nor bar any right or remedy of Landlord in respect of such breach or any subsequent breach.

(f) If Tenant defaults in the performance of any covenant, agreement, term, provision, or condition contained in this Lease, Landlord, in addition to any other rights and remedies it has under this Lease and without thereby waiving such default, may perform the same for the account of and at the expense of Tenant (but shall not be obligated to do so), without notice in a case of emergency and in any other case if such default continues after five (5) days from the date that Landlord gives written notice to Tenant of its intention to do so. Landlord may invoice Tenant for all amounts paid by Landlord and all losses, costs, and expenses incurred by Landlord in connection with any such performance by Landlord pursuant to this paragraph, plus the Administrative Fee, including, without limitation, all amounts paid and costs and expenses incurred by Landlord for any property, material, labor, or services provided, furnished, or rendered, or caused to be provided, furnished, or rendered, by Landlord to Tenant, and shall amount shall be due and payable by Tenant to Landlord as Additional Rent within ten (10) days after Tenant receives the invoice. Any reservation of a right by Landlord to enter upon the Premises and to make or perform any repairs, alterations, or other work in, to, or about the Premises, which, in the first instance, is Tenant's obligation pursuant to this Lease, shall not be deemed to impose any obligation on Landlord to do so, render Landlord liable to Tenant or any third party for the failure to do so, or relieve Tenant from any obligation to indemnify Landlord as otherwise provided elsewhere in this Lease.

(g) The rights granted to Landlord in this Section shall be cumulative of every other right or remedy provided in this Lease or which Landlord may otherwise have at law or in equity or by statute, and the exercise of one or more rights or remedies shall not prejudice or impair the concurrent or subsequent exercise of other rights or remedies or constitute a forfeiture or waiver of Rent or damages accruing to Landlord by reason of any Event of Default under this Lease. Landlord shall have all rights and remedies now or hereafter existing at law or in equity with respect to the enforcement of Tenant's obligations hereunder and the recovery of the Premises. No right or remedy herein conferred upon or reserved to Landlord shall be exclusive of any other right or remedy, but shall be cumulative and in addition to all other rights and remedies given hereunder or now or hereafter existing at law or in equity. Landlord shall be entitled to injunctive relief in case of the violation, or attempted or threatened violation, of any covenant, agreement, condition or provision of this Lease, or to a decree compelling performance of any covenant, agreement, condition or provision of this Lease.

(h) No payment by Tenant or receipt by Landlord of a lesser amount than any payment of Fixed Rent or Additional Rent herein stipulated shall be deemed to be other than on account of the earliest stipulated Fixed Rent or Additional Rent due and payable hereunder, nor shall any endorsement or statement or any check or any letter accompanying any check or payment as Rent be deemed an accord and satisfaction. Landlord may accept such check or payment without prejudice to Landlord's right to recover the balance of such Rent or pursue any other right or remedy provided for in this Lease, at law or in equity, and acceptance of such partial payment shall be deemed subject to Landlord's reservation of all rights.

(i) Tenant further waives the right to any notices to quit as may be specified in the Landlord and Tenant Act of Pennsylvania, Act of April 6,1951, as amended, or any similar or successor provision of law, and agrees that five (5) days' notice shall be sufficient in any case where a longer period may be statutorily specified.

(j) **In addition to, and not in lieu of any of the foregoing rights granted to Landlord:**

(1) WHEN THIS LEASE OR TENANT'S RIGHT OF POSSESSION SHALL BE TERMINATED BY COVENANT OR CONDITION BROKEN, OR FOR ANY OTHER REASON, EITHER DURING THE TERM OF THIS LEASE OR ANY RENEWAL OR EXTENSION THEREOF, AND ALSO WHEN AND AS SOON AS THE TERM HEREBY CREATED OR ANY EXTENSION THEREOF SHALL HAVE EXPIRED, IT SHALL BE LAWFUL FOR ANY ATTORNEY AS ATTORNEY FOR TENANT TO FILE AN AGREEMENT FOR ENTERING IN ANY COMPETENT COURT AN ACTION TO CONFESS JUDGMENT IN EJECTMENT AGAINST TENANT AND ALL PERSONS CLAIMING UNDER TENANT, WHEREUPON, IF LANDLORD SO DESIRES, A WRIT OF EXECUTION OR OF POSSESSION MAY ISSUE FORTHWITH, WITHOUT ANY PRIOR WRIT OF PROCEEDINGS, WHATSOEVER, AND PROVIDED IF FOR ANY REASON AFTER SUCH ACTION SHALL HAVE BEEN COMMENCED THE SAME SHALL BE DETERMINED AND THE POSSESSION OF THE PREMISES HEREBY DEMISED REMAIN IN OR BE RESTORED TO TENANT, LANDLORD SHALL HAVE THE RIGHT UPON ANY SUBSEQUENT DEFAULT OR DEFAULTS, OR UPON THE TERMINATION OF THIS LEASE AS HEREINBEFORE SET FORTH, TO BRING ONE OR MORE ACTION OR ACTIONS AS HEREINBEFORE SET FORTH TO RECOVER POSSESSION OF THE SAID PREMISES.

(2) In any action to confess judgment in ejectment, Landlord shall first cause to be filed in such action an affidavit made by it or someone acting for it setting forth the facts necessary to authorize the entry of judgment, of which facts such affidavit shall be conclusive evidence, and if a true copy of this Lease (and of the truth of the copy such affidavit shall be sufficient evidence) be filed in such action, it shall not be necessary to file the original as a warrant of attorney, any rule of Court, custom or practice to the contrary notwithstanding. Tenant represents to Landlord that it has a gross income of at least $10,000.

TENANT WAIVER. TENANT SPECIFICALLY ACKNOWLEDGES THAT TENANT HAS VOLUNTARILY, KNOWINGLY, AND INTELLIGENTLY WAIVED CERTAIN DUE PROCESS RIGHTS TO A PREJUDGMENT HEARING BY AGREEING TO THE TERMS OF THE FOREGOING PARAGRAPHS REGARDING CONFESSION OF JUDGMENT. TENANT FURTHER SPECIFICALLY AGREES THAT IN THE EVENT OF DEFAULT, LANDLORD MAY PURSUE MULTIPLE REMEDIES INCLUDING OBTAINING POSSESSION PURSUANT TO A JUDGMENT BY CONFESSION. FURTHERMORE, TENANT SPECIFICALLY WAIVES ANY CLAIM AGAINST LANDLORD AND LANDLORD'S COUNSEL FOR VIOLATION OF TENANT'S CONSTITUTIONAL RIGHTS IN THE EVENT THAT JUDGMENT IS CONFESSED PURSUANT TO THIS LEASE.

TENANT: CABALETTA BIO, INC.

By: /s/ Steven Nichtberger
Name: Steven Nichtberger
Title: CEO
Date: 2/8/2019

(k) If Landlord defaults in the performance of any of its maintenance or repair obligations under this Lease, Tenant may send to Landlord written notice thereof, which notice must identify with reasonable specificity the default and Tenant's remedies under this paragraph ("Reminder Notice"). If Landlord fails to either: (a) dispute the existence of such default within five (5) business days; or (b) cure such default within Landlord's Cure Period, then Tenant will have all rights and remedies available at law or in equity for a landlord default. "Landlord's Cure Period" means thirty (30) days after Landlord's receipt of a Reminder Notice, provided if cure cannot be reasonably effected by Landlord within such thirty (30)-day period, Landlord's Cure Period includes such additional time as may be reasonably necessary for Landlord to cure, provided Landlord commences to cure within such thirty (30)-day period and diligently prosecutes such cure to completion.

18. SURRENDER: HOLDOVER.

(a) By no later than the Expiration Date or earlier termination of Tenant's right to possession of the Premises (such earlier date, the "Surrender Date"). Tenant shall vacate and surrender the Premises to Landlord in good order and condition, free of all Transferees, vacant, broom clean, and in conformity with the applicable provisions of this Lease, including without limitation Sections 9 and 11, ordinary wear and tear excepted and subject to Section 14 and Section 15. Tenant shall have no right to hold over beyond the Surrender Date, and if Tenant does not vacate as required such failure shall be deemed an Event of Default and Tenant's occupancy shall not be construed to effect or constitute anything other than a tenancy at sufferance. During any period of occupancy beyond the Surrender Date, the amount of Rent owed by Tenant to Landlord will be the Holdover Percentage of the Rent for the month immediately prior to the Expiration Date, without prorating for any partial month of holdover, and except that any provisions in this Lease that limit the amount or defer the payment of

Additional Rent are null and void. The "Holdover Percentage" equals: (i) 150% for the first two (2) months of holdover; and (ii) 200% for any period of holdover beyond two (2) months. The acceptance of Rent by Landlord or the failure or delay of Landlord in notifying or evicting Tenant following the Surrender Date shall not create any tenancy rights in Tenant and any such payments by Tenant may be applied by Landlord against its reasonable costs and expenses, including reasonable attorneys' fees, incurred by Landlord as a result of such holdover. The provisions of this Section shall not constitute a waiver by Landlord of any right of reentry as set forth in this Lease; nor shall receipt of any Rent or any other act in apparent affirmance of the tenancy operate as a waiver of Landlord's right to terminate this Lease for a breach of any of the terms, covenants, or obligations herein on Tenant's part to be performed. No option to extend this Lease shall have been deemed to have occurred by Tenant's holdover, and any and all options to extend this Lease or expand the Premises shall be deemed terminated and of no further effect as of the first date that Tenant holds over. In addition, if Tenant fails to vacate and surrender the Premises as herein required, then Tenant shall indemnify, defend, and hold harmless Landlord from and against any and all costs, losses, expenses, or liabilities incurred as a result of or related to such failure, including without limitation, claims made by any succeeding tenant and real estate brokers' claims and reasonable attorneys' fees. Notwithstanding the foregoing, Tenant shall have no liability for consequential damages, including claims made by any succeeding tenant, unless Tenant fails to vacate and surrender the Premises as required herein within thirty (30) days after receipt of Landlord's notice to vacate (which notice to vacate shall notify Tenant that its failure to timely vacate the Premises may result in lost leasing opportunities for Landlord and subject Tenant to liability for consequential damages). Tenant's obligation to pay Rent and to perform all other Lease obligations for the period up to and including the Surrender Date, and the provisions of this Section, shall survive the Expiration Date. In no way shall the remedies to Landlord set forth above be construed to constitute liquidated damages for Landlord's losses resulting from Tenant's holdover.

(b) Prior to the Surrender Date, Tenant, at Tenant's expense, shall remove from the Premises Tenant's Property and restore in a good and workmanlike manner any damage to the Premises and/or the Building caused by such removal or replace the damaged component of the Premises and/or the Building if such component cannot be restored as aforesaid as reasonably determined by Landlord. Notwithstanding the foregoing, Tenant shall not be required to remove a Specialty Alteration if at the time Tenant requests Landlord's consent to such Specialty Alteration, Tenant provides Landlord with written notification that Tenant desires to not be required to remove such Specialty Alteration and Landlord consents in writing to Tenant's non-removal request. A "Specialty Alteration" means an Alteration that: (i) Landlord required to be removed in connection with Landlord's consent to making such Alteration; or (ii) is not Building standard, including without limitation kitchens (other than a pantry installed for the use of Tenant's employees only), executive restrooms, computer room installations, supplemental HVAC equipment and components, safes, vaults, libraries or file rooms requiring reinforcement of floors, internal staircases, slab penetrations, non-Building standard life safety systems, security systems, specialty door locksets (such as cipher locks) or lighting, and any demising improvements done by or on behalf of Tenant after the Commencement Date. If Tenant fails to remove any of Tenant's Property, as required herein, the same shall be deemed abandoned and Landlord, at Tenant's reasonable expense, may remove and dispose of same and repair and restore any damage caused thereby, or, at Landlord's election, such Tenant's Property, shall become Landlord's property. Tenant shall not remove any Alteration (other than Specialty Alterations) from the Premises without the prior written consent of Landlord, which consent shall not be unreasonably withheld, conditioned or delayed.

19. RULES AND REGULATIONS. Tenant covenants that Tenant and Tenant Agents shall comply with the rules and regulations set forth on Exhibit E attached hereto. Landlord shall have the right to rescind and/or augment any of the rules and regulations and to make such other and further written rules and regulations as in the reasonable judgment of Landlord shall from time to time be needed for the safety, protection, care, and cleanliness of the Project, the operation thereof, the preservation of good order therein, and the protection and comfort of its tenants, their agents, employees, and invitees, which when delivered to Tenant shall be binding upon Tenant in a like manner as if originally prescribed. In the event of an inconsistency between the rules and regulations and this Lease, the provisions of this Lease shall control. Landlord shall not have any liability to Tenant for any failure of any other tenants to comply with any of the rules and regulations, but Landlord shall use commercially reasonable efforts to enforce the rules and regulations equally against all office tenants and occupants of the Building, subject to the terms of applicable leases.

20. GOVERNMENTAL REGULATIONS.

(a) Tenant shall not use, generate, manufacture, refine, transport, treat, store, handle, dispose, bring, or otherwise cause to be brought or permit any Tenant Agent to bring, in, on, or about any part of the Project, any hazardous waste, solid waste, hazardous substance, toxic substance, petroleum product or derivative, asbestos, polychlorinated biphenyl, hazardous material, pollutant, contaminant, or similar material or substance as defined by the Comprehensive Environmental Response Compensation and Liability Act, 42 U.S.C. Sections 9601 *et seq.*, as the same may from time to time be amended, and the regulations promulgated pursuant thereto (CERCLA), or now or hereafter defined or regulated as such by any other Law ("Hazardous Material"). Notwithstanding the foregoing, Tenant shall be permitted to bring onto the Premises office cleaning supplies and products normally found in modem offices provided Tenant only brings a reasonable quantity of such supplies and products onto the Premises and Tenant shall at all times comply with all Laws pertaining to the storage, handling, use, disposal, and application of such supplies and products, and all Laws pertaining to the communication to employees and other third parties of any hazards associated with such supplies and products. Tenant shall not install any underground or above ground tanks on the Premises. Tenant shall not cause or permit to exist any release, spillage, emission, or discharge of any Hazardous Material on or about the Premises in violation of applicable Laws ("Release"). In the event of a Release, Tenant shall immediately notify Landlord both orally and in writing, report such Release to the relevant government agencies as required by applicable Law, and promptly remove the Hazardous Material and otherwise investigate and remediate the Release in accordance with applicable Law and to the satisfaction of Landlord. Landlord shall have the right, but not the obligation, to enter upon the Premises to investigate and/or remediate the Release in lieu of Tenant, and Tenant shall reimburse Landlord as Additional Rent for the reasonable costs of such remediation and investigation. Tenant shall promptly notify Landlord if Tenant acquires knowledge of the presence of any Hazardous Material on or about the Premises, except as Tenant is permitted to bring onto the Premises under this Lease. Landlord shall have the right to inspect (upon reasonable notice to Tenant) and assess the Premises for the purpose of determining whether Tenant is handling any Hazardous Material in violation of this Lease or

applicable Law, or to ascertain the presence of any Release. In exercising the foregoing rights, Landlord shall use its commercially reasonable efforts not to interfere with Tenant's use and occupancy of the Premises. This subsection shall survive the Expiration Date. Landlord represents to Tenant to Landlord's actual knowledge without independent investigation or inquiry that, as of the date of this Lease, it has no notice the presence of Hazardous Materials, in, on, or about the Premises or the Building in violation of environmental Laws. Landlord will take all remedial actions required by Laws with respect to any Hazardous Materials, in, on, or about the Building that are the responsibility of Landlord.

(b) Tenant shall, and shall cause Tenant Agents to, use the Premises in compliance with all applicable Laws. Tenant shall, at its sole cost and expense, promptly comply with each and all of such Laws, except in the case of required changes not triggered by Tenant's particular use or manner of use or change in use of the Premises, or Tenant's Alterations. Without limiting the generality of the foregoing, Tenant shall: (i) obtain, at Tenant's expense, before engaging in Tenant's business or profession within the Premises, all necessary licenses and permits including, but not limited to, state and local business licenses, and permits; and (ii) remain in compliance with and keep in full force and effect at all times all licenses, consents, and permits necessary for the lawful conduct of Tenant's business or profession at the Premises. Tenant shall pay all personal property taxes, income taxes, gross receipts taxes, and other taxes, assessments, duties, impositions, and similar charges that are or may be assessed, levied, or imposed upon Tenant or Tenant's Property. Tenant shall also comply with all applicable Laws that do not relate to the physical condition of the Premises and with which only the occupant can comply, such as laws governing maximum occupancy, workplace smoking, VDT regulations, and illegal business operations, such as gambling. The judgment of any court of competent jurisdiction or the admission of Tenant in any judicial, governmental or regulatory action, regardless of whether Landlord is a party thereto, that Tenant has violated any of such Laws shall be conclusive of that fact as between Landlord and Tenant.

(c) Notwithstanding anything to the contrary in this Lease, if the requirement of any public authority obligates either Landlord or Tenant to expend money in order to bring the Premises and/or any area of the Project into compliance with Laws as a result of: (i) Tenant's particular use or Alteration of the Premises; (ii) Tenant's change in the use of the Premises; (iii) any cause or condition created by or at the instance of Tenant or any Tenant Agent, other than by Landlord's performance of any work for or on behalf of Tenant; or (iv) breach of any of Tenant's obligations hereunder, then Tenant shall bear all costs of bringing the Premises and/or Project into compliance with Laws, whether such costs are related to structural or nonstructural elements of the Premises or Project.

(d) Except to the extent Tenant shall comply as set forth above, during the Term Landlord shall comply with all applicable Laws regarding the Project (including the Premises), including without limitation compliance with Title III of the Americans with Disabilities Act of 1990,42 U.S.C. §12181 et seq. and its regulations as to the design and construction of the Common Areas.

(e) Each party hereto hereby acknowledges and agrees that it will not knowingly violate any applicable Laws regarding bribery, corruption, and/or prohibited business practices as they concern each such party's respective activities under or in connection with this Lease, and each such party will be solely responsible for and will hold harmless the other party from and against any claims or liabilities in connection with any of such responsible party's own violations of any such Laws.

21. NOTICES. Wherever in this Lease it is required or permitted that notice or demand be given or served by either party to this Lease to or on the other party, such notice or demand will be duly given or served if in writing and either: (i) personally served; (ii) delivered by prepaid nationally recognized courier service (e.g., Federal Express, UPS, and USPS) with evidence of receipt required for delivery; (iii) delivered by registered or certified mail, return receipt requested, postage prepaid; or (iv) if an email address is provided by the recipient, emailed with confirmation of receipt by the recipient; in all such cases addressed to the parties at the addresses set forth below. Each such notice will be deemed to have been given to or served upon the party to which addressed on the date the same is delivered or delivery is refused. Each party has the right to change its address for notices (provided such new address is in the continental United States) by a writing sent to the other party in accordance with this Section, and each party will, if requested, within ten (10) days confirm to the other its notice address. Notices from Landlord or Tenant may be given by either an agent or attorney acting on behalf of Landlord or Tenant.

Tenant:	Cabaletta Bio, Inc. Attn: Steven Nichtberger, MD Cira Centre 2929 Arch Street Suite 600 Philadelphia, PA 19104 Email: steven@cabalettabio.com	With a copy to: Steven Nichtberger, MD 01 Northwick Lane Villanova, PA 19085
Landlord:	Brandywine Cira, L.P. c/o Brandywine Realty Trust Attn: Jeff DeVouno Evecutive Vice President & Senior Managing Director, RE: Building #150 FMC Tower at Cira Centre South 2929 Walnut St., Suite 1700 Philadelphia, PA 19104 Phone No. 610-325-5600 Email: jeff.devouono@bnreit.com	With a copy to: Email: Legal.Notices@bdnreit.com

Notwithstanding anything to the contrary in this Lease, billing statements and the like may be sent by regular mail or electronic means (such as email) to Tenant's billing contact without copies.

Tenant's billing contact:
Cabaletta Bio, Inc.
Attn: Steven Nichtberger, MD
Cira Centre
2929 Arch Street
Suite 600
Philadelphia, PA 19104 Phone:
Email: AP@cabalettabio.com

22. BROKERS. Landlord and Tenant each represents and warrants to the other that such representing party has had no dealings, negotiations, or consultations with respect to the Premises or this transaction with any broker or finder other than a Landlord affiliate and Broker. Each party shall indemnify, defend, and hold harmless the other from and against any and all liability, cost, and expense (including reasonable attorneys' fees and court costs), arising out of or from or related to its misrepresentation or breach of warranty under this Section. Landlord shall pay Broker a commission in connection with this Lease pursuant to the terms of a separate written agreement between Landlord and Broker. This Section shall survive the Expiration Date.

23. LANDLORD'S LIABILITY. Landlord's obligations hereunder shall be binding upon Landlord only for the period of time that Landlord is in ownership of the Building, and upon termination of that ownership, Tenant, except as to any obligations that are then due and owing, shall look solely to Landlord's successor-in-interest in ownership of the Building for the satisfaction of each and every obligation of Landlord hereunder (so long as Landlord's successor assumes all of Landlord's obligations hereunder). Upon request and without charge, Tenant shall attorn to any successor to Landlord's interest in this Lease and, at the option of any Mortgagees, to such Mortgagees, so long as such successor entity(ies) agree(s) in writing to assume Landlord's obligations under this Lease. Landlord may transfer its interest in the Building without the consent of Tenant, and such transfer or subsequent transfer shall not be deemed a violation on Landlord's part of any of the terms of this Lease. Landlord shall have no personal liability under any of the terms, conditions, or covenants of this Lease. Tenant and Tenant Agents shall look solely to the equity of Landlord in the Building, all rents, issues and profits therefrom, and/or the net proceeds actually received therefrom for the satisfaction of any claim, remedy, or cause of action of any kind whatsoever arising from the relationship between the parties or any rights and obligations they may have relating to the Project, this Lease, or anything related to either, including without limitation as a result of the breach of any Section of this Lease by Landlord. In addition, no recourse shall be had for an obligation of Landlord hereunder, or for any claim based thereon or otherwise in respect thereof or the relationship between the parties, against any past, present, or future Landlord Indemnitee (other than Landlord), whether by virtue of any statute or rule of law, or by the enforcement of any assessment or penalty or otherwise, all such other liability being expressly waived and released by Tenant with respect to the Landlord Indemnitees (other than Landlord).

24. RELOCATION. Landlord, at its sole expense, on at least six (6) months' prior written notice to Tenant, may require Tenant to move from the Premises to another suite of substantially comparable size and decor in the Building. In the event of any such relocation, Landlord shall pay all the reasonable expenses: (a) of preparing and decorating the new premises so that they will be substantially similar to the Premises; (b) of moving Tenant's

furniture and equipment to the new premises (including Tenant's data and communication wiring and cabling); and (c) reasonably incurred and documented by Tenant, up to a maximum amount of $5,000.00, in notifying its clients of such relocation, obtaining new letterhead and business cards, and other incidental expenses related directly to Tenant' s relocation. Tenant shall execute any reasonable amendment evidencing the terms of the relocation as Landlord may require in its reasonable discretion. Upon the effective date of the relocation: (i) the description of the Premises set forth in this Lease shall, without further act on the part of Landlord or Tenant, be deemed amended so that the new premises shall, for all purposes, be deemed the Premises hereunder, and all of the terms, covenants, conditions, provisions, and agreements of this Lease, including those agreements to pay Rent (at the same rate per rentable square foot except as set forth below), shall continue in full force and effect and shall apply to the new premises; provided, however, in no event shall the Fixed Rent payable by Tenant under the Lease or Tenant's Share increase as a result of such relocation (if the new premises are smaller than the Premises, all rental charges which are based upon the square footage of the Premises shall be reduced accordingly); and (ii) Tenant shall move into the new premises. Notwithstanding the foregoing, Tenant shall have the right to terminate this Lease by written notice to Landlord within thirty (30) calendar days after receipt of Landlord's notice of relocation; provided, however, Landlord shall have the right to rescind its relocation notice by notice to Tenant within fifteen (15) calendar days after receipt of Tenant's notice of termination, in which case the Term and the Premises shall continue as if Landlord never sent a notice of relocation under this Section 24. If Tenant timely terminates this Lease pursuant to the foregoing and Landlord does not elect to rescind its relocation notice, the Term shall automatically end on the date set forth in Landlord's notice as the relocation date as if the Term were originally scheduled to expire on such date, which date shall be deemed the Expiration Date under this Lease.

25. GENERAL PROVISIONS.

(a) Provided Tenant has performed all of the terms and conditions of this Lease to be performed by Tenant within all applicable notice and/or cure periods set forth herein, including the payment of Rent, Tenant shall peaceably and quietly hold and enjoy the Premises for the Term, without hindrance from Landlord or anyone lawfully or equitably claiming by, through, or under Landlord, under and subject to the terms and conditions of this Lease.

(b) Subject to the terms and provisions of Section 10. the respective rights and obligations provided in this Lease shall bind and inure to the benefit of the parties hereto, their successors and assigns.

(c) This Lease shall be governed in accordance with the Laws of the State, without regard to choice of law principles. Landlord and Tenant hereby consent to the exclusive jurisdiction of the state and federal courts located in the jurisdiction in which the Project is located.

(d) In connection with any litigation or arbitration arising out of this Lease, Landlord or Tenant, whichever is the prevailing party as determined by the trier of fact in such litigation, shall be entitled to recover from the other party all reasonable costs and expenses incurred by the prevailing party in connection with such litigation, including reasonable attorneys' fees. If, in the context of a bankruptcy case, Landlord is compelled at any time to

incur any expense, including attorneys' fees, in enforcing or attempting to enforce the terms of this Lease or to enforce or attempt to enforce any actions required under the Bankruptcy Code to be taken by the trustee or by Tenant, as debtor-in-possession, then the sum so paid by Landlord shall be awarded to Landlord by the Bankruptcy Court and shall be immediately due and payable by the trustee or by Tenant's bankruptcy estate to Landlord in accordance with the terms of the order of the Bankruptcy Court.

(e) This Lease, which by this reference incorporates all exhibits, riders, schedules, and other attachments hereto, supersedes all prior discussions, proposals, negotiations and discussions between the parties and this Lease contains all of the agreements, conditions, understandings, representations, and warranties made between the parties hereto with respect to the subject matter hereof, and may not be modified orally or in any manner other than by an agreement in writing signed by both parties hereto or their respective successors-in-interest. Whenever placed before one or more items, the words "include", "includes", and "including" shall mean considered as part of a larger group, and not limited to the item(s) recited. Except to the extent expressly set forth otherwise in this Lease, neither Landlord, nor anyone acting on Landlord's behalf, has made any representation, warranty, estimation, or promise of any kind or nature whatsoever relating to the physical condition of the Building or the land under the Building or suitability, including without limitation, the fitness of the Premises for Tenant's intended use. If any provisions of this Lease are held to be invalid, void, or unenforceable, the remaining provisions hereof shall in no way be affected or impaired and such remaining provisions shall remain in full force and effect.

(f) TIME IS OF THE ESSENCE UNDER ALL PROVISIONS OF THIS LEASE, INCLUDING ALL NOTICE PROVISIONS.

(g) If Landlord or Tenant is in any way delayed or prevented from performing any obligation (except, with respect to Tenant, its obligations to pay Rent) due to fire or other casualty (or reasonable delays in the adjustment of insurance claims), acts of terrorism, war or other emergency (including severe weather emergency), governmental delay beyond what is commercially reasonable (provided the party claiming the delay provides reasonable evidence to the other party that the party claiming the delay is diligently pursuing the approval or permit that is the subject to the governmental delay), inability to obtain any materials or services, acts of God, strike, lockout or other labor dispute, orders or regulations of any federal, state, county or municipal authority, embargoes, or any other cause beyond such party's reasonable control (whether similar or dissimilar to the foregoing events) (each, a "Force Maieure Event"), then the time for performance of such obligation shall be excused for the period of such delay or prevention (and such party shall not be deemed in default with respect to the performance of its obligations) and extended for a period equal to the period of such delay or prevention. Financial disability or hardship shall never constitute a Force Majeure Event. No such inability or delay due to a Force Majeure Event shall constitute an actual or constructive eviction, in whole or in part, or entitle Tenant to any abatement or diminution of Rent, or relieve the other party from any of its obligations under this Lease, or impose any liability upon such party or its agents, by reason of inconvenience or annoyance to the other party, or injury to or interruption of the other party's business, or otherwise.

(h) Excepting payments of Fixed Rent, Operating Expenses, and utilities (which are to be paid as set forth in Section 4.5. and 6) and unless a specific time is otherwise set forth in this Lease for any Tenant payments, all amounts due from Tenant to Landlord shall be paid by Tenant to Landlord as Additional Rent within thirty (30) days after receipt of an invoice therefor.

(i) Unless Tenant's financials are publicly available online at no cost to Landlord, within ten (10) days after written request by Landlord (but not more than once during any twelve (12)-month period except in the event of a sale, financing, or refinancing by Landlord of all or any portion of the Project), Tenant shall furnish to Landlord, Mortgagee, or Landlord's prospective mortgagee or purchaser, reasonably requested financial information. In connection therewith and upon Tenant's request, Landlord and Tenant shall execute a mutually acceptable confidentiality agreement on Landlord's form therefor.

(j) Tenant represents and warrants to Landlord that: (i) Tenant was duly organized and is validly existing and in good standing under the Laws of the jurisdiction set forth for Tenant in the first sentence of this Lease; (ii) Tenant is legally authorized to do business in the State; (iii) the person(s) executing this Lease on behalf of Tenant is(are) duly authorized to do so; and (iv) Tenant has the full corporate or partnership power and authority to enter into this Lease and has taken all corporate or partnership action, as the case may be, necessary to carry out the transaction contemplated herein, so that when executed, this Lease constitutes a valid and binding obligation enforceable in accordance with its terms.

(k) If Tenant has removed all or substantially all of Tenant's Property and there is one (1) month or less remaining in the Term, Landlord shall have the right to access and make improvements to the Premises in anticipation of reletting without affecting or modifying the Term or Rent, and without any additional notice to or consent of Tenant. Tenant shall have no rights in or to such improvements. Tenant hereby waives any claim of constructive eviction, early termination of this Lease, or reduction of Rent in connection with Landlord exercising such right.

(l) Each party hereto represents and warrants to the other that such party is not a party with whom the other is prohibited from doing business pursuant to the regulations of the Office of Foreign Assets Control ("OFAC") of the U.S. Department of the Treasury, including those parties named on OFAC's Specially Designated Nationals and Blocked Persons List. Each party hereto is currently in compliance with, and shall at all times during the Term remain in compliance with, the regulations of OFAC and any other governmental requirement relating thereto. Each party hereto shall defend, indemnify, and hold harmless the other from and against any and all claims, damages, losses, risks, liabilities, and expenses (including reasonable attorneys' fees and costs) incurred by the other to the extent arising from or related to any breach of the foregoing certifications. The foregoing indemnity obligations shall survive the Expiration Date.

(m) Landlord shall have the right, to the extent required to be disclosed by Landlord or Landlord's affiliates in connection with filings required by applicable Laws, including without limitation the Securities and Exchange Commission ("SEC"), without notice to Tenant to include in such securities filings general information relating to this Lease, including,

without limitation, Tenant's name, the Building, and the square footage of the Premises. Except as required by Law, information relating to rates set forth in the Lease will not be released without Tenant's prior written consent. Except as set forth in the preceding sentence, neither Tenant nor Landlord shall issue, or permit any broker, representative, or agent representing either party in connection with this Lease to issue: (i) any press release; or (ii) any other public disclosure regarding the specific terms of this Lease (or any amendments or modifications hereof), without the prior written approval of the other party, which approval shall not be unreasonably withheld, conditioned or delayed. The parties acknowledge that the transaction described in this Lease and the terms thereof (but not the existence thereof) are of a confidential nature and shall not be disclosed except to such party's employees, attorneys, accountants, consultants, advisors, affiliates, and actual and prospective purchasers, lenders, investors, subtenants and assignees (collectively, "Permitted Parties"), and except as, in the good faith judgment of Landlord or Tenant, may be required to enable Landlord or Tenant to comply with its obligations under Law or under laws and regulations of the SEC. Neither party may make any public disclosure of the specific terms of this Lease, except as required by Law, including without limitation SEC laws and regulations, or as otherwise provided in this paragraph.

(n) Neither Tenant, nor anyone acting through, under, or on behalf of Tenant, shall have the right to record this Lease, nor any memorandum, notice, affidavit, or other writing with respect thereto.

(o) Tenant shall not claim any money damages by way of setoff, counterclaim, or defense, based on any claim that Landlord unreasonably withheld its consent, in which case Tenant's sole and exclusive remedy shall be an action for specific performance, injunction, or declaratory judgment. Notwithstanding the foregoing, if a court determines that Landlord acted maliciously or in bad faith in unreasonably withholding, conditioning, or delaying its consent or approval in an instance where Landlord was obligated not to unreasonably withheld, condition, or delay its consent or approval, then the limitation on damages and remedies provided for in this paragraph shall have no further application.

(p) All requests made to Landlord to perform repairs or furnish services, supplies, utilities, or freight elevator usage (if applicable), shall be made online to the extent available (currently such requests shall be made via http://etenants.com/, as the same may be modified by Landlord from time to time) otherwise via email or written communication to Landlord's property manager for the Building. Whenever Tenant requests Landlord to take any action not required of Landlord under this Lease or give any consent required or permitted to be given by Landlord under this Lease (for example, a request for a Transfer consent, a consent to an Alteration, or a subordination of Landlord's lien, but other than a request for services, supplies, or utilities which is governed by Section 7(b)). Tenant shall pay to Landlord for Landlord's reasonable administrative and/or professional costs in connection with each such action or consent, including reasonable attorneys', engineers' and/or architects' fees (as applicable). The foregoing amount shall be paid by Tenant to Landlord within thirty (30) days after Landlord's delivery to Tenant of an invoice for such amount. Tenant shall pay such amount without regard to whether Landlord takes the requested action or gives the requested consent.

(q) Tenant acknowledges and agrees that Landlord shall not be considered a "business associate" for any purpose under the Health Insurance Portability and Accountability Act of 1996 and all related implementing regulations and guidance.

(r) Tenant shall cause any work performed on behalf of Tenant to be performed by contractors who work in harmony, and shall not interfere, with any labor employed by Landlord or Landlord's contractors. If at any time any of the contractors performing work on behalf of Tenant does not work in harmony or unreasonably interferes with any labor employed by Landlord, other tenants, or their respective mechanics or contractors, then the permission granted by Landlord to Tenant to do or cause any work to be done in or about the Premises may be withdrawn by Landlord with forty-eight (48) hours' written notice to Tenant.

(s) This Lease may be executed in any number of counterparts, each of which shall be deemed to be an original as against any party whose signature appears thereon, and all of which shall together constitute one and the same instrument. The submission of this Lease by Landlord to Tenant for examination does not constitute a reservation of or option for the Premises or of any other space within the Building or in other buildings owned or managed by Landlord or its affiliates. This Lease shall not be binding nor shall either party have any obligations or liabilities or any rights with respect hereto, or with respect to the Premises, unless and until both parties have executed and delivered this Lease. The parties acknowledge and agree that notwithstanding any law or presumption to the contrary, the exchange of copies of this Lease and signature pages by electronic transmission shall constitute effective execution and delivery of this Lease for all purposes, and signatures of the parties hereto transmitted and/or produced electronically shall be deemed to be their original signature for all purposes.

(t) Landlord and persons authorized by Landlord may enter the Premises at all reasonable times upon reasonable advance notice or, in the case of an emergency, at any time without notice, for any commercially reasonable purpose, including without limitation to inspect the Premises, to make alterations or repairs that Landlord is required to make under this Lease, and to show the Premises to prospective purchasers, lenders, and prospective Tenants. Landlord shall not be liable for inconvenience to or disturbance of Tenant by reason of any such entry; provided, however, such access shall be done, so far as practicable, so as to not unreasonably interfere with Tenant's use of the Premises.

(u) If more than one person executes this Lease as Tenant, each of them is jointly and severally liable for the keeping, observing, and performing of all of the terms, covenants, conditions, provisions, and agreements of this Lease to be kept, observed, and performed by Tenant.

(v) TO THE EXTENT PERMITTED BY APPLICABLE LAW, LANDLORD AND TENANT HEREBY WAIVE TRIAL BY JURY IN ANY ACTION, PROCEEDING, OR COUNTERCLAIM BROUGHT BY EITHER AGAINST THE OTHER ON ANY MATTER ARISING OUT OF OR IN ANY WAY CONNECTED WITH THIS LEASE, THE RELATIONSHIP OF LANDLORD AND TENANT, OR TENANT'S USE OR OCCUPANCY OF THE BUILDING, ANY CLAIM OR INJURY OR DAMAGE, OR ANY EMERGENCY OR OTHER STATUTORY REMEDY WITH RESPECT THERETO. TENANT CONSENTS TO SERVICE OF PROCESS AND ANY PLEADING RELATING TO ANY SUCH ACTION AT

THE PREMISES; PROVIDED, HOWEVER, NOTHING HEREIN SHALL BE CONSTRUED AS REQUIRING SUCH SERVICE AT THE PREMISES. TENANT WAIVES ANY RIGHT TO RAISE ANY NONCOMPULSORY COUNTERCLAIM IN ANY SUMMARY OR EXPEDITED ACTION OR PROCEEDING INSTITUTED BY LANDLORD. LANDLORD, TENANT, ALL GUARANTORS, AND ALL GENERAL PARTNERS EACH WAIVES ANY OBJECTION TO THE VENUE OF ANY ACTION FILED IN ANY COURT SITUATED IN THE JURISDICTION IN WHICH THE BUILDING IS LOCATED, AND WAIVES ANY RIGHT, CLAIM, OR POWER UNDER THE DOCTRINE OF FORUM NON CONVENIENS OR OTHERWISE TO TRANSFER ANY SUCH ACTION TO ANY OTHER COURT.

(w) Except in connection with a Tenant holdover as set forth in, and subject to the terms and conditions in Section 18 of the Lease, and notwithstanding anything to the contrary in this Lease, each party waives, and the other shall not be liable to the waiving party for, any claim against the other party or the other party's agents, invitees, employees, or contractors, for loss of business opportunity, loss of profits, loss of income, economic loss, consequential damages, or punitive damages; the foregoing waiver shall survive the expiration or sooner termination of this Lease.

(x) Landlord shall have no security interest or other lien in any equipment, fixtures, furniture, inventory, and other personal property or fixtures of Tenant situate in the Premises, and Landlord hereby waives and releases any such lien or right to lien. During the Term, Landlord will promptly execute any commercially reasonable form of release of Landlord's lien as to any furniture, fixtures, equipment, inventory, and other personal property belonging to Tenant and located in the Premises, subject to Section 25(p) above.

(y) During the Term and subject to availability and Landlord's rules and regulations therefor, Tenant's employees who work in the Building shall have the nonexclusive, first-come, first-served use of any fitness facilities and cafeterias available to tenants that may from time to time exist in the Building. Tenant acknowledges that no such cafeteria exists on the date of this Lease. Any user of the fitness facility shall execute Landlord's standard fitness center use agreement. Neither Landlord nor any Landlord Indemnitee (as defined in Section 13(a)) shall have any liability to Tenant or any Tenant Agent for any damage, injury, loss, expense, compensation, or claim whatsoever arising out of the use of such fitness facilities and cafeteria.

26. EXTENSION OPTION.

(a) Provided: (i) no Event of Default exists; and (ii) this Lease is in full force and effect, Tenant shall have the right to extend the Term ("Extension Option") for sixty (60) months beyond the end of the Initial Term ("Extension Term") by delivering Tenant's written extension election notice ("Extension Notice") to Landlord no later than the Extension Deadline and no earlier than six (6) months prior to the Extension Deadline, with time being of the essence. The "Extension Deadline" means the date that is eight (8) months prior to the expiration of the Initial Term. The terms and conditions of this Lease during the Extension Term shall remain unchanged except Tenant shall only be entitled to the one (1) Extension Term provided above, the annual Fixed Rent for the Extension Term shall be the Extension Rent (as defined below), the Expiration Date shall be the last day of the Extension Term (or such earlier

date of termination of this Lease pursuant to the terms hereof), and, except to the extent reflected in the Extension Rent, Landlord shall have no obligation to perform any tenant improvements to the Premises or provide any tenant improvement allowance to Tenant. Upon Tenant's delivery of the Extension Notice, Tenant may not thereafter revoke its exercise of the Extension Option. Notwithstanding anything to the contrary in this Lease, Tenant shall have no right to extend the Term other than or beyond the one (1), sixty (60)-month Extension Term described in this paragraph.

(b) "Extension Rent" means the fair market extension term base rent for space comparable to the Premises in comparable buildings in the market in which the Project is located. In determining the Extension Rent, Landlord, Tenant and any broker shall take into account all relevant factors including, without limitation, prevailing market allowances and concessions for renewing tenants, space measurement methods and loss factors, the lease term, the size of the space, the location of the building(s), parking charges, the amenities offered at the building(s), the age of the building(s), and whether Project Expenses and other pass-through expenses are on a triple net, base year, expense stop or other basis. In lieu of directly providing any prevailing market allowances and/or concessions, Landlord may elect to reduce the Extension Rent by the economic equivalent thereof to reflect the fact that such allowances and concessions were not provided directly to Tenant. During the Extension Term, Tenant shall not be entitled to any tenant improvement allowances, free rent periods, or other economic concessions (if any) that Tenant was entitled to during the prior Term, except to the extent such items are indirectly incorporated into the Extension Rent as set forth in this Section. When the Extension Rent is being determined for the first year of the Extension Term, the Extension Rent for the second and all subsequent years of the Extension Term shall also be determined in accordance with the same procedures as are set forth herein and based upon the then prevailing annual rent escalation factor in the applicable leasing market.

(c) If Tenant timely exercises the Extension Option and Landlord and Tenant, after using their good faith efforts to do so, do not agree upon the Extension Rent in writing by the date that is the later of twenty (20) days after Landlord's receipt of the Extension Notice or three (3) months prior to the Extension Deadline, then within fifteen (15) days after either party notifies the other in writing that such notifying party desires to determine the Extension Rent in accordance with the procedures set forth in this Section, Landlord and Tenant shall each deliver to the other party a written statement of such delivering party's determination of the Extension Rent, together with such supporting documentation as the delivering party desires to deliver. Within ten (10) days after such fifteen (15)-day period, Landlord and Tenant shall appoint a real estate broker having a minimum of ten (10) years' experience in the market in which the Project is located who shall select either Landlord's determination or Tenant's determination, whichever the broker finds more accurately reflects the Extension Rent. The broker shall be instructed to notify Landlord and Tenant of such selection within ten (10) days after such broker's appointment. The broker shall have no power or authority to select any Extension Rent other than the Extension Rent submitted by Landlord or Tenant nor shall the broker have any power or authority to modify any of the provisions of this Lease, and the decision of the broker shall be final and binding upon Landlord and Tenant. If Landlord and Tenant do not timely agree in writing upon the appointment of the broker, Landlord shall submit to Tenant the names of three (3) qualified brokers with a minimum of ten (10) years' experience in the market in which the Project is located, and Tenant shall have ten (10) days after receiving such names to notify

Landlord of which of the three (3) brokers Tenant selects to determine the Extension Rent. If Tenant fails to timely notify Landlord of Tenant's selection, Landlord shall have the right to unilaterally appoint the broker. The fee and expenses of the broker shall be shared equally by Landlord and Tenant.

(d) Upon Tenant's timely and proper exercise of the Extension Option pursuant to the terms above and satisfaction of the above conditions: (i) the "Term" shall include the Extension Term, subject only to the determination of Extension Rent; and (ii) upon Landlord's request, Tenant shall execute prior to the expiration of the then-expiring Term, an appropriate amendment to this Lease, in form and content reasonably satisfactory to both Landlord and Tenant, memorializing the extension of the Term for the ensuing Extension Term (provided Tenant's failure to execute such amendment shall not negate the effectiveness of Tenant's exercise of the Extension Option).

27. RIGHT OF FIRST OFFER.

(a) Provided: (i) no Event of Default exists; and (ii) this Lease is in full force and effect, then during the Term (including the Extension Term) Landlord shall notify Tenant in writing ("Landlord's ROFO Notice") when any rentable space located contiguous to and on the same floor as the Premises ("Potential ROFO Space") becomes available to lease (as defined below) from Landlord or Landlord reasonably anticipates that such space will become available to lease from Landlord. Landlord's ROFO Notice shall identify the portion of the Potential ROFO Space that is available to lease (such identified space, "ROFO Space"), and include the anticipated availability date and basic economic terms for the lease of the ROFO Space and, subject to the terms and provisions of this Section, Tenant shall have the right ("ROFO") to lease all (but not less than all) of the ROFO Space by delivering Tenant's written notice of such election to Landlord ("Tenant's ROFO Notice") within ten (10) business days after Tenant's receipt of Landlord's ROFO Notice. Landlord acknowledges and agrees that the term of the Lease with respect to the ROFO Space identified in Landlord's ROFO Notice shall be coterminous with the term of this Lease with respect to the Premises (and any renewals thereof).

(b) Upon Tenant's delivery of Tenant's ROFO Notice, Tenant may not thereafter revoke Tenant's exercise of the ROFO. If an Event of Default exists at any time after Landlord receives Tenant's ROFO Notice but before the first day that Tenant commences to lease the ROFO Space, Landlord, at Landlord's option, shall have the right to nullify Tenant's exercise of the ROFO with respect to the ROFO Space. If Tenant notifies Landlord that Tenant elects not to lease the ROFO Space or if Tenant fails to timely deliver Tenant's ROFO Notice to Landlord with respect thereto, then Landlord shall have the right to enter into a lease agreement(s) for the ROFO Space under one or more leases containing such terms as Landlord deems acceptable in Landlord's sole discretion, and the ROFO shall be void and have no further force or effect with respect to such space; provided, however, Tenant shall retain its right of first offer rights hereunder with respect to any part of the Potential ROFO Space that was not covered by Landlord's ROFO Notice.

(c) The ROFO shall be subject, subordinate, and in all respects inferior to the rights of any third-party tenant leasing space at the Building as of the date of this Lease. Landlord may at any time choose to use any space that is or about to become vacant within the Building for marketing or property management purposes, or as a Building amenity or Common Area such as a fitness center or conference area, or to lease such space to an existing tenant of Landlord in connection with the relocation of such tenant, without in any such case notifying or offering such space to Tenant or giving rise to any right of Tenant hereunder. Space is "available to lease" if and when: (i) the lease for any tenant of all or a portion of the space expires or is otherwise terminated, provided space shall not be deemed to be or become available if the space is assigned or subleased by the tenant of the space, or relet by the tenant or subtenant of the space by renewal, extension, or new lease; and (ii) to the extent that all or a portion of the Potential ROFO Space is available to lease from Landlord as of the date of this Lease, Landlord has entered into a lease with a third-party tenant for such currently available ROFO Space after the date of this Lease and the term of that lease has expired (including, without limitation, the expiration of any lease term extension period(s), regardless of whether the extension right or agreement is contained in such lease or is agreed to at any time by Landlord and the tenant under such lease or otherwise) or been terminated.

(d) Except to the extent expressly set forth in Landlord's ROFO Notice to the contrary, if Tenant elects to lease the ROFO Space, such space shall become subject to this Lease upon the same terms and conditions as are then applicable to the original Premises, except that Tenant shall take the ROFO Space in "AS IS" condition and Landlord shall have no obligation to make any improvements or alterations to the ROFO Space, and the term of Tenant's lease of the ROFO Space shall be coterminous with this Lease (and any renewals thereof). Landlord shall determine the exact location of any demising walls (if any) for the ROFO Space. Tenant shall not be entitled to any tenant improvement allowances, free rent periods, or other special concessions granted to Tenant with respect to the original Premises. Upon Tenant's leasing of the ROFO Space, the "Premises" shall include the ROFO Space and, except as otherwise set forth in this Section, all computations made under this Lease based upon or affected by the rentable area of the Premises shall be recomputed to include the ROFO Space.

(e) If Tenant timely exercises its right to lease the ROFO Space: (i) Tenant's lease of the ROFO Space shall commence upon the later of: (A) the date of availability specified in Landlord's ROFO Notice; or (B) the date Landlord tenders possession of the ROFO Space in vacant condition; and (ii) upon Landlord's request, Tenant shall execute an appropriate amendment, in form and content reasonably satisfactory to both Landlord and Tenant, memorializing the expansion of the Premises as set forth in this Section (provided Tenant's failure to execute such lease or amendment shall not negate the effectiveness of Tenant's exercise of the ROFO).

28. TENANT CONFESSION CERTIFICATION: Tenant acknowledges and agrees that any failure of Tenant to execute Section 17 of this Lease shall be an absolute bar from Tenant (or Tenant's successors or assigns) claiming, alleging or petitioning, including, but not limited to, in any petition to open said confession, that such Section is invalid and not binding upon Tenant (or Tenant's successors or assigns).

[SIGNATURES ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the parties hereto have executed this Lease under seal as of the day and year first- above stated.

LANDLORD:
BRANDYWINE CIRA, L.P.

By: Brandwine Cira, L.L.C., its general partner

By: /s/ Stephen Rush
Name: Stephen Rush
Title: Vice President
Date: 2/11/2019

TENANT:
CABALETTA BIO, INC.

By: /s/ Steven Nichtberger
Name: Steven Nichtberger
Title: CEO
Date: 2/8/2019

Exhibits:

Exhibit A: Location Plan of Premises
Exhibit B: Form of COLT
Exhibit C: Leasehold Improvements
Exhibit D: Cleaning Specifications
Exhibit E: Rules and Regulations

[Signature page]

EXHIBIT B
FORM OF COLT

CONFIRMATION OF LEASE TERM

THIS CONFIRMATION OF LEASE TERM ("COLT") is made as of _____ between _____ ("Landlord") and _____ ("Tenant").

1. Landlord and Tenant are parties !o that certain lease dated ("Lease Document"), with respect to the premises described in the Lease Document, known as Suite _____ consisting of approximately _____ rentable square feet ("Premises"), located at_____.

2. All capitalized terms, if not defined in this COLT, have the meaning give such terms in the Lease Document.

3. Tenant has accepted possession of the Premises in their "AS IS" "WHERE IS" condition and all improvements required to be made by Landlord per the Lease Document have been completed.

4. The Lease Document provides for the commencement and expiration of the Term of the lease of the Premises, which Term commences and expires as follows:

a. Commencement of the Term of the Premises: _____

b. Expiration of the Term of the Premises: _____

5. The required amount of the Security Deposit and/or Letter of Credit per the Lease Document is $_____. Tenant has delivered the Security Deposit and/or Letter of Credit per the Lease Document in the amount of $_____.

6. The Building Number is _____ and the Lease Number is _____. This information must accompany every payment c f Rent made by Tenant to Landlord per the Lease Document.

TENANT:	LANDLORD:
_____	_____
By: _____	By: _____
Name: _____	Name: _____
Title: _____	Title: _____

EXHIBIT C
LEASEHOLD IMPROVEMENTS

1. Landlord will, at its sole cost and expense and using Building-standard materials and finishes, complete the improvements in the Premises shown or described as Landlord Work on Exhibit C-1 attached hereto ("Landlord Work"). In addition, Landlord will, at Tenant sole cost and expense, complete the improvements in the Premises shown or described as Tenant Work on Exhibit C-1 attached hereto ("Tenant Work"). Landlord Work and Tenant Work are referred to herein collectively as the "Leasehold Improvements", and Exhibit C-1 is referred to herein as the "Scope of Work". The Leasehold Improvements shall expressly *not* include any finishes, materials, or improvements not specifically addressed and detailed on the Scope of Work. If any material revision to the Leasehold Improvements is deemed necessary by Landlord, such revision will be submitted to Tenant for approval, which approval may not be unreasonably withheld, conditioned, or delayed.

2. "Substantial Completion" means the date on which (i) the Leasehold Improvements have been completed except as set forth on the Punch List (as defined below), and (ii) Landlord has obtained a final inspection approval, or temporary or permanent certificate of occupancy from the applicable local governing authority for the Premises. Notwithstanding the foregoing, in the event of Tenant Delay (as defined below), Substantial Completion shall be deemed to be the date Substantial Completion would have occurred but for Tenant Delays. Landlord shall have no obligation to expend any funds, employ any additional labor, contract for overtime work, or otherwise take any action to compensate for any Tenant Delay. Tenant shall reimburse Landlord for any reasonable, incremental costs in labor, materials, and supplies incurred due to Tenant Delay. If issuance of governmental permits or approvals is conditioned upon Tenant's installation of its equipment, racking, cabling, or furniture or completion of any other work or activity in the Premises for which Tenant is responsible, and the governmental authority will not issue such permits or approvals, or schedule an inspection of the Leasehold Improvements due to Tenant's failure to complete any work, installation, or activity (including the installation of any telephone, telephone switching, telephone, data, and security cabling and systems, furniture, computers, servers, Tenant's trade fixtures and other personal property installed (or to be installed) by or on behalf of Tenant in the Premises), then Substantial Completion is deemed to have occurred without Landlord having obtained such permits or approvals. "Tenant Delay" means any delay in Substantial Completion caused by Tenant or any Tenant Agent, including without limitation: (i) Tenant's failure to provide any reasonably requested information or approvals related to the Leasehold Improvements within 3 business days after receipt of Landlord's written request therefor; (ii) Tenant's request for materials, finishes, or installations other than Landlord's Building standard (unless set forth on the Scope of Work); and (iii) the performance or completion of any work, labor, or services by Tenant or any Tenant Agent that unreasonably interferes with the performance of the Leasehold Improvements. Tenant shall reimburse Landlord for any reasonable, incremental costs in labor, materials, and supplies incurred due to Tenant Delay.

3. Prior to delivery of possession of the Premises to Tenant, Landlord or Landlord's architect will prepare a preliminary punch list in writing for Landlord's and Tenant's review, and Landlord and Tenant will examine the Premises and agree on a final punch list that specifies any items of work that require correction, repair, or replacement ("Punch List"). Tenant must approve the Punch List in writing within two (2) business days of the walkthrough. Landlord will use commercially reasonable efforts to complete the Punch List work within thirty (30) days.

4. Except as may be otherwise set forth in the Scope of Work, Tenant is solely responsible for the purchase and installation of all furniture and equipment, including without limitation its data/telecommunication systems and wiring at the Premises. Subject to Landlord's reasonable approval, Tenant may use the vendor of its choice for such installation. Tenant must contact the municipality in which the Building is located for specific installation requirements, comply with all local rules and regulations, and obtain and pay for any and all required permits in connection therewith.

5. Tenant will have reasonable access to the Premises ("Early Access") during completion of the Leasehold Improvements to coordinate installation of Tenant's cabling and wiring and during the thirty (30)-day period immediately prior to Substantial Completion to install its furniture, fixtures, and equipment; provided in any such case Tenant's Early Access does not interfere with, or delay completion of, the Leasehold Improvements, and Tenant first provides Landlord with a certificate of insurance as required under the Lease. All insurance, waiver, and indemnity provisions of the Lease will be in full force and effect during Early Access. Tenant must ensure that its phone/data, security, and other vendors comply with all applicable Laws and pull their permits and perform their work in conjunction with the Leasehold Improvements so as not to delay completion of the Leasehold Improvements and any and all inspections therefor. Any delay resulting from Early Access, including without limitation due to a Tenant vendor's work delaying Landlord's ability to obtain its permits, is deemed a Tenant Delay.

6. Tenant shall be solely responsible for all costs of Tenant Work ("Tenant Improvement Costs"), including without limitation the professional fees of any engineers, consultants, architects, and/or space planners engaged by Landlord and other professionals preparing and/or reviewing Exhibit C-2 and all costs in the permitting, demolition, construction, acquisition, and installation of Tenant Work, including, without limitation, contractor fees, overhead, and profit, and the cost of all labor and materials supplied by the general contractor engaged by Landlord, suppliers, independent contractors, and subcontractors arising in connection with Tenant Work; provided, however, in no event shall any supervisory or construction management fees by Landlord be included as part of the Tenant Improvement Costs. Tenant shall pay Tenant Improvement Costs to Landlord within thirty (30) days after receipt of an invoice therefor from time to time, provided Landlord shall have the right to invoice Tenant with respect to particular components of Tenant Work and the applicable amount of Tenant Improvement Costs (as reasonably determined by Landlord) upon substantial completion of such component. If Tenant fails to make any payment when due under this Exhibit, such failure shall be deemed a failure to make a Rent payment under the Lease.

7. Landlord shall obtain from its contractor a commercially customary one-year warranty for the Leasehold Improvements, and Landlord shall use commercially reasonable efforts to make a claim under such warranties on behalf of Tenant to the extent necessary.

EXHIBIT E
RULES AND REGULATIONS

1. Sidewalks, entrances, passages, elevators, vestibules, stairways, corridors, halls, lobby, and any other part of the Building shall not be obstructed or encumbered by Tenant or used for any purpose other than ingress or egress to and from the Premises. Landlord shall have the right to control and operate the common portions of the Building and exterior facilities furnished for common use of the Building's tenants (such as the eating, smoking, and parking areas) in such a manner as Landlord deems appropriate.

2. No awnings or other projections may be attached to the outside walls of the Building without the prior written consent of Landlord. All drapes and window blinds shall be of a quality, type, design, and color, and attached in a manner approved in writing by Landlord.

3. No showcases, display cases, or other articles may be put in front of or affixed to any part of the exterior of the Building, or placed in hallways or vestibules without the prior written consent of Landlord. All supplies shall be kept in designated storage areas. Tenant shall not use or permit the use of any portion of the Project for outdoor storage. No mats, trash, or other objects may be placed in the public corridors, hallways, stairs, or other common areas of the Building.

4. Restrooms and other plumbing fixtures shall not be used for any purposes other than those for which they were constructed, and no debris, rubbish, rags, or other substances may be thrown therein. Only standard toilet tissue may be flushed in commodes. All damage resulting from any misuse of these fixtures shall be the responsibility of the tenant who, or whose employees, agents, visitors, clients, or licensees, caused such damage. Bathing and changing of clothes is permitted only in designated shower/locker facilities, and is not permitted in restrooms.

5. Tenant shall not, without the prior written consent of Landlord, mark, paint, drill into, bore, cut, string wires, or in any way deface any part of the Premises or the Building except for the reasonable hanging of decorative or instructional materials on the walls of the Premises. Tenant shall remove seasonal decorations that are visible outside of the Premises within 30 days after the end of the applicable season.

6. Tenant shall not construct, install, maintain, use, or operate in any part of the Project any electrical device, wiring, or other apparatus in connection with a loud speaker system or other sound/communication system that may be heard outside the Premises.

7. No bicycles, mopeds, skateboards, scooters, or other vehicles may be brought into, used, or kept in or about the Building or in the common areas of the Project other than in locations specifically designated thereof. No animals or pets of any kind (other than a service animal performing a specified task), including without limitation fish, rodents, and birds, may be brought into, used, or kept in or about the Building. Rollerblading and roller skating is not permitted in the Building or in the common areas of the Project.

8. Tenant shall not cause or permit any unusual or objectionable odors to be produced upon or permeate from the Premises.

9. No space in the Project may be used for the manufacture of goods for sale in the ordinary course of business, or for sale at auction of merchandise, goods, or property of any kind.

10. Tenant shall not make any unseemly or disturbing noises, or disturb or interfere with the occupants of the Building or neighboring buildings or residences by voice, musical instrument, radio, talking machines, whistling, singing, lewd behavior, or in any other way. All passage through the Building's hallways, elevators, and main lobby shall be conducted in a quiet, businesslike manner. Tenant shall not commit or suffer any waste upon the Premises, the Building, or the Project, or any nuisance, or do any other act or thing that may disturb the quiet enjoyment of any other tenant in the Building or Project.

11. Tenant shall not throw anything out of the doors, windows, or down corridors or stairs of the Building

12. Tenant shall not place, install, or operate in the Premises or in any part of the Project, any engine, stove, machinery, or electrical equipment not directly related to its business, including without limitation space heaters, coffee cup warmers, and small refrigerators, conduct mechanical operations, cook thereon or therein, or place or use in or about the Premises or the Project any explosives, gasoline, kerosene oil, acids, caustics, canned heat, charcoal, or any other flammable, explosive or hazardous material, without the prior written consent of Landlord. Notwithstanding the foregoing, Tenant shall have the right to install and use a coffee machine, microwave oven, toaster, ice maker, refrigerator, and/or vending machine in compliance with all applicable Laws in a kitchen or break room designated as such by Landlord, provided Tenant shall use only stainless steel braided hoses. All supply waterlines shall be of copper (not plastic) tubing.

13. No smoking (including without limitation of cigarettes, cigars, and e-cigarettes) is permitted anywhere in the Premises, the Building, or the Project, including but not limited to restrooms, hallways, elevators, stairs, lobby, exit and entrance vestibules, sidewalks, and parking lot areas, provided smoking shall be permitted in any Landlord-designated exterior smoking area. All cigarette ashes and butts shall be deposited in the containers provided for such disposal, and shall not be disposed of on sidewalks, parking lot areas, or toilets.

14. Tenant shall not install any additional locks or bolts of any kind upon any door or window of the Building without the prior written consent of Landlord. Tenant shall, upon the termination of its tenancy, return to Landlord all keys for the Premises, either furnished to or otherwise procured by Tenant, and all security access cards to the Building.

15. Tenant shall keep all doors to hallways and corridors closed during Business Hours except as they may be used for ingress or egress.

16. Tenant shall not use the name of the Building, Project, Landlord, or Landlord's agents or affiliates in any way in connection with its business except as the address thereof. Landlord shall also have the right to prohibit any advertising by Tenant that, in Landlord's sole opinion, tends to impair the reputation of the Building or its desirability as a building for offices, and upon written notice from Landlord, Tenant shall refrain from or discontinue such advertising.

17. Tenant shall be responsible for all security access cards issued to it, and shall secure the return of all security cards from all employees terminating employment with them. Lost cards shall cost $35.00 per card to replace. No person/company other than Building tenants and/or their employees may have security access cards unless Landlord grants prior written approval.

18. All deliveries to the Building that involve the use of a hand cart, hand truck, or other heavy equipment or device shall be made via the freight elevator, if such freight elevator exists in the Building. Tenant shall be responsible to Landlord for any loss or damage resulting from any deliveries made by or for Tenant to the Building. Tenant shall procure and deliver to Landlord a certificate of insurance from its movers, which certificate shall name Landlord as an additional insured.

19. Landlord reserves the right to inspect all freight to be brought into the Building, and to exclude from the Building all freight or other material that violates any of these rules and regulations.

20. Tenant shall refer all contractors, contractor's representatives, and installation technicians rendering any service on or to the Premises, to Landlord for Landlord's approval and supervision before performance of any contractual service or access to Building. This provision shall apply to all work performed in the Building including installation of telephones, telegraph equipment, electrical devices and attachments, and installations of any nature affecting floors, walls, woodwork, trim, windows, ceilings, equipment, or any other physical portion of the Building. Landlord reserves the right to require that all agents of contractors and vendors sign in and out of the Building.

21. If Tenant desires to introduce electrical, signaling, telegraphic, telephonic, protective alarm or other wires, apparatus or devices, Landlord shall direct where and how the same are to be placed, and except as so directed, no installation boring or cutting shall be permitted, without Landlord's consent, not to be unreasonably withheld, conditioned, or delayed. Landlord shall have the right to prevent and to cut off the transmission of excessive or dangerous current of electricity or annoyances into or through the Building or the Premises and to require the changing of wiring connections or layout at Tenant's expense, to the extent that Landlord may reasonably deem necessary, and further to require compliance with such reasonable and uniformly applied rules as Landlord may establish relating thereto, and in the event of non-compliance with the requirements or rules, Landlord shall have the right immediately to cut wiring or to do what it reasonably considers necessary to remove the danger, annoyance, or electrical interference with apparatus in any part of the Building. All wires installed by Tenant must be clearly tagged at the distributing boards and junction boxes and elsewhere where required by Landlord, with the suite number of the office to which such wires lead, and the purpose for which the wires respectively are used, together with the name of the concern, if any, operating such wires.

22. Landlord reserves the right to exclude from the Building at all times any person who is not known or does not properly identify himself or herself to Landlord's management or security personnel.

23. Landlord may require, at its sole option, all persons entering the Building outside of Business Hours to register at the time they enter and at the time they leave the Building

24. No space within the Building or in the common areas such as the parking lot, may be used at any time for the purpose of lodging, sleeping or for any immoral or illegal purposes.

25. Tenant shall not use the hallways, stairs, lobby, or other common areas of the Building as lounging areas during breaks or during lunch periods.

26. No canvassing soliciting, or peddling is permitted in the Building or its common areas.

27. Tenant shall comply with all Laws regarding the collection, sorting separation, and recycling of garbage, trash, rubbish and other refuse, and Landlord's recycling policy for die Building.

28. Landlord does not maintain suite finishes that are non-standard, such as kitchens, bathrooms, wallpaper, special lights, etc. However, should the need arise for repair of items not maintained by Landlord, Landlord at its sole option, may arrange for the work to be done at tenant's expense.

29. Tenant shall clean at least once a year, at its expense, drapes in the Premises that are visible from the exterior of the Building.

30. No pictures, signage, advertising decals, banners, etc. may be placed in or on windows in such a manner as they are visible from the exterior, without the prior written consent of Landlord.

31. Tenant is prohibited at all times from eating or drinking in hallways, elevators, restrooms, lobbies, or lobby vestibules outside of the Premises. Food storage shall be limited to a Landlord-approved kitchen or break room.

32. Tenant shall be responsible to Landlord for any acts of vandalism performed in the Building by its employees, invitees, agents, contractors, licensees, subtenants, and assignees.

33. Tenant shall not permit the visit to the Premises of persons in such numbers or under such conditions as to interfere with the use and enjoyment by other tenants of the entrances, hallways, elevators, lobby, exterior common areas, or other public portions or facilities of the Building.

34. Landlord's employees shall not perform any work or do anything outside of their regular duties unless under special instructions from Landlord. Requests for such requirements shall be submitted in writing to Landlord.

35. Tenant is prohibited from interfering in any manner with the installation and/or maintenance of the heating air conditioning and ventilation facilities and equipment at the Project.

36. Landlord shall not be responsible for lost or stolen personal property, equipment, money, or jewelry regardless of whether such loss occurs when an area is locked against entry or not.

37. Landlord shall not permit entrance to the Premises by use of pass key controlled by Landlord, to any person at any time without written permission of Tenant, except employees, contractors or service personnel supervised or employed by Landlord.

38. Tenant shall observe and comply with the driving and parking signs and markers on the Project grounds and surrounding areas. Tenant shall comply with all reasonable and uniformly applied parking regulations promulgated by Landlord from time to time for the orderly use of vehicle parking areas. Parked vehicles shall not be used for vending or any other business or other activity while parked in the parking areas. Vehicles shall be parked only in striped parking spaces, except for loading and unloading, which shall occur solely in zones marked for such purpose, and be so conducted as to not unreasonably interfere with traffic flow or with loading and unloading areas of other tenants. Tractor trailers shall be parked in areas designated for tractor trailer parking. Employee and tenant vehicles shall not be parked in spaces marked for visitor parking or other specific use. All vehicles entering or parking in the parking areas shall do so at owner's sole risk and Landlord assumes no responsibility for any damage, destruction, vandalism, or theft. Tenant shall cooperate with Landlord in any reasonable and uniformly applied measures implemented by Landlord to control abuse of the parking areas, including without limitation access control programs, tenant and guest vehicle identification programs, and validated parking programs, provided no such validated parking program shall result in Tenant being charged for spaces to which it has a right to free use under the Lease. Each vehicle owner shall promptly respond to any sounding vehicle alarm or horn, and failure to do so may result in temporary or permanent exclusion of such vehicle from the parking areas. Any vehicle that violates the parking regulations may be cited, towed at the expense of the owner, temporarily or permanently excluded from the parking areas, or subject to other lawful consequence.

39. Tenant shall not enter other separate tenants' hallways, restrooms, or premises except with prior written approval from Landlord's management.

40. Tenant shall not place weights anywhere beyond the load-per-square-foot carrying capacity of the Building.

41. Tenant shall comply with all laws, regulations, or other governmental requirements with respect to energy savings, not permit any waste of any utility services provided Landlord, and cooperate with Landlord fully to ensure the most effective and efficient operation of the Building.

42. The finishes, including floor and wall coverings, and the furnishings and fixtures in any areas of the Premises that are visible from the common areas of the Building are subject to Landlord's approval in its sole discretion Selections for these areas shall be pre-approved in writing by Landlord.

43. Power strips and extension cords shall not be combined (also known as daisy chaining).

44. Candles and open flames are prohibited in the Building.

45. Guns, firearms, and other dangerous weapons (concealed or otherwise) are not allowed at the Project, subject to applicable Law (if any) requiring Landlord to so permit at the Project.

Landlord reserves the right to rescind any of these rules and make such other and further rules and regulations as in the judgment of Landlord shall from time to time be needed for the safety, protection, care, and cleanliness of the Project, the operations thereof, the preservation of good order therein, and the protection and comfort of its tenants, their agents, employees, and invitees, which rules when made and notice thereof given to Tenant shall be binding upon Tenant in a like manner as if originally prescribed. As used in these rules and regulations, capitalized terms shall have the respective meanings given to them in the Lease to which these rules and regulations are attached, provided Tenant shall be responsible for compliance herewith by everyone under Tenant's reasonable control, including without limitation its employees, invitees, agents, contractors, licensees, subtenants and assignees, and a violation of these rules and regulations by any of the foregoing is deemed a violation by Tenant.

Exhibit 21.1

List of Subsidiaries

None.