

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549**

**FORM S-1
REGISTRATION STATEMENT
UNDER
THE SECURITIES ACT OF 1933**

Landos Biopharma, Inc.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of
incorporation or organization)

2834
(Primary Standard Industrial
Classification Code Number)

81-5085535
(I.R.S. Employer
Identification No.)

1800 Kraft Drive, Suite 216
Blacksburg, VA 24060
(540) 218-2232

(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Josep Bassaganya-Riera
Chairman, President and Chief Executive Officer
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Blacksburg, VA 24060
(540) 218-2232

(Name, address, including zip code, and telephone number, including area code, of agent for service)

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Approximate date of commencement of proposed sale to the public: As soon as practicable after this Registration Statement is declared effective.

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, 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, 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	<input type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input checked="" type="checkbox"/>	Smaller reporting company	<input checked="" type="checkbox"/>
Emerging growth company	<input checked="" type="checkbox"/>		

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 7(a)(2)(B) of the Securities Act.

CALCULATION OF REGISTRATION FEE

Title of each Class of Securities to be registered	Proposed maximum aggregate offering price(1)(2)	Amount of registration fee(3)
Common Stock, \$0.01 par value 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.
- (2) Includes the offering price of additional shares that the underwriters have the option to purchase.
- (3) Calculated pursuant to Rule 457(o) based on an estimate of the proposed maximum aggregate offering price.

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 which specifically states that this Registration Statement shall thereafter become effective in accordance with Section 8(a) of the Securities Act of 1933 or until the 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. These securities may not be sold until the registration statement filed with the Securities and Exchange Commission is effective. This preliminary prospectus is not an offer to sell these securities nor does it seek an offer to buy these securities in any jurisdiction where the offer or sale is not permitted.

Subject to completion, dated _____, 2021

Preliminary prospectus

shares



Common stock

This is an initial public offering of shares of common stock Landos Biopharma, Inc. We are offering _____ shares of our common stock. The initial public offering price is expected to be between \$ _____ and \$ _____ per share.

Prior to this offering, there has been no public market for our common stock. We have applied to list our common stock on the Nasdaq Global Market under the symbol "LABP."

We are an "emerging growth company" as defined under U.S. federal securities laws and will be subject to reduced public company reporting requirements. See "Prospectus summary—Implications of being an emerging growth company."

	Per share	Total
Initial public offering price	\$	\$
Underwriting discounts and commissions(1)	\$	\$
Proceeds, before expenses, to us	\$	\$

(1) See the section titled "Underwriting" beginning on page 202 for a description of compensation payable to the underwriters.

We have granted the underwriters an option to purchase up to an additional _____ shares from us at the initial public offering price, less the underwriting discounts and commissions, for a period of up to 30 days after the date of this prospectus.

Investing in our common stock involves risks. See the section titled "[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 these securities, or passed upon the accuracy or adequacy of this prospectus. Any representation to the contrary is a criminal offense.

The underwriters expect to deliver the shares of common stock to the purchasers on or about _____, 2021.

J.P. Morgan

Jefferies
Raymond James

SVB Leerink

, 2021

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We and the underwriters have not authorized anyone to provide any information or to make any representations other than those contained in this prospectus or in any free writing prospectuses we have prepared. We and the underwriters take no responsibility for, and can provide no assurance as to the reliability of, any other information that others may provide you. We are offering to sell, and seeking offers to buy, shares of common stock only in jurisdictions where offers and sales are permitted. The information contained in this prospectus is accurate only as of the date of this prospectus, regardless of the time of delivery of this prospectus or of any sale of the common stock. Our business, financial condition, results of operations and prospects may have changed since that date.

Through and including _____, 2021 (the 25th day after the date of this prospectus), all dealers that effect transactions in these securities, whether or not participating in this offering, may be required to deliver a prospectus. This is in addition to the dealers' obligation to deliver a prospectus when acting as underwriters and with respect to their unsold allotments or subscriptions.

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.

Prospectus summary

This summary highlights information contained elsewhere in this prospectus. This summary does not contain all of the information you should consider before investing in our common stock. You should read this entire prospectus carefully, especially the “Risk factors” section beginning on page 11 and our financial statements and the related notes appearing at the end of this prospectus, before making an investment decision.

As used in this prospectus, unless the context otherwise requires, references to “we,” “us,” “our,” “the company” and “Landos Biopharma” refer to Landos Biopharma, Inc. and its subsidiaries.

Overview

We are a clinical-stage biopharmaceutical company focused on the discovery and development of oral therapeutics for patients with autoimmune diseases that are the first to target new mechanisms of action, including the LANCL2, NLRX1 and PLXDC2 immunometabolic pathways. Our core expertise is in the development of therapeutic candidates targeting novel pathways at the interface of immunity and metabolism. Based on our understanding of the role that cell metabolic pathways have on modulating inflammatory responses, we aim to inhibit these inflammatory responses by changing the metabolic processes in target cells. We leverage our proprietary AI-based precision medicine platform, our LANCE platform, to identify novel therapeutic targets based on predictions of immunometabolic function and create therapeutic candidates to engage those targets in areas of unmet medical need. Through our LANCE platform we have identified seven novel immunometabolic targets and product candidates to date across 14 indications, including ulcerative colitis, or UC, Crohn’s disease, or CD, lupus, rheumatoid arthritis, nonalcoholic steatohepatitis, or NASH, multiple sclerosis, Alzheimer’s disease, asthma, psoriasis, atopic dermatitis, eosinophilic esophagitis, or EoE, chronic obstructive pulmonary disease, or COPD, diabetic nephropathy and type 1 diabetes. We are currently conducting a Phase 2 clinical trial of our lead product candidate, BT-11, for mild to moderate UC in the United States and Europe and expect to report results in the second half of 2020. We expect to initiate a Phase 2 trial of BT-11 for the treatment of moderate to severe CD in the first half of 2021. We believe the therapeutics we discover and develop, if approved, will have a significant impact on the quality of life of patients suffering from autoimmune diseases.

Autoimmune diseases generally result from the loss of self-tolerance in the immune system, causing the immune system to attack healthy organs and tissues. This leads to inflammation of the organs and tissues, causing chronic pain and deterioration or destruction of the ability of these organs to function. Current therapies either broadly prevent the immune system from functioning, in the case of corticosteroids, aminosalicylates and immunosuppressants, or systemically block specific molecules that promote inflammation in the case of biologics and JAK inhibitors. While great strides have been made, existing approaches continue to leave patient needs unmet, due in part to significant safety concerns.

Our proprietary LANCE platform: our approach to optimally identifying novel immunometabolic targets

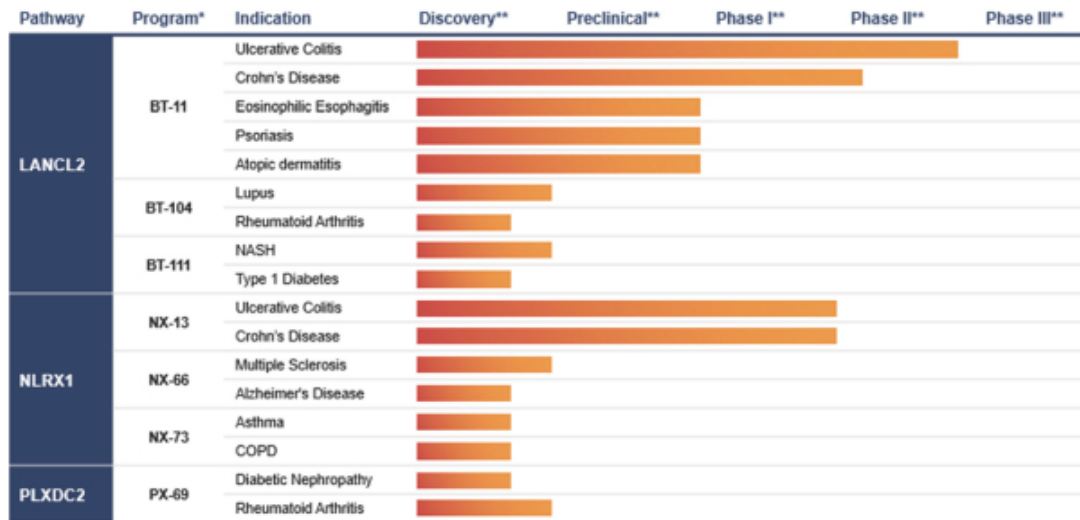
We are developing novel, disease-specific oral therapeutic candidates designed to address the therapeutic gap in the current treatment paradigm for autoimmune diseases. We leverage our AI-based integrated computational and experimental LANCE platform to discover novel therapeutic targets based on the prediction and validation of immunometabolic function. Through our LANCE platform, we have identified novel pathways that stand at immunometabolic intersections of multiple well-established immune processes. We believe these pathways have a greater potential to restore the immune tolerance that is lost in patients with autoimmune disease.

We begin our discovery process with an *in silico* discovery platform. The LANCE platform analyzes large datasets from autoimmune disease patients to identify novel expression patterns tied to regulatory functions. It then ranks and prioritizes new immunometabolic targets that are perturbed in human disease and have high potential to serve as selective portals to the coordination of multiple well-categorized downstream responses tied to autoimmune diseases. We then continue evaluation *in silico*, identifying thousands of targets within the human immune system to evaluate and refine potential targets to maximize efficiency of time and cost. We include multi-scale modeling of immune and disease processes in virtual representations of target tissues for a specific disease to prioritize targets capable of exerting control on the immune response to a level providing meaningful change at the tissue and clinical level. In parallel, targets are filtered for druggability and safety parameters, removing those that are difficult to activate or inhibit or have potential to be linked to toxicity. We prioritize the selection of targets with mechanisms applicable to numerous autoimmune and inflammatory diseases, while generating predictions for disease-specific potency and optimal pharmacokinetic, or PK, profiles. We then conduct experimental target validation of top ranked targets in cells and in mouse models of disease using loss-of-function and constitutive expression methods. Upon successful target identification, an internal medicinal chemistry program is initiated to optimize preliminary scaffolds into leads. We evaluate lead compounds through a series of in-house robust target engagement, *in vitro* culture, multiple animal models for diseases of interest, PK evaluation, preliminary dose range finding, or DRF, toxicity studies in rats and translational studies in human patient samples. We have used this strategy to identify, evaluate and advance seven product candidates across three targets spanning numerous autoimmune and related disorders. Prioritization of these product candidates occurs based on unmet clinical need, therapeutic market size and opportunity, preclinical safety and efficacy data, and performance in translational biomarkers.

We believe our LANCE platform may have several key advantages compared to traditional drug discovery paradigms in autoimmune diseases, including improved discovery and significant target generation potential, an ability to modulate multiple critical pathways via a single target, and cost advantage. We have leveraged our platform to identify seven novel immunometabolic targets to date, two of which we are evaluating in clinical trials, LANCL2 and NLRX1. Using our LANCE platform, we expect to identify further novel targets and develop new product candidates for additional indications such as lupus, rheumatoid arthritis, NASH, type 1 diabetes, multiple sclerosis, Alzheimer's disease, diabetic nephropathy, asthma, psoriasis, EoE and COPD, with the potential to submit one to two investigational new drug applications, or INDs, per year over the next five years, including at least three new INDs in 2021.

Our portfolio

We are leveraging our LANCE platform, our proprietary computational target discovery engine, to design and develop a pipeline of oral small molecule product candidates with differentiated profiles that are the first to target novel mechanisms to address autoimmune diseases. We currently own worldwide development and commercialization rights to each of our product candidates. Since our inception, we successfully cleared four INDs with the United States Food and Drug Administration, or FDA. We expect to submit at least three additional INDs by the end of 2021. Leveraging our LANCE platform, we have reduced our development time, measured from initial target discovery and Phase 1 clinical trial dosing, from 24 months, in the case of BT-11, to 18 months, in the case of NX-13. Our development time from discovery to Phase 2 ready was 30 months, in the case of BT-11, and 24 months, in the case of NX-13. We believe similar timelines are possible with our future product candidates; however, the process of clinical development is inherently uncertain and no guarantee can be made that similar timelines will be achieved.



* Subject to feedback from the FDA, we intend to initially submit one IND for each product candidate in order to initiate Phase 1 clinical trials in an indication. We will submit subsequent INDs to proceed to Phase 1 clinical trials in additional indications for that product candidate.

** We define the discovery stage of development as the design, initial synthesis, target binding and preliminary pharmacology testing in in vitro and animal models of disease; the preclinical stage of development as GLP toxicity and pharmacology studies, metabolism and pharmacokinetics in addition to scale-up chemistry manufacturing and controls for drug substance and drug product; the Phase 1 stage as clinical trials designed to assess safety, tolerability and pharmacokinetics in healthy volunteers or small patient cohorts; the Phase 2 stage as placebo-controlled clinical trials designed to provide proof-of-concept efficacy in the target patient population; and the Phase 3 stage as clinical trials designed to provide the final supporting data for the safety and effectiveness of a drug in the proposed indication to support an NDA filing.

Numerous advances in our portfolio are currently in preparation. For BT-11, we expect a Phase 3 clinical trial in UC will be initiated in the first half of 2021, a Phase 2 clinical trial in CD will be initiated in the first half of 2021 and Phase 1b clinical trials in EoE and psoriasis will be initiated in the first half of 2021 and the second half of 2021, respectively. For NX-13, Phase 2 clinical trials in UC and CD are expected to be initiated in the second half

of 2021 and the first half of 2022, respectively. For BT-104, BT-111, and NX-66, IND-enabling studies are expected to be completed in 2021. For PX-69, IND-enabling studies are expected to be completed in the first half of 2022.

BT-11 program overview

Our lead product candidate, BT-11, a gut-restricted oral therapeutic that is the first candidate designed to engage the novel target lanthionine synthetase C-like protein 2, or LANCL2, a membrane receptor that has been shown to modulate immunological mechanisms that are associated with autoimmune diseases such as UC or CD. Approximately 2 million Americans suffer from UC or CD, and the treatment of these two diseases in the United States accounts for an aggregate annual market size of up to \$17 billion. There are currently no approved treatments that target LANCL2. BT-11 is designed to act locally in the gastrointestinal tract for treatment of inflammatory bowel disease, or IBD. We have designed BT-11 to overcome limitations of existing therapies, including with respect to side effect profiles, route of administration (injectables) and sustained efficacy. We are currently conducting a Phase 2 clinical trial of BT-11 in patients affected by mild to moderate UC in the United States and Europe and expect to report topline data in the second half of 2020. Following receipt of results from the ongoing Phase 2 trial, we plan to initiate a Phase 3 trial for UC in the first half of 2021 and a Phase 2 trial for the treatment of moderate to severe CD in the first half of 2021. We believe that BT-11, if approved, has the potential to disrupt the treatment paradigm in IBD. In UC, we believe BT-11 has the potential to be utilized as a pre-biologic therapy for mild-to-moderate cases, where greater than 90% of the patient population with active disease exists, due to its novel mechanism of action and tolerability profile, with no dose-limiting toxicities observed in preclinical studies in doses up to 7-fold higher than the proposed clinical therapeutic dose. In CD, we believe that BT-11, if approved, has the potential to serve as a first-line therapy and treat patients prior to their progression into biologics by addressing the main limitations of current therapeutics. We believe that an oral, gut-restricted small molecule delivered once daily in a singular tablet could serve as a first-line therapy in the moderate to severe CD treatment paradigm. We also plan to develop BT-11 for EoE, and expect to initiate a Phase 1b clinical trial in EoE in the first half of 2021. Additionally, we plan to develop BT-11 for psoriasis and expect to initiate a Phase 1b clinical trial in psoriasis in the second half of 2021. We also plan to develop BT-11 for atopic dermatitis.

NX-13 program overview

Our second product candidate, NX-13, is a novel, gut-restricted oral therapeutic that targets NOD-like receptor X1, or NLRX1, a mitochondria-associated receptor that has been associated with the modulation of inflammatory cytokines for UC and CD. There are currently no approved NLRX1 ligands. NX-13 is designed to target NLRX1 in order to induce anti-inflammatory effects in CD4+ T cells and other immune cells in the gastrointestinal tract. We believe that, if approved, NX-13 could provide an additional treatment option for the up to 50% of UC patients that experience relapse within one year of current therapies and up to 55% of CD patients that relapse within one year of achieving active remission. Mechanistically, NX-13 could provide improvements in fibrosis. We believe NX-13 offers the potential, both as a single agent and in combination with other therapeutics, to address the unmet medical need in UC and CD. We have initiated a Phase 1 trial of NX-13 for the treatment of UC and CD and expect to report topline data in the second half of 2020.

Discovery programs overview

Our earlier stage pipeline includes numerous product candidates targeting the LANCL2 pathway (BT-104, BT-111), NLRX1 pathway (NX-66 and NX-73) and PLXDC2 pathway (PX-69):

- **BT-104 for the treatment of lupus and rheumatoid arthritis.** BT-104 is our oral, small molecule agonist of the LANCL2 pathway product candidate being developed for the treatment of lupus and rheumatoid arthritis. The therapeutic market in lupus is sparsely populated, with sales of the top ten therapeutics for lupus amounting to over \$4 billion annually. The therapeutic market in rheumatoid arthritis is fragmented and represents approximately \$25 billion annually. We intend to submit an IND for BT-104 in the second half of 2021, and to initiate a Phase 1 clinical trial of BT-104 in healthy volunteers thereafter in the second half of 2021.
- **BT-111 for the treatment of NASH and type 1 diabetes.** BT-111 is our oral, small molecule agonist of the LANCL2 pathway product candidate being developed for the treatment of NASH and type 1 diabetes. NASH has a wide projected market of approximately \$25 billion annually by 2025 and is a rapidly expanding public health issue. We intend to submit an IND for BT-111 in the second half of 2021, and to initiate a Phase 1 clinical trial of BT-111 in healthy volunteers thereafter in the second half of 2021.
- **NX-66 for the treatment of multiple sclerosis and Alzheimer's disease.** NX-66 is our oral, small molecule agonist of the NLRX1 pathway product candidate being developed for the treatment of multiple sclerosis and Alzheimer's disease. The combined CNS market in multiple sclerosis and Alzheimer's disease is estimated to be \$22 billion annually. We believe NX-66, if approved, may address the lack of therapeutic options for progressive MS and has the potential to slow cognitive decline in patients with Alzheimer's disease. We intend to submit an IND for NX-66 in the second half of 2021 and to initiate a Phase 1 clinical trial in healthy volunteers thereafter.
- **NX-73 for the treatment of asthma and COPD.** NX-73 is our oral, small molecule agonist of the NLRX1 pathway product candidate being developed for the treatment of asthma and COPD. The combined respiratory market in asthma and COPD is estimated at \$25 billion annually. We intend to submit an IND for NX-73 in the second half of 2023 and to initiate a Phase 1 clinical trial in healthy volunteers thereafter.
- **PX-69 for the treatment of diabetic nephropathy and rheumatoid arthritis.** PX-69 is our oral, small molecule agonist of the PLXDC2 pathway product candidate being developed for the treatment of diabetic nephropathy and rheumatoid arthritis. The annual markets for diabetic nephropathy, the leading cause of long-term renal dialysis, and rheumatoid arthritis, are estimated at up to \$3 billion and \$25 billion, respectively. We intend to submit an IND for PX-69 in the first half of 2022 and to initiate a Phase 1 clinical trial in healthy volunteers thereafter.

Our strengths

We believe we are a leader in the discovery of targets through unique multi-modal pathways at the interface of immunity and metabolism. Through our proprietary LANCE precision medicine platform, we have pioneered a promising drug development engine underpinned by advanced computational capabilities applied to the discovery of new therapeutic targets for autoimmune disease.

Our distinctive strengths include:

- We are pioneering a new treatment paradigm in immunometabolism based on novel pathways.
- We have discovered and are developing several clinical-stage assets across the LANCL2 and NLRX1 pathways through our LANCE platform and distinctive capabilities.

- We are developing product candidates with novel mechanisms of action and the potential for use as monotherapy or combination therapy to address therapeutic gaps for patients for whom current treatments have limited efficacy and safety and tolerability concerns.
- We are targeting several indications characterized by unmet medical need and therapeutic gaps that represent a broad market opportunity.
- We have a strong intellectual property foundation and we retain global commercial rights to all of our product candidates.
- We have assembled an experienced team comprised of industry leaders in the fields of immunology and inflammation and are backed by prominent life science investors.

Our strategy

As a leader in the development of therapeutic candidates addressing novel immunometabolic mechanisms of action such as the LANCL2, NLRX1 and PLXDC2 pathways, we believe we are distinctly positioned to discover and develop potentially safer and more effective novel therapeutics for autoimmune diseases. We are targeting indications characterized by high unmet clinical need, significant likelihood of success in clinical development and the ability to improve the quality of life for large patient populations. Our strategy consists of the following key components:

- Maximize and capture value in our LANCE platform by discovering and developing oral therapeutics that are the first to target novel immunometabolic pathways and are designed to improve the lives of patients with autoimmune diseases.
- Advance the development of our lead product candidate, BT-11, into Phase 3 clinical trials for the treatment of UC and CD.
- Advance our second clinical candidate, NX-13, into Phase 1b/2 clinical trials for the treatment of UC and CD.
- Continue to develop a franchise of oral therapies from our deep preclinical pipeline of product candidates targeting immunometabolic pathways identified by our LANCE platform.
- Maximize the commercial value of our therapeutic pipeline.

Our culture and team

We were founded in January 2017 by Dr. Josep Bassaganya-Riera, our Chairman of our board of directors, President and Chief Executive Officer, who has assembled a management team of biopharmaceutical specialists with extensive experience in building and operating organizations that develop and deliver innovative medicines to patients. Our management team has broad expertise and successful track records in drug discovery, immunology & inflammation, clinical development, regulatory affairs, manufacturing and commercialization of therapies, as well as in business and finance, through previous experiences at leading institutions. We are also guided by our board of directors, and a clinical advisory board composed of key opinion leaders in UC and CD. We are backed by leading life sciences investors, including Perceptive Advisors, or Perceptive, and RTW Investments, or RTW.

Risks associated with our business

Our business is subject to numerous risks that you should be aware of before making an investment decision. These risks are described more fully in the section entitled “Risk factors.” These risks include, among others:

- We have incurred significant losses since our inception. We expect to incur losses over the next several years and may never achieve or maintain profitability.
- We have a limited operating history, have not yet completed Phase 3 clinical trials and have no history of commercializing products, which may make it difficult for an investor to evaluate the success of our business to date and to assess our future viability.
- Even if this offering is successful, we will need substantial additional funding to meet our financial obligations and to pursue our business objectives. If we are unable to raise capital when needed, we could be forced to curtail our planned operations and the pursuit of our growth strategy.
- Our business and operations may be adversely affected by the evolving and ongoing COVID-19 global pandemic.
- We currently have only two clinical-stage product candidates, BT-11 and NX-13. If we are unable to successfully develop, receive regulatory approval for and commercialize our product candidates for these or any other indications, or successfully develop any other product candidates, or experience significant delays in doing so, our business will be harmed.
- The regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time consuming and inherently unpredictable. If we are not able to obtain required regulatory approval for our product candidates, our business will be substantially harmed.
- Success in preclinical studies or earlier clinical trials may not be indicative of results in future clinical trials.
- We may not be successful in our efforts to increase our pipeline of product candidates, including by pursuing additional indications for our current product candidates or in-licensing or acquiring additional product candidates for other diseases.
- We face substantial competition, which may result in a smaller than expected commercial opportunity and/or others discovering, developing or commercializing products before or more successfully than we do.
- We rely on third parties to conduct a significant portion of our existing clinical trials and potential future clinical trials for product candidates, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials.
- If we are unable to obtain or protect intellectual property rights related to any of our product candidates, we may not be able to compete effectively in our market.
- There has been no prior public market for our common stock. An active trading market for our common stock may not develop and you may not be able to resell your shares of our common stock at or above the initial offering price, if at all.

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, or the JOBS Act. An emerging growth company may take advantage of relief from certain reporting requirements and other burdens that are otherwise applicable generally to public companies. These provisions include:

- reduced obligations with respect to financial data, including presenting only two years of audited financial statements and only two years of selected financial data in this prospectus;
- an exception from compliance with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended, or the Sarbanes-Oxley Act;
- reduced disclosure about our executive compensation arrangements in our periodic reports, proxy statements and registration statements; and
- exemptions from the requirements of holding non-binding advisory votes on executive compensation or golden parachute arrangements.

We may take advantage of these provisions for up to five years or such earlier time that we no longer qualify as an emerging growth company. We would cease to qualify as an emerging growth company if we have more than \$1.07 billion in annual revenue, we are deemed to be a “large accelerated filer” under the rules of the U.S. Securities and Exchange Commission, or SEC, which means the market value of our common stock that is held by non-affiliates exceeds \$700 million as of the prior June 30th or issue more than \$1.0 billion of non-convertible debt over a three-year period. We may choose to take advantage of some but not all of these reduced reporting burdens. For example, we may take advantage of the exemption from auditor attestation on the effectiveness of our internal control over financial reporting. To the extent that we take advantage of these reduced reporting burdens, the information that we provide stockholders may be different than you might obtain from other public companies in which you hold equity interests.

In addition, under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards and, therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

Corporate information

We were incorporated under the laws of the State of Delaware in January 2017. Our principal executive offices are located at 1800 Kraft Drive, Suite 216, Blacksburg, VA 24060, and our telephone number is (540) 218-2232. Our website address is www.landosbiopharma.com. The information contained on, or accessible through, our website is not incorporated by reference into this prospectus, and you should not consider any information contained in, or that can be accessed through, our website as part of this prospectus or in deciding whether to purchase our common stock.

We own various U.S. federal trademark applications and unregistered trademarks, including our company name. All other trademarks or trade names referred to in this prospectus are the property of their respective owners. Solely for convenience, the trademarks and trade names in this prospectus are referred to without the symbols ® and ™, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

The offering

Common stock offered by us	shares
Common stock to be outstanding after this offering	shares (or additional shares) shares if the underwriters exercise in full their option to purchase
Underwriters' option to purchase additional shares	We have granted the underwriters a 30-day option to purchase up to additional shares of common stock from us at the public offering price, less underwriting discounts and commissions.
Use of proceeds	We estimate that the net proceeds from the sale of the shares of common stock in this offering will be approximately \$ million (or approximately \$ million if the underwriters exercise their option to purchase additional shares of common stock in full) after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us. We intend to use the net proceeds from this offering as follows: . See "Use of proceeds" beginning on page 65.
Risk factors	Investing in our common stock involves risks. See "Risk factors" beginning on page 11 and the other information included in this prospectus for a discussion of factors you should consider carefully before deciding to invest in our common stock.
Proposed Nasdaq Global Market symbol	"LABP"

The number of shares of our common stock to be outstanding after this offering is based on 18,035,608 shares of our common stock (including preferred stock on an as-converted basis) outstanding as of September 30, 2020 and excludes:

- 2,003,956 shares of our common stock reserved for future issuance under our 2019 Equity Incentive Plan, or our 2019 Plan, as well as any automatic increases in the number of shares of common stock reserved for future issuance under the 2019 Plan.

Unless otherwise indicated, this prospectus reflects and assumes the following:

- the automatic conversion of all outstanding shares of our preferred stock on a one-for-one basis into 11,260,608 shares of our common stock, which will occur immediately prior to the closing of this offering;
- a -for-one reverse stock split of our common stock effected on , 2021;
- the filing and effectiveness of our amended and restated certificate of incorporation, which will occur immediately prior to the closing of this offering; and
- no exercise by the underwriters of their option to purchase additional shares of our common stock.

Summary consolidated financial data

The following tables present our summary consolidated financial data. You should read the following summary consolidated financial data together with our consolidated financial statements and the related notes thereto included elsewhere in this prospectus and the “Selected consolidated financial data” and “Management’s discussion and analysis of financial condition and results of operations” sections of this prospectus. We have derived the following consolidated statement of operations data for the years ended December 31, 2018 and 2019 from our audited consolidated financial statements appearing at the end of this prospectus. We have derived the following consolidated statement of operations data for the nine months ended September 30, 2019 and 2020 and the balance sheet data as of September 30, 2020 from our unaudited interim condensed consolidated financial statements appearing at the end of this prospectus. The unaudited interim condensed consolidated financial statements reflect, in the opinion of management, adjustments of a normal, recurring nature that are necessary for a fair statement of the unaudited interim consolidated financial statements. Our historical results are not necessarily indicative of the results that should be expected in the future.

(in thousands, except share and per share data)	Year ended December 31,		Nine months ended	
	2018	2019	2019	September 30, 2020
			(unaudited)	
Consolidated statement of operations data:				
Operating expenses:				
Research and development	\$ 6,803	\$ 11,812	\$ 8,455	\$ 15,379
General and administrative	1,136	1,478	1,097	3,898
Total operating expenses	7,939	13,290	9,552	19,277
Loss from operations	(7,939)	(13,290)	(9,552)	(19,277)
Other income (expense):				
Research and development incentive income	2,005	—	—	—
Interest expense	(4)	(304)	(304)	—
Loss from foreign exchange	(106)	(33)	(103)	37
Other income, net	—	160	—	437
Other income (expense), net	1,895	(177)	(407)	474
Net loss	\$ (6,044)	\$ (13,467)	\$ (9,959)	\$ (18,803)
Net loss per share, basic and diluted ⁽¹⁾	\$ (1.07)	\$ (2.16)	\$ (1.61)	\$ (2.84)
Weighted average common shares outstanding, basic and diluted	5,637,905	6,243,382	6,190,123	6,613,248
Pro forma net loss per share, basic and diluted (unaudited) ⁽¹⁾		\$ (1.06)		\$ (1.05)
Pro forma weighted average common shares outstanding, basic and diluted (unaudited) ⁽¹⁾		12,660,028		17,873,856
Net loss	\$ (6,044)	\$ (13,467)	\$ (9,959)	\$ (18,803)
Unrealized gain (loss) on available-for-sale securities	—	(77)	—	113
Comprehensive loss	\$ (6,044)	\$ (13,544)	\$ (9,959)	\$ (18,690)

(1) See Note 10 to our consolidated financial statements included elsewhere in this prospectus for an explanation of the method used to calculate pro forma net loss per share and pro forma weighted average common shares outstanding.

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The following table presents our summary balance sheet data as of September 30, 2020:

- on an actual basis;
- on a pro forma basis to give effect to the conversion of all outstanding shares of our convertible preferred stock into an aggregate of 11,260,608 shares of our common stock, which will occur immediately prior to the closing of this offering; and
- on a pro forma as adjusted basis to give further effect to our issuance and sale of _____ shares of common stock in this offering at 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 the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

(in thousands)	As of September 30, 2020		
	Actual	Pro	Pro forma as
	(unaudited)	forma	adjusted
		(unaudited)	(unaudited)
Consolidated balance sheet data:			
Cash, cash equivalents and marketable securities	\$ 35,331	\$ 35,331	\$
Working capital(1)	27,618	27,618	
Total assets	36,762	36,762	
Redeemable convertible preferred stock	73,037	—	
Total stockholders' (deficit) equity	(44,234)	28,803	

(1) We define working capital as current assets less current liabilities. See our consolidated financial statements included elsewhere in this prospectus.

Each \$1.00 increase or decrease in the 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, would increase or decrease the pro forma as adjusted amount of each of cash and cash equivalents, working capital, total assets and total stockholders' equity by \$ _____ million, assuming that the number of shares offered by us, as set forth on the cover page of this prospectus, remains the same and after deducting the estimated underwriting discounts and commissions. Each increase or decrease of 1.0 million in the number of shares we are offering would increase or decrease the pro forma as adjusted amount of each of cash and cash equivalents, working capital, total assets and total stockholders' equity by \$ _____ million, assuming no change in the assumed initial public offering price per share and after deducting the estimated underwriting discounts and commissions. This pro forma as adjusted information is illustrative only and will depend on the actual initial public offering price and other terms of this offering determined at pricing.

Risk factors

Investing in our common stock involves a high degree of risk. You should consider carefully the risks and uncertainties described below, together with all of the other information in this prospectus, including our financial statements and related notes, before deciding whether to purchase shares of our common stock. The risks and uncertainties described below are not the only ones we face. Such risks and uncertainties may be amplified by the COVID-19 pandemic and its potential impact on our business and the global economy. Additional risks and uncertainties that we are unaware of, or that we currently believe are not material, may also become important factors that affect us. If any of the following risks are realized, our business, financial condition, results of operations and prospects could be materially and adversely affected. In that event, the price of our common stock could decline, and you could lose part or all of your investment.

Summary risk factors

Investing in our common stock involves a high degree of risk, as fully described below. The principal factors and uncertainties that make investing in our common stock risky, include, among others:

- We have incurred significant losses since our inception. We expect to incur losses over the next several years and may never achieve or maintain profitability.
- We have a limited operating history, have not yet completed Phase 3 clinical trials and have no history of commercializing products, which may make it difficult for an investor to evaluate the success of our business to date and to assess our future viability.
- Even if this offering is successful, we will need substantial additional funding to meet our financial obligations and to pursue our business objectives. If we are unable to raise capital when needed, we could be forced to curtail our planned operations and the pursuit of our growth strategy.
- Our business and operations may be adversely affected by the evolving and ongoing COVID-19 global pandemic.
- We currently have only two clinical-stage product candidates, BT-11 and NX-13. If we are unable to successfully develop, receive regulatory approval for and commercialize our product candidates for these or any other indications, or successfully develop any other product candidates, or experience significant delays in doing so, our business will be harmed.
- The regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time consuming and inherently unpredictable. If we are not able to obtain required regulatory approval for our product candidates, our business will be substantially harmed.
- Success in preclinical studies or earlier clinical trials may not be indicative of results in future clinical trials.
- We may not be successful in our efforts to increase our pipeline of product candidates, including by pursuing additional indications for our current product candidates or in-licensing or acquiring additional product candidates for other diseases.
- We face substantial competition, which may result in a smaller than expected commercial opportunity and/or others discovering, developing or commercializing products before or more successfully than we do.
- We rely on third parties to conduct a significant portion of our existing clinical trials and potential future clinical trials for product candidates, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials.

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- If we are unable to obtain or protect intellectual property rights related to any of our product candidates, we may not be able to compete effectively in our market.
- There has been no prior public market for our common stock. An active trading market for our common stock may not develop and you may not be able to resell your shares of our common stock at or above the initial offering price, if at all.

Risks related to our financial position and capital needs

We have incurred significant losses since our inception. We expect to incur losses over the next several years and may never achieve or maintain profitability.

We are a clinical-stage biopharmaceutical company with a limited operating history. Since our inception, we have incurred significant net losses, and we expect to continue to incur significant expenses and operating losses for the foreseeable future. Our net losses were \$6.0 million and \$13.5 million for the years ended December 31, 2018 and 2019, respectively. Our net losses were \$9.0 million and \$18.8 million for the nine months ended September 30, 2019 and 2020, respectively. As of September 30, 2020, we had an accumulated deficit of \$44.4 million. We have financed our operations with \$70.0 million in gross proceeds raised in our private placements of convertible preferred stock and convertible promissory notes. We have no products approved for commercialization and have never generated any revenue from product sales.

We have devoted substantially all of our financial resources and efforts to the development of our clinical and preclinical product candidates and our LANCE platform, including conducting preclinical studies and clinical trials. We expect to continue to incur significant expenses and operating losses over the next several years. We expect that it could be several years, if ever, before we have a commercialized product. Our net losses may fluctuate significantly from quarter to quarter and year to year. We anticipate that our expenses will increase substantially as we:

- conduct our ongoing and planned clinical trials of BT-11 and NX-13, as well as initiate and complete additional clinical trials;
- pursue regulatory approval of BT-11 and NX-13 for the treatment of ulcerative colitis, or UC, and Crohn's disease;
- seek to discover and develop additional clinical and preclinical product candidates;
- scale up our clinical and regulatory capabilities;
- establish a commercialization infrastructure and scale up external manufacturing and distribution capabilities to commercialize any product candidates for which we may obtain regulatory approval, including BT-11 and NX-13;
- adapt our regulatory compliance efforts to incorporate requirements applicable to marketed products;
- maintain, expand and protect our intellectual property portfolio;
- hire additional clinical, manufacturing and scientific personnel;
- add operational, financial and management information systems and personnel, including personnel to support our product development and planned future commercialization efforts; and
- incur additional legal, accounting and other expenses in operating as a public company.

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To become and remain profitable, we must succeed in developing and eventually commercializing product candidates that generate significant revenue. This will require us to be successful in a range of challenging activities, including completing preclinical testing and clinical trials of our product candidates, obtaining regulatory approval, and manufacturing, marketing and selling any product candidates for which we may obtain regulatory approval, as well as discovering and developing additional product candidates. We are only in the preliminary stages of most of these activities. We may never succeed in these activities and, even if we do, may never generate any revenue or revenue that is significant enough to achieve profitability.

Even if we achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable would depress the value of our company and could impair our ability to raise capital, expand our business, maintain our development efforts, obtain product approvals, diversify our offerings or continue our operations. A decline in the value of our company could also cause you to lose all or part of your investment.

We have a limited operating history, have not yet completed Phase 3 clinical trials and have no history of commercializing products, which may make it difficult for an investor to evaluate the success of our business to date and to assess our future viability.

We commenced operations in 2017, and our operations to date have been largely focused on raising capital and developing our clinical and preclinical product candidates and our LANCE platform, including undertaking preclinical studies and conducting clinical trials. To date, we have not yet demonstrated our ability to successfully complete pivotal clinical trials, obtain regulatory approvals, manufacture a product on a commercial scale, or arrange for a third party to do so on our behalf, or conduct sales and marketing activities necessary for successful commercialization. Consequently, any predictions you make about our future success or viability may not be as accurate as they could be if we had a longer operating history or a history of successfully developing and commercializing products.

We may also need to transition from a company with a research focus to a company capable of supporting commercial activities. Our inability to adequately address these risks and difficulties or successfully make such a transition could adversely affect our business, financial condition, results of operations and growth prospects.

We may encounter unforeseen expenses, difficulties, complications, delays and other known or unknown factors in achieving our business objectives. We may also need to transition from a company with a research focus to a company capable of supporting commercial activities. Our inability to adequately address these risks and difficulties or successfully make such a transition could adversely affect our business, financial condition, results of operations and growth prospects.

Even if this offering is successful, we will need substantial additional funding to meet our financial obligations and to pursue our business objectives. If we are unable to raise capital when needed, we could be forced to curtail our planned operations and the pursuit of our growth strategy.

Our operations have consumed substantial amounts of cash since inception. Identifying potential product candidates and conducting preclinical testing and clinical trials is a time-consuming, expensive and uncertain process that takes years to complete, and we may never generate the necessary data or results required to obtain regulatory approval and achieve product sales. We expect to continue to incur significant expenses and operating losses over the next several years as we complete our ongoing clinical trials of our product candidates, initiate future clinical trials of our product candidates, seek marketing approval for BT-11 and NX-13 for the treatment of UC and Crohn's disease and advance any of our other product candidates we may develop or otherwise acquire. In addition, our product candidates, if approved, may not achieve commercial success. Our revenue, if any, will be derived from sales of products that we do not expect to be commercially available.

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for a number of years, if at all. If we obtain marketing approval for BT-11, NX-13 or any other product candidates that we develop or otherwise acquire, we expect to incur significant commercialization expenses related to product sales, marketing, distribution and manufacturing. We also expect an increase in our expenses associated with creating additional infrastructure to support operations as a public company.

As of September 30, 2020, we had cash, cash equivalents and marketable securities of \$35.3 million. We believe that the anticipated net proceeds from this offering, together with our existing cash and cash equivalents, will be sufficient to fund our operating expenses and capital requirements through . This estimate is based on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we expect. Changes may occur beyond our control that would cause us to consume our available capital before that time, including changes in and progress of our development activities, acquisitions of additional product candidates, and changes in regulation. Our future capital requirements will depend on many factors, including:

- the scope, progress, costs and results of our ongoing and planned clinical trials of BT-11 and NX-13, as well as the associated costs, including any unforeseen costs we may incur as a result of preclinical study or clinical trial delays due to the COVID-19 pandemic or other delays;
- the scope, progress, costs and results of preclinical development, laboratory testing and clinical trials for any future product candidates we may decide to pursue;
- the extent to which we develop, in-license or acquire other product candidates and technologies;
- the costs and timing of process development and manufacturing scale-up activities associated with our product candidates and other programs we advance them through preclinical and clinical development;
- the number and development requirements of other product candidates that we may pursue;
- the costs, timing and outcome of regulatory review of our product candidates;
- the costs and timing of future commercialization activities, including product manufacturing, marketing, sales and distribution, for any of our product candidates for which we receive marketing approval;
- the revenue, if any, received from commercial sales of our product candidates for which we receive marketing approval;
- our ability to establish collaborations to commercialize BT-11, NX-13 or any of our other product candidates outside the United States; and
- the costs and timing of preparing, filing and prosecuting patent applications, maintaining and enforcing our intellectual property rights and defending any intellectual property-related claims;

We will require additional capital to commercialize BT-11 and NX-13. If we receive regulatory approval for either of these product candidates, we expect to incur significant commercialization expenses related to product manufacturing, sales, marketing and distribution, depending on where we choose to commercialize. Additional funds may not be available on a timely basis, on favorable terms, or at all, and such funds, if raised, may not be sufficient to enable us to continue to implement our long-term business strategy. Further, our ability to raise additional capital may be adversely impacted by potential worsening global economic conditions and the recent disruptions to and volatility in the credit and financial markets in the United States and worldwide resulting from the ongoing COVID-19 pandemic. If we are unable to raise sufficient additional capital, we could be forced to curtail our planned operations and the pursuit of our growth strategy.

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

Until such time, if ever, as we can generate substantial revenue, we may finance our cash needs through a combination of equity offerings, government or private party grants, debt financings and license and collaboration agreements. We do not currently have any other committed external source of funds. 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 of these securities may include liquidation or other preferences that adversely affect your rights as a common stockholder. Debt financing and preferred equity financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends.

If we raise additional funds through collaborations, strategic alliances or marketing, distribution or licensing arrangements with third parties, we may be required to relinquish valuable rights to our technologies, future revenue streams or product candidates, grant licenses on terms that may not be favorable to us or commit to future payment streams. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce or terminate our product development or future commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves. Market volatility resulting from the COVID-19 pandemic or other factors may further adversely impact our ability to access capital as and when needed.

Risks related to the discovery, development and commercialization of our product candidates

Our business and operations may be adversely affected by the evolving and ongoing COVID-19 global pandemic.

Our business and operations may be adversely affected by the effects of the recent and evolving COVID-19 virus, which was declared by the World Health Organization as a global pandemic. The COVID-19 pandemic has resulted in travel and other restrictions in order to reduce the spread of the disease, including public health directives and orders in the United States and the European Union that, among other things and for various periods of time, directed individuals to shelter at their places of residence, directed businesses and governmental agencies to cease non-essential operations at physical locations, prohibited certain non-essential gatherings and events and ordered cessation of non-essential travel. Although our employees are no longer working remotely after the expiration of such orders in Virginia, future remote work policies and similar government orders or other restrictions on the conduct of business operations related to the COVID-19 pandemic may negatively impact productivity and may disrupt our ongoing research and development activities and our clinical programs and timelines, the magnitude of which will depend, in part, on the length and severity of the restrictions and other limitations on our ability to conduct our business in the ordinary course. Further, such orders also may impact the availability or cost of materials, which would disrupt our supply chain and manufacturing efforts and could affect our ability to conduct ongoing and planned clinical trials and preparatory activities.

Although our ongoing and planned clinical trials have not been impacted by the COVID-19 pandemic to date, we may experience related disruptions in the future that could severely impact our clinical trials, including:

- delays, difficulties or a suspension in clinical site initiation, including difficulties in recruiting clinical site investigators and clinical site staff;
- risk that participants enrolled in our clinical trials will contract COVID-19 while the clinical trial is ongoing, which could impact the results of the clinical trial, including by increasing the number of observed adverse events;

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- interruptions in our ability to manufacture and deliver drug supply for trials;
- diversion of healthcare resources away from the conduct of clinical trials, including the diversion of hospitals serving as our clinical trial sites and hospital staff supporting the conduct of our clinical trials;
- changes in local regulations as part of a response to the COVID-19 outbreak that may require us to change the ways in which our clinical trials are conducted, which may result in unexpected costs, or to discontinue the clinical trials altogether;
- interruption of key clinical trial activities, such as clinical trial site monitoring, and the ability or willingness of subjects to travel to trial sites due to limitations on travel imposed or recommended by federal or state governments, employers and others;
- limitations in employee resources that would otherwise be focused on the conduct of our clinical trials, including because of sickness of employees or their families or the desire of employees to avoid contact with large groups of people;
- delays in necessary interactions with local regulators, ethics committees and other important agencies and contractors due to limitations in employee resources or forced furlough of government employees; and
- refusal of the United States Food and Drug Administration, or the FDA, to accept data from clinical trials in these affected geographies.

The spread of COVID-19, which has caused a broad impact globally, may materially affect us economically. While the potential economic impact brought by, and the duration of, COVID-19 may be difficult to assess or predict, a widespread pandemic could result in significant disruption of global financial markets, reducing our ability to access capital, which could in the future negatively affect our liquidity. In addition, a recession or market correction resulting from the spread of COVID-19 could materially affect our business and the value of our common stock.

The global COVID-19 pandemic continues to rapidly evolve. The extent to which the COVID-19 pandemic impacts our business and operations, including our clinical development and regulatory efforts, will depend on future developments that are highly uncertain and cannot be predicted with confidence at the time of this prospectus, such as the ultimate geographic spread of the disease, the duration of the outbreak, the duration and effect of business disruptions and the short-term effects and ultimate effectiveness of the travel restrictions, quarantines, social distancing requirements and business closures in the United States and other countries to contain and treat the disease. Accordingly, we do not yet know the full extent of potential delays or impacts on our business, our clinical and regulatory activities, healthcare systems or the global economy as a whole. However, these impacts could adversely affect our business, financial condition, results of operations and growth prospects.

In addition, to the extent the ongoing COVID-19 pandemic adversely affects our business and results of operations, it may also have the effect of heightening many of the other risks and uncertainties described in this “Risk factors” section.

We currently have only two clinical-stage product candidates, BT-11 and NX-13. If we are unable to successfully develop, receive regulatory approval for and commercialize such product candidates for these or any other indications, or successfully develop any other product candidates, or experience significant delays in doing so, our business will be harmed.

We currently have no products that are approved for commercial sale. We currently have only two clinical-stage product candidates, BT-11 and NX-13. To date, we have not yet conducted any pivotal clinical trials. We have not completed the development of any product candidates, and we may never be able to develop marketable products.

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We have invested substantially all of our efforts and financial resources in the development of our clinical and preclinical product candidates and our LANCE platform. Our ability to generate revenue from our product candidates, which we do not expect will occur for several years, if ever, will depend heavily on the successful development, regulatory approval and eventual commercialization of our product candidates. The success of BT-11, NX-13 or any other product candidates that we develop or otherwise may acquire will depend on several factors, including:

- timely and successful completion of preclinical studies and clinical trials;
- sufficiency of our financial and other resources to complete the necessary preclinical studies and clinical trials;
- successful patient enrollment and completion of clinical trials;
- successful development of, or making arrangements with third-party manufacturers for, our commercial manufacturing processes for any of our product candidates that receive regulatory approval;
- timely receipt marketing approvals from applicable regulatory authorities;
- launching commercial sales of products, if approved;
- acceptance of our products, if approved, by patients, the medical community and third-party payors, for their approved indications;
- the prevalence and severity of adverse events experienced with BT-11, NX-13 or any other product candidates;
- the availability, perceived advantages, cost, safety and efficacy of alternative therapies for any product candidate, and any indications for such product candidate, that we develop, specifically alternative treatments for UC or Crohn's disease;
- our ability to produce BT-11, NX-13 or any other product candidates we develop on a commercial scale;
- obtaining and maintaining patent, trademark and trade secret protection and regulatory exclusivity for our product candidates and otherwise protecting our rights in our intellectual property portfolio;
- maintaining compliance with regulatory requirements, including current good manufacturing practices, or cGMPs, and complying effectively with other procedures;
- maintaining a continued acceptable safety, tolerability and efficacy profile of the products following approval;
- obtaining and maintaining patent protection, trade secret protection and regulatory exclusivity, both in the United States and internationally;
- the protection of our rights in our intellectual property portfolio;
- the successful launch of commercial sales following any marketing approval;
- a continued acceptable safety profile following any marketing approval;
- commercial acceptance by patients, the medical community and third-party payors; and
- our ability to compete with other therapies.

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We do not have complete control over many of these factors, including certain aspects of clinical development and the regulatory submission process, potential threats to our intellectual property rights and the manufacturing, marketing, distribution and sales efforts of any future collaborator. If we are not successful with respect to one or more of these factors in a timely manner or at all, we could experience significant delays or an inability to successfully commercialize the product candidates we develop, which would materially harm our business. If we do not receive marketing approvals for BT-11, NX-13 or any other product candidate we develop, we may not be able to continue our operations.

The regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time consuming and inherently unpredictable. If we are not able to obtain required regulatory approval for our product candidates, our business will be substantially harmed.

The time required to obtain approval or other marketing authorizations by the FDA and comparable foreign authorities is unpredictable, and it typically takes many years following the commencement of clinical trials and depends upon numerous factors, including the substantial discretion of the regulatory authorities. In addition, approval policies, regulations, and the type and amount of clinical data necessary to gain approval may change during the course of a product candidate's clinical development and may vary among jurisdictions. BT-11 and NX-13 are currently our only clinical-stage product candidates. We have not obtained regulatory approval for any product candidate, and it is possible that we may never obtain regulatory approval for BT-11, NX-13 or any product candidates we may seek to develop in the future. Neither we nor any current or future collaborator is permitted to market any drug product candidates in the United States until we receive regulatory approval of a new drug application, or NDA, from the FDA. To date, we have only had limited discussions with the European Medicines Agency, or EMA, and other comparable foreign authorities regarding regulatory approval for BT-11, NX-13 or any other product candidate outside of the United States.

Prior to obtaining approval to commercialize any drug product candidate in the United States or abroad, we must demonstrate with substantial evidence from well-controlled clinical trials, and to the satisfaction of the FDA or foreign regulatory agencies, that such product candidates are safe, pure and effective for their intended uses. Results from preclinical studies and clinical trials can be interpreted in different ways. Even if we believe the preclinical or clinical data for our product candidates are promising, such data may not be sufficient to support approval by the FDA and other regulatory authorities. The FDA may also require us to conduct additional preclinical studies or clinical trials for our product candidates either prior to or after approval, or it may object to elements of our clinical development programs.

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

We have invested a significant portion of our time and financial resources in the development of our clinical and preclinical product candidates, including BT-11 and NX-13. Our business is dependent on our ability to successfully complete preclinical and clinical development of, obtain regulatory approval for, and, if approved, successfully commercialize BT-11, NX-13 and any future product candidates in a timely manner.

Even if we eventually complete clinical testing and receive approval of a NDA or foreign marketing application for BT-11, NX-13 or any future product candidates, the FDA or the applicable foreign regulatory agency may grant approval or other marketing authorization contingent on the performance of costly additional clinical trials, including post-marketing clinical trials. The FDA or the applicable foreign regulatory agency also may approve or authorize for marketing a product candidate for a more limited indication or patient population

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than we originally request, and the FDA or applicable foreign regulatory agency may not approve or authorize the labeling that we believe is necessary or desirable for the successful commercialization of a product candidate. Any delay in obtaining, or inability to obtain, applicable regulatory approval or other marketing authorization would delay or prevent commercialization of that product candidate and would materially adversely impact our business and prospects.

In addition, the FDA and other regulatory authorities may change their policies, issue additional regulations or revise existing regulations, or take other actions, which may prevent or delay approval of our future products under development on a timely basis. Such policy or regulatory changes could impose additional requirements upon us that could delay our ability to obtain approvals, increase the costs of compliance or restrict our ability to maintain any marketing authorizations we may have obtained.

Clinical product development involves a lengthy and expensive process, with an uncertain outcome. We may incur additional costs and experience delays in completing, or ultimately be unable to complete, the development and commercialization of our product candidates.

In order to obtain FDA approval to market a new drug product we must demonstrate proof of safety, purity and efficacy in humans. The risk of failure for product candidates is high. It is impossible to predict when or if any of our product candidates will prove effective or safe in humans or will receive regulatory approval. Before obtaining marketing approval from regulatory authorities for the sale of any product candidate, we must complete preclinical development and then conduct extensive clinical trials to demonstrate the safety, purity, potency, and efficacy of our product candidates in humans. Clinical testing is expensive, difficult to design and implement, can take many years to complete and is inherently uncertain as to outcome. A failure of one or more clinical trials can occur at any stage of testing or at any time during the trial process. The outcome of preclinical testing and early clinical trials may not be predictive of the results of later clinical trials, and interim results of a clinical trial do not necessarily predict final results. Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their products.

We have not completed all clinical trials required for the approval of any of our product candidates. We cannot assure you that any clinical trial that we are conducting, or may conduct in the future, will demonstrate consistent or adequate efficacy and safety to obtain regulatory approval to market our product candidates.

We may incur additional costs and experience delays in ongoing clinical trials for our product candidates, and we do not know whether future clinical trials, if any, will begin on time, need to be redesigned, enroll an adequate number of patients on time or be completed on schedule, if at all. We may experience numerous unforeseen events during or as a result of clinical trials that could delay or prevent our ability to receive marketing approval or commercialize our product candidates, including:

- regulators or institutional review boards may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;
- we may experience delays in reaching, or fail to reach, agreement on acceptable clinical trial contracts or clinical trial protocols with prospective trial sites or prospective contract research organizations, or CROs, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- clinical trials of our product candidates may produce negative or inconclusive results, including failure to demonstrate statistical significance, and we may decide, or regulators may require us, to conduct additional clinical trials or abandon product development programs;

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- the number of patients required for clinical trials of our product candidates may be larger than we anticipate, enrollment in these clinical trials may be slower than we anticipate or participants may drop out of these clinical trials or fail to return for post-treatment follow-up at a higher rate than we anticipate;
- our product candidates may have undesirable side effects or other unexpected characteristics, causing us or our investigators, regulators or institutional review boards to suspend or terminate the trials;
- our third-party contractors may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;
- regulators or institutional review boards may require that we or our investigators suspend or terminate clinical development for various reasons, including noncompliance with regulatory requirements or a finding that the participants are being exposed to unacceptable health risks;
- the cost of clinical trials of our product candidates may be greater than we anticipate; and
- the supply or quality of our product candidates or other materials necessary to conduct clinical trials of our product candidates may be insufficient or inadequate.

If we experience delays in the completion of, or termination of, any clinical trial of our product candidates, the commercial prospects of our product candidates will be harmed, and our ability to generate product revenues from any of these product candidates will be delayed. In addition, any delays in completing our clinical trials will increase our costs, slow down our product candidate development and approval process and jeopardize our ability to commence product sales and generate revenues.

If we are required to conduct additional clinical trials or other testing of our product candidates beyond those that we currently contemplate, if we are unable to successfully complete clinical trials of our product candidates or other testing, if the results of these trials or tests are not favorable or if there are safety concerns, we may:

- be delayed in obtaining marketing approval for our product candidates;
- not obtain marketing approval at all;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- obtain approval with labeling that includes significant use or distribution restrictions or safety warnings;
- be subject to additional post-marketing testing requirements; or
- have the product removed from the market after obtaining marketing approval.

Success in preclinical studies or earlier clinical trials may not be indicative of results in future clinical trials.

Success in preclinical testing and early clinical trials does not ensure that later clinical trials will generate the same results or otherwise provide adequate data to demonstrate the efficacy and safety of a product candidate. Preclinical tests and Phase 1 and Phase 2 clinical trials are primarily designed to test safety, to study pharmacokinetics and pharmacodynamics and to understand the side effects of product candidates at various doses and schedules. Success in preclinical or animal studies and early clinical trials does not ensure that later large-scale efficacy trials will be successful nor does it predict final results. Our product candidates may fail to show the desired safety and efficacy in clinical development despite positive results in preclinical studies or having successfully advanced through initial clinical trials, particularly because we are targeting novel pathways that have not yet been tested in later-stage clinical trials.

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Many companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in late-stage clinical trials even after achieving promising results in preclinical testing and earlier-stage clinical trials. Data obtained from preclinical and clinical activities are subject to varying interpretations, which may delay, limit or prevent regulatory approval. In addition, we may experience regulatory delays or rejections as a result of many factors, including changes in regulatory policy during the period of our product candidate development. Any such delays could negatively impact our business, financial condition, results of operations and prospects.

We may seek orphan drug designation for some of our product candidates and we may be unsuccessful, or may be unable to maintain the benefits associated with orphan drug designation, including the potential for market exclusivity, for product candidates for which we obtain orphan drug designation.

Regulatory authorities in some jurisdictions, including the United States, may designate drugs or biologics intended to treat relatively small patient populations as orphan drug products. Under the Orphan Drug Act, the FDA may designate a drug or biologic as an orphan drug if it is intended to treat a rare disease or condition, which is generally defined as a patient population of fewer than 200,000 individuals in the United States, or a patient population greater than 200,000 in the United States where there is no reasonable expectation that the cost of developing the drug will be recovered from sales in the United States.

If a drug or biologic with an orphan drug designation subsequently receives the first marketing approval for the indication for which it has such designation, the drug or biologic is entitled to a period of marketing exclusivity, which precludes the FDA from approving another marketing application for the same drug and indication for that time period, except in limited circumstances. If our competitors are able to obtain orphan drug exclusivity prior to us, for products that constitute the “same drug” and treat the same indications as our product candidates, we may not be able to have competing products approved by the applicable regulatory authority for a significant period of time. The applicable period is seven years in the United States.

We intend to seek orphan designation for a modified formulation of BT-11 for the treatment of eosinophilic esophagitis. However, we may be unsuccessful in obtaining orphan drug designation for this or other product candidates, and may be unable to maintain the benefits associated with orphan drug designation. Even if we obtain orphan drug exclusivity for any of our product candidates, that exclusivity may not effectively protect those product candidates from competition because different drugs can be approved for the same condition, and orphan drug exclusivity does not prevent the FDA from approving the same or a different drug in another indication. Even after an orphan drug is granted orphan exclusivity and approved, the FDA can subsequently approve a later application for the same drug for the same condition before the expiration of the seven-year exclusivity period if the FDA concludes that the later drug is clinically superior in that it is shown to be safer in a substantial portion of the target populations, more effective or makes a major contribution to patient care. In addition, a designated orphan drug may not receive orphan drug exclusivity if it is approved for a use that is broader than the indication for which it received orphan designation. Moreover, orphan-drug-exclusive marketing rights in the United States may be lost if the FDA later determines that the request for designation was materially defective or if we are unable to manufacture sufficient quantities of the product to meet the needs of patients with the rare disease or condition. Orphan drug designation neither shortens the development time or regulatory review time of a drug nor gives the drug any advantage in the regulatory review or approval process.

Interim “top-line” and preliminary results from our clinical trials that we announce or publish from time to time may change as more patient data become available and are subject to audit and verification procedures that could result in material changes in the final data.

From time to time, we may publish interim top-line or preliminary results from our preclinical studies and clinical trials, which are based on a preliminary analysis of then-available data, and the results and related

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findings and conclusions are subject to change following a more comprehensive review of the data related to the particular study or trial. Interim results 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. Preliminary or top-line results 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, interim and preliminary data should be viewed with caution until the final data are available. Differences between preliminary or interim data and final data could significantly harm our business prospects and may cause the trading price of our common stock to fluctuate significantly.

Further, others, including regulatory agencies, 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. In addition, the information we choose to publicly disclose regarding a particular study or clinical trial is based on what is typically extensive information, and investors or others may not agree with what we determine is material or otherwise appropriate information to include in our disclosure.

Our clinical trials may fail to demonstrate the safety and efficacy of our product candidates, or serious adverse or unacceptable side effects may be identified during the development of our product candidates, which could prevent or delay regulatory approval and commercialization, increase our costs or necessitate the abandonment or limitation of the development of some of our product candidates.

Before obtaining regulatory approvals for the commercial sale of our product candidates, we must demonstrate through lengthy, complex and expensive preclinical testing and clinical trials that our product candidates are safe, pure and effective for use in each target indication, and failures can occur at any stage of testing. Clinical trials often fail to demonstrate safety or efficacy of the product candidate studied for the target indication.

If our product candidates are associated with side effects in clinical trials or have characteristics that are unexpected, we may need to abandon their development or limit development to more narrow uses in which the side effects or other characteristics are less prevalent, less severe or more acceptable from a risk-benefit perspective. The FDA or an institutional review board may also require that we suspend, discontinue, or limit our clinical trials based on safety information, or that we conduct additional animal or human studies regarding the safety and efficacy of our product candidates which we have not planned or anticipated. Such findings could further result in regulatory authorities failing to provide marketing authorization for our product candidates or limiting the scope of the approved indication, if approved. Many product candidates that initially showed promise in early stage testing have later been found to cause side effects that prevented further development of the product candidate.

Additionally, if one or more of our product candidates receives marketing approval, and we or others identify undesirable side effects caused by such products, a number of potentially significant negative consequences could result, including:

- regulatory authorities may withdraw approvals of such product;
- regulatory authorities may require additional warnings on the labels;
- we may be required to create a medication guide outlining the risks of such side effects for distribution to patients;
- we could be sued and held liable for harm caused to patients;

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- we may not be able to achieve or maintain third-party payor coverage and adequate reimbursement; and
- our reputation and physician or patient acceptance of our products may suffer.

There can be no assurance that we will resolve any issues related to any product-related adverse events to the satisfaction of the FDA or foreign regulatory agency in a timely manner or at all. Moreover, any of these events could prevent us from achieving or maintaining market acceptance of the particular product candidate, if approved, and could significantly harm our business, results of operations and prospects.

As an organization, we have never conducted pivotal clinical trials, and we may be unable to do so for any product candidates we may develop.

We will need to successfully complete pivotal clinical trials in order to obtain the approval of the FDA, EMA or other regulatory agencies to market BT-11, NX-13 or any future product candidate. Carrying out pivotal clinical trials is a complicated process. As an organization, we have not previously conducted any later stage or pivotal clinical trials. In order to do so, we will need to expand our clinical development and regulatory capabilities, and we may be unable to recruit and train qualified personnel. We also expect to continue to rely on third parties to conduct our pivotal clinical trials. See “—Risks related to our dependence on third parties—We will rely on third parties to conduct our future clinical trials for product candidates, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials.” Consequently, we may be unable to successfully and efficiently execute and complete necessary clinical trials in a way that leads to NDA submission and approval of BT-11, NX-13 or future product candidates. We may require more time and incur greater costs than our competitors and may not succeed in obtaining regulatory approvals of product candidates that we develop. Failure to commence or complete, or delays in, our planned clinical trials, could prevent us from or delay us in commercializing our product candidates.

If we experience delays or difficulties in the enrollment and/or maintenance of patients in clinical trials, our receipt of necessary regulatory approvals could be delayed or prevented.

Successful and timely completion of clinical trials will require that we enroll a sufficient number of patients. Patient enrollment, a significant factor in the timing of clinical trials, is affected by many factors, including the size and nature of the patient population and competition for patients with other trials. For example, we are aware of multiple clinical trials for the treatment of UC and Crohn’s disease being conducted by competitors that may make it difficult for us to enroll sufficient patients. Trials may be subject to delays as a result of patient enrollment taking longer than anticipated or patient withdrawal. We may not be able to initiate or continue clinical trials for our product candidates if we are unable to locate and enroll a sufficient number of eligible patients to participate in these trials as required by the FDA or foreign regulatory authorities. We cannot predict how successful we will be at enrolling subjects in future clinical trials. Subject enrollment is affected by other factors including:

- the eligibility criteria for the trial in question;
- the size of the patient population and process for identifying patients;
- the perceived risks and benefits of the product candidate in the trial;
- the availability of competing commercially available therapies and other competing drug candidates’ clinical trials;
- the willingness of patients to be enrolled in our clinical trials;
- the efforts to facilitate timely enrollment in clinical trials;

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- potential disruptions caused by the COVID-19 pandemic, including difficulties in initiating clinical sites, enrolling and retaining participants, diversion of healthcare resources away from clinical trials, travel or quarantine policies that may be implemented, and other factors;
- the patient referral practices of physicians;
- the ability to monitor patients adequately during and after treatment; and
- the proximity and availability of clinical trial sites for prospective patients.

Our inability to enroll a sufficient number of patients for clinical trials would result in significant delays and could require us to abandon one or more clinical trials altogether. Enrollment delays in these clinical trials may result in increased development costs for our product candidates, which would cause the value of our company to decline and limit our ability to obtain additional financing. Furthermore, we rely on and expect to continue to rely on CROs and clinical trial sites to ensure the proper and timely conduct of our clinical trials and we will have limited influence over their performance.

Furthermore, even if we are able to enroll a sufficient number of patients for our clinical trials, we may have difficulty maintaining enrollment of such patients in our clinical trials.

Changes in methods of product candidate manufacturing or formulation may result in additional costs or delay.

As product candidates proceed through preclinical studies to late-stage clinical trials towards potential approval and commercialization, it is common that various aspects of the development program, such as manufacturing methods and formulation, are altered along the way in an effort to optimize processes and product characteristics. Such changes carry the risk that they will not achieve these intended objectives. 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 materials manufactured using altered processes. Such changes may also require additional testing, FDA notification or FDA approval. This could delay completion of clinical trials, require the conduct of bridging clinical trials or the repetition of one or more clinical trials, increase clinical trial costs, delay approval of our product candidates and jeopardize our ability to commence sales and generate revenue.

We may not be successful in our efforts to increase our pipeline of product candidates, including through our LANCE platform, by pursuing additional indications for our current product candidates or by in-licensing or acquiring additional product candidates for other diseases.

A key element of our strategy is to build and expand our pipeline of product candidates. We have developed the LANCE platform to enable the identification, testing, design and development of new product candidates. We cannot assure you that our LANCE platform will work, nor that any of these potential targets or other aspects of our platform will yield product candidates that could enter clinical development and, ultimately, be commercially valuable. Although we expect to continue to enhance the capabilities of our LANCE platform by developing and integrating existing and new research technologies, we may not be successful in any of our enhancement and development efforts. If our enhancement or development efforts are unsuccessful, we may not be able to advance our drug discovery capabilities as quickly as we expect or identify as many potential drug candidates as we desire.

In addition, we may in-license or acquire additional product candidates for other diseases. We may not be able to identify or develop product candidates that are safe, tolerable and effective. Even if we are successful in continuing to build our pipeline, the potential product candidates that we identify, in-license or acquire may not be suitable for clinical development, including as a result of being shown to have harmful side effects or other characteristics that indicate that they are unlikely to be products that will receive marketing approval and achieve market acceptance.

We may expend our limited resources to pursue a particular product candidate or indication and fail to capitalize on product candidates or indications that may be more profitable or for which there is a greater likelihood of success.

Because we have limited financial and management resources, we focus on development programs and product candidates that we identify for specific indications. As such, we are currently primarily focused on the development of BT-11 and NX-13 for the treatment of UC and Crohn's disease. As a result, we may forego or delay pursuit of opportunities with other product candidates or for other indications for BT-11 and NX-13 that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. Our spending on current and future development programs and product candidates for specific indications may not yield any commercially viable products. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate.

We intend to explore the use of BT-11 and NX-13, and potentially other product candidates, in combination with other therapies, which exposes us to additional risks.

We intend to explore the use of BT-11 and NX-13 and likely other future product candidates in combination with one or more other approved or unapproved therapies to treat UC and CD.

Even if any product candidate we develop were to receive marketing approval or be commercialized for use in combination with other existing therapies, we would continue to be subject to the risks that the FDA, EMA or comparable foreign regulatory authorities outside of the United States could revoke approval of the therapy used in combination with our product or that safety, efficacy, manufacturing or supply issues could arise with any of those existing therapies. If the therapies we use in combination with our product candidates are replaced as the standard of care for the indications we choose for any of our product candidates, the FDA, EMA or comparable foreign regulatory authorities may require us to conduct additional clinical trials. The occurrence of any of these risks could result in our own products, if approved, being removed from the market or being less successful commercially.

We also may choose to evaluate BT-11 and NX-13 or any other future product candidates in combination with one or more therapies that have not yet been approved for marketing by the FDA, EMA or comparable foreign regulatory authorities. We will not be able to market and sell BT-11 or NX-13 or any product candidate we develop in combination with an unapproved therapy for a combination indication if that unapproved therapy does not ultimately obtain marketing approval either alone or in combination with our product. In addition, unapproved therapies face the same risks described with respect to our product candidates currently in development and clinical trials, including the potential for serious adverse effects, delay in their clinical trials and lack of FDA approval.

If the FDA, EMA or comparable foreign regulatory authorities do not approve these other drugs or revoke their approval of, or if safety, efficacy, quality, manufacturing or supply issues arise with, the drugs we choose to evaluate in combination with our product candidate we develop, we may be unable to obtain approval of or market such combination therapy.

The United Kingdom's withdrawal from the European Union may have a negative effect on global economic conditions, financial markets and our business.

Following the result of a referendum in 2016, the United Kingdom left the European Union on January 31, 2020, commonly referred to as Brexit. Pursuant to the formal withdrawal arrangements agreed to by the United

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Kingdom and the European Union, the United Kingdom will be subject to a transition period until December 31, 2020, or the Transition Period, during which European Union rules will continue to apply. Negotiations between the United Kingdom and the European Union are expected to continue in relation to the customs and trading relationship between the United Kingdom and the European Union following the expiry of the Transition Period.

Since a significant proportion of the regulatory framework in the United Kingdom applicable to our business and our product candidates is derived from European Union directives and regulations, Brexit, following the Transition Period, could materially impact the regulatory regime with respect to the development, manufacture, importation, approval and commercialization of our product candidates in the United Kingdom or the European Union. For example, as a result of the uncertainty surrounding Brexit, the EMA relocated to Amsterdam from London. Following the Transition Period, the United Kingdom will no longer be covered by the centralized procedures for obtaining European Union-wide marketing and manufacturing authorizations from the EMA and, unless a specific agreement is entered into, a separate process for authorization of drug products will be required in the United Kingdom, the potential process for which is currently unclear. Any delay in obtaining, or an inability to obtain, any marketing approvals, as a result of Brexit or otherwise, would prevent us from commercializing our product candidates in the United Kingdom or the European Union and limit our ability to generate revenue and achieve and sustain profitability. In addition, we may be required to pay taxes or duties or be subjected to other hurdles in connection with the importation of our product candidates into the European Union, or we may incur expenses in establishing a manufacturing facility in the European Union in order to circumvent such hurdles. If any of these outcomes occur, we may be forced to restrict or delay efforts to seek regulatory approval in the United Kingdom or the European Union for our product candidates, or incur significant additional expenses to operate our business, which could significantly and materially harm or delay our ability to generate revenues or achieve profitability of our business. Any further changes in international trade, tariff and import/export regulations as a result of Brexit or otherwise may impose unexpected duty costs or other non-tariff barriers on us. These developments, or the perception that any of them could occur, may significantly reduce global trade and, in particular, trade between the impacted nations and the United Kingdom. It is also possible that Brexit may negatively affect our ability to attract and retain employees, particularly those from the European Union.

Risks related to the commercialization of our product candidates

Even if any of our product candidates receive marketing approval, they may fail to achieve the degree of market acceptance by physicians, patients, third-party payors and others in the medical community necessary for commercial success.

If any of our product candidates receive marketing approval, they may nonetheless fail to gain sufficient market acceptance by physicians, patients, third-party payors and others in the medical community. If our product candidates do not achieve an adequate level of acceptance, we may not generate significant revenue and we may not become profitable. The degree of market acceptance of our product candidates, if approved for commercial sale, will depend on a number of factors, including:

- the efficacy, safety and potential advantages compared to alternative treatments;
- the timing of market introduction of the product candidate as well as competitive products;
- our ability to offer our products for sale at competitive prices;
- the convenience and ease of administration compared to alternative treatments;
- product labeling or product insert requirements of the FDA or foreign regulatory authorities, including any limitations or warnings contained in a product's approved labeling, including any black box warning;

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- the availability of the approved product candidate for use as a combination therapy;
- the willingness of the target patient population to try new treatments and of physicians to prescribe these treatments;
- our ability to hire and retain a sales force in the United States;
- the strength of marketing and distribution support;
- the availability of third-party coverage and adequate reimbursement for BT-11, NX-13 and any other product candidates, once approved;
- the prevalence and severity of any side effects; and
- any restrictions on the use of our products together with other medications.

If we are unable to establish sales, marketing and distribution capabilities for BT-11, NX-13 or any other product candidate that may receive regulatory approval, we may not be successful in commercializing those product candidates if and when they are approved.

We do not have sales or marketing infrastructure. To achieve commercial success for BT-11, NX-13 or any other product candidate for which we may obtain marketing approval, we will need to establish a sales and marketing organization. In the future, we expect to build a focused sales and marketing infrastructure to market some of our product candidates in the United States, if and when they are approved. 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. This may be costly, and our investment would be lost if we cannot retain or reposition our sales and marketing personnel.

Factors that may inhibit our efforts to market our products on our own include:

- our inability to recruit, train and retain adequate numbers of effective sales and marketing personnel;
- the inability of sales personnel to obtain access to physicians in order to educate physicians about our product candidates, once approved;
- the lack of complementary products to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines; and
- unforeseen costs and expenses associated with creating an independent sales and marketing organization.

If we are unable to establish our own sales, marketing and distribution capabilities and are forced to enter into arrangements with, and rely on, third parties to perform these services, our revenue and our profitability, if any, are likely to be lower than if we had developed such capabilities ourselves. In addition, we may not be successful in entering into arrangements with third parties to sell, market and distribute our product candidates or may be unable to do so on terms that are favorable to us. We likely will have little control over such third parties, and any of them may fail to devote the necessary resources and attention to sell and market our products effectively. If we do not establish sales, marketing and distribution capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our product candidates.

We face substantial competition, which may result in a smaller than expected commercial opportunity and/or others discovering, developing or commercializing products before or more successfully than we do.

The biotechnology and pharmaceutical industries, and particularly the market for the treatment of autoimmune diseases, are characterized by rapidly advancing technologies, intense competition and a strong emphasis on proprietary and novel products and product candidates. We face competition with respect to our current product candidates, and will face competition with respect to any product candidates that we may seek to develop or commercialize in the future, from many different sources, including major pharmaceutical and specialty pharmaceutical companies, compounding facilities, academic institutions and governmental agencies and public and private research institutions.

We are aware of several other products and product candidates as potential treatments for UC and Crohn's disease that would compete with BT-11 and NX-13, if approved. In particular, we expect to compete against companies that produce biologic drugs that currently dominate the UC and Crohn's disease market, as well as companies that produce the aminosalicylates, steroids and immunosuppressants that are currently used to treat patients with mild to moderate disease.

In addition, our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer or more effective, have fewer or less severe side effects, are more convenient or are less expensive than BT-11, NX-13 or any other product that we may develop. Our competitors also may obtain FDA or other regulatory approval for their products more rapidly than we may obtain approval for our product, which could result in our competitors establishing a strong market position before we are able to enter the market.

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 industries 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 that may be necessary for, our programs.

The success of BT-11, NX-13 or any future product candidate, will depend significantly on coverage and adequate reimbursement or the willingness of patients to pay for these products.

We believe our success depends on obtaining and maintaining coverage and adequate reimbursement for BT-11 and NX-13 for the treatment of UC and Crohn's disease, and the extent to which patients will be willing to pay out-of-pocket for such products, in the absence of reimbursement for all or part of the cost. Additionally, in the United States, there is no uniform policy of coverage and reimbursement among third-party payors. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own coverage and reimbursement policies. However, decisions regarding the extent of coverage and amount of reimbursement to be provided are made on a payor-by-payor basis. One payor's determination to provide coverage for a drug product does not assure that other payors will also provide coverage, and adequate reimbursement.

Third-party payors determine which products they will cover and establish reimbursement levels. Even if a third-party payor covers a particular product, the resulting reimbursement payment rates may not be adequate. Reimbursement by a third-party payor may depend upon a number of factors, including the third-party payor's determination that a product is safe, effective and medically necessary; appropriate for the

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specific patient; cost-effective; supported by peer-reviewed medical journals; included in clinical practice guidelines; and neither cosmetic, experimental, nor investigational.

Increasingly, third-party payors are requiring that drug companies provide them with predetermined discounts from list prices and are challenging the prices charged for medical products. Further, such payors are increasingly challenging the price, examining the medical necessity and reviewing the cost effectiveness of medical product candidates. There may be especially significant delays in obtaining coverage and reimbursement for newly approved drugs. Third-party payors may limit coverage to specific product candidates on an approved list, known as a formulary, which might not include all FDA-approved drugs for a particular indication. We may need to conduct expensive pharmaco-economic studies to demonstrate the medical necessity and cost effectiveness of our products. Nonetheless, our product candidates may not be considered medically necessary or cost effective. We cannot be sure that coverage and reimbursement will be available for any product that we commercialize and, if reimbursement is available, what the level of reimbursement will be.

Foreign governments also have their own healthcare reimbursement systems, which vary significantly by country and region, and we cannot be sure that coverage and adequate reimbursement will be made available with respect to the treatments in which our products are used under any foreign reimbursement system.

There can be no assurance that BT-11, NX-13 or any other product candidate, if approved for sale in the United States or in other countries, will be considered medically reasonable and necessary, that it will be considered cost-effective by third-party payors, that coverage or an adequate level of reimbursement will be available or that reimbursement policies and practices in the United States and in foreign countries where our products are sold will not adversely affect our ability to sell our product candidates profitably, if they are approved for sale.

The market for BT-11, NX-13 or any other product candidates may be smaller than we expect.

Our estimates of the potential market opportunity for BT-11, NX-13 or any other product candidates include several key assumptions based on our industry knowledge, industry publications and third-party research reports. These assumptions include the number of patients who have the autoimmune diseases we intend to target, as well as the estimated reimbursement levels for each product candidate if approved. However, there can be no assurance that any of these assumptions are, or will remain, accurate. Further, new studies may change the estimated incidence or prevalence of these diseases, and the potentially addressable patient population for our product candidates may not ultimately be amenable to treatment with our product candidates. If the actual market for BT-11, NX-13 or for any other product candidates we may develop is smaller than we expect, our revenues, if any, may be limited and it may be more difficult for us to achieve or maintain profitability.

Product liability lawsuits against us could cause us to incur substantial liabilities and to limit commercialization of any products that we may develop.

We face an inherent risk of product liability exposure related to the testing of our product candidates in human clinical trials and will face an even greater risk if we commercially sell any products that we may develop. If we cannot successfully defend ourselves against claims that our product candidates or drugs caused injuries, we will incur substantial liabilities. Regardless of merit or eventual outcome, liability claims may result in:

- decreased demand for any product candidates or drugs that we may develop;
- injury to our reputation and significant negative media attention;
- withdrawal of clinical trial participants;
- significant costs to defend the related litigation;

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- substantial monetary awards paid to trial participants or patients;
- loss of revenue;
- reduced resources of our management to pursue our business strategy; and
- the inability to commercialize any products that we may develop.

Although we maintain product liability insurance coverage, such insurance may not be adequate to cover all liabilities that we may incur. We may need to increase our insurance coverage as we expand our clinical trials or if we commence commercialization of our product candidates. Insurance coverage is increasingly expensive. We may not be able to maintain insurance coverage at a reasonable cost or in an amount adequate to satisfy any liability that may arise.

Our business and operations would suffer in the event of computer system failures, cyberattacks or a deficiency in our cybersecurity.

Despite the implementation of security measures, our internal computer systems, and those of third parties on which we rely, are vulnerable to damage from computer viruses, malware, natural disasters, terrorism, war, telecommunication and electrical failures, cyberattacks or cyber-intrusions over the Internet, attachments to emails, persons inside our organization, or persons with access to systems inside our organization. The risk of a security breach or disruption, particularly through cyberattacks or cyber intrusion, including by computer hackers, “phishing” attacks, foreign governments, and cyber terrorists, has generally increased as the number, intensity and sophistication of attempted attacks and intrusions from around the world have increased. If such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our product development programs. For example, the loss of clinical trial data from completed or ongoing or planned clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. The techniques used by cyber criminals change frequently, may not be recognized until launched and can originate from a wide variety of sources, including outside groups such as external service providers, organized crime affiliates, terrorist organizations or hostile foreign governments or agencies. We cannot assure you that our security measures will prevent significant breakdowns, data leakages or breaches in our systems or those of our CROs and other contractors and consultants. As a result of the COVID-19 pandemic, we may face increased cybersecurity risks due to our reliance on internet technology and the number of our employees that are working remotely, which may create additional opportunities for cybercriminals to exploit vulnerabilities. For example, companies have experienced an increase in phishing and social engineering attacks from third parties in connection with the COVID-19 global pandemic. To the extent that any disruption or security breach was to result in a loss of or damage to our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur material legal claims and liability and damage to our reputation, and the further development of our product candidates could be delayed.

We maintain a large quantity of sensitive information, including confidential business and personal information in connection with the conduct of our clinical trials and related to our employees, and we are subject to laws and regulations governing the privacy and security of such information.

In the United States, there are numerous federal and state privacy and data security laws and regulations governing the collection, use, disclosure and protection of personal information, including federal and state health information privacy laws, federal and state security breach notification laws, and federal and state consumer protection laws. Each of these constantly evolving laws can be subject to varying interpretations. In addition, we may obtain health information from third parties (including research institutions from which we obtain clinical trial data) that are subject to privacy and security requirements under HIPAA. Depending on the facts and circumstances, we could be subject to criminal penalties if we knowingly obtain, use, or disclose

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individually identifiable health information maintained by a HIPAA-covered entity in a manner that is not authorized or permitted by HIPAA.

Even when HIPAA does not apply, according to the Federal Trade Commission, or the FTC, violating consumers' privacy rights or failing to take appropriate steps to keep consumers' personal information secure may constitute unfair acts or practices in or affecting commerce in violation of Section 5(a) of the FTC Act. The FTC expects a company's data security measures to be reasonable and appropriate in light of the sensitivity and volume of consumer information it holds, the size and complexity of its business, and the cost of available tools to improve security and reduce vulnerabilities. Individually identifiable health information is considered sensitive data that merits stronger safeguards.

Foreign data protection laws, including without limitation, the European Union General Data Protection Regulation or the GDPR, which became effective in May 2018, and member state data protection legislation, may also apply to health-related and other personal information obtained outside of the United States. The GDPR governs the collection, use, disclosure, transfer or other processing of personal data of individuals within the European Economic Area, or the EEA. Among other things, the GDPR imposes strict obligations on the ability to process health-related and other personal data of data subjects in the EEA. The GDPR imposes requirements relating to the consent of the individuals to whom the personal data relates, including detailed notices for clinical trial subjects and investigators. The GDPR also includes certain requirements regarding the security of personal data and notification of data processing obligations or security incidents to appropriate data protection authorities or data subjects as well as requirements for establishing a lawful basis on which personal data can be processed. In addition, the GDPR increases the scrutiny of transfers of personal data from clinical trial sites located in the EEA to the United States and other jurisdictions that the European Commission does not recognize as having "adequate" data protection laws. Recent legal developments in Europe have created complexity and compliance uncertainty regarding certain transfers of personal data from the EEA. For example, on July 16, 2020, the Court of Justice of the European Union, or the CJEU, invalidated the EU-US Privacy Shield Framework, or the Privacy Shield, under which personal data could be transferred from the EEA to United States entities who had self-certified under the Privacy Shield scheme. While the CJEU upheld the adequacy of the standard contractual clauses (a standard form of contract approved by the European Commission as an adequate personal data transfer mechanism, and potential alternative to the Privacy Shield), it made clear that reliance on them alone may not necessarily be sufficient in all circumstances. Use of the standard contractual clauses must now be assessed on a case-by-case basis taking into account the legal regime applicable in the destination country, in particular applicable surveillance laws and rights of individuals. The GDPR imposes substantial fines for breaches and violations (up to the greater of €20 million or 4% of our consolidated annual worldwide gross revenue). The GDPR also confers a private right of action on data subjects and consumer associations to lodge complaints with supervisory authorities, seek judicial remedies and obtain compensation for damages resulting from violations of the GDPR.

Further, following Brexit and the end of the Transition Period, we will have to comply with the GDPR and separately the GDPR as implemented in the United Kingdom, each regime having the ability to fine up to the greater of €20 million / £17 million or 4% of global turnover. The relationship between the United Kingdom and the European Union in relation to certain aspects of data protection law remains unclear, including how data transfers between European Union member states and the United Kingdom will be treated. These changes may lead to additional compliance costs and could increase our overall risk.

Compliance with these and any other applicable privacy and data security laws and regulations is a rigorous and time-intensive process, and we may be required to put in place additional mechanisms ensuring compliance with the new data protection rules. If we fail to comply with any such laws or regulations, we may face significant fines and penalties that could adversely affect our business, financial condition and results of operations. Furthermore, the laws are not consistent, and compliance in the event of a widespread data breach

is costly. In addition, states are constantly adopting new laws or amending existing laws, requiring attention to frequently changing regulatory requirements. For example, California enacted the California Consumer Privacy Act, or the CCPA, on June 28, 2018, which took effect on January 1, 2020 and has been dubbed the first “GDPR-like” law in the United States. The CCPA gives California residents expanded rights to access and delete their personal information, opt out of certain personal information sharing and receive detailed information about how their personal information is used by requiring covered companies to provide new disclosures to California consumers (as that term is broadly defined) and provide such consumers new ways to opt-out of certain sales of personal information. The CCPA provides for civil penalties for violations, as well as a private right of action for data breaches that is expected to increase data breach litigation. The CCPA may increase our compliance costs and potential liability. Some observers have noted that the CCPA could mark the beginning of a trend toward more stringent privacy legislation in the United States. Other states are beginning to pass similar laws. For example, an amendment to Nevada’s privacy laws, which went into effect October 1, 2019, requires us to offer to consumers the right to opt-out of the sale of their personal information.

Risks related to our dependence on third parties

We rely on third parties to conduct a significant portion of our existing clinical trials and potential future clinical trials for product candidates, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials.

To date, we have generally engaged CROs to conduct our ongoing and completed clinical trials of BT-11 and NX-13. We expect to engage CROs for future clinical trials for BT-11, NX-13 or other product candidates that we may progress to clinical development. We expect to continue to rely on third parties, including clinical data management organizations, medical institutions and clinical investigators, to conduct those clinical trials. Any of these third parties may terminate their engagements with us, some in the event of an uncured material breach and some at any time for convenience. If any of our relationships with these third parties terminate, we may not be able to timely enter into arrangements with alternative third parties or to do so on commercially reasonable terms, if at all. Switching or adding CROs involves substantial cost and requires management time and focus. In addition, there is a natural transition period when a new CRO commences work. As a result, delays occur, which can materially impact our ability to meet our desired clinical development timelines. Though we intend to carefully manage our relationships with our CROs, there can be no assurance that we will not encounter 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. Further, the performance of our CROs may also be interrupted by the ongoing COVID-19 pandemic, including due to travel or quarantine policies, heightened exposure of CRO staff who are healthcare providers to COVID-19 or prioritization of resources toward the pandemic.

In addition, 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 clinical programs. 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, regulatory requirements or for other reasons, our clinical trials may be extended, delayed or terminated and we may not be able to obtain regulatory approval for or successfully commercialize our product candidates. Consequently, our results of operations and the commercial prospects for our product candidates would be harmed, our costs could increase substantially and our ability to generate revenue could be delayed significantly.

We rely on these parties for execution of our preclinical studies and clinical trials, and generally do not control their activities. Our reliance on these third parties for research and development activities will reduce our

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control over these activities but will not relieve us of our responsibilities. For example, we will remain responsible for ensuring that each of our clinical trials is conducted in accordance with the general investigational plan and protocols for the trial. Moreover, the FDA requires us to comply with standards, commonly referred to as good clinical practices, or GCPs, for conducting, recording and reporting the results of clinical trials to assure that data and reported results are credible and accurate and that the rights, integrity and confidentiality of trial participants are protected. We also are required to register ongoing clinical trials and post the results of completed clinical trials on a government-sponsored database, ClinicalTrials.gov, within specified timeframes. Failure to do so can result in fines, adverse publicity and civil and criminal sanctions. If we or any of our CROs or other third parties, including trial sites, fail to comply with applicable GCPs, the clinical data generated in our clinical trials may be deemed unreliable and the FDA, EMA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. We cannot assure you that upon inspection by a given regulatory authority, such regulatory authority will determine that any of our clinical trials complies with GCP regulations. In addition, our clinical trials must be conducted with product produced under cGMP conditions. Our failure to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory approval process.

In addition, principal investigators for our clinical trials may serve as scientific advisors or consultants to us from time to time and receive compensation in connection with such services. Under certain circumstances, we may be required to report some of these relationships to the FDA. The FDA may conclude that a financial relationship between us and a principal investigator has created a conflict of interest or otherwise affected interpretation of the trial. The FDA may therefore question the integrity of the data generated at the applicable clinical trial site and the utility of the clinical trial itself may be jeopardized. This could result in a delay in approval, or rejection, of our marketing applications by the FDA and may ultimately lead to the denial of marketing approval of BT-11, NX-13 or any other product candidates.

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

We contract with third parties for the manufacture of BT-11 and NX-13 for clinical drug supply and expect to continue to do so for commercialization if approved. This reliance on third parties increases the risk that we will not have sufficient quantities of our product candidates or such quantities at an acceptable cost, which could delay, prevent or impair our development or commercialization efforts.

We do not have any cGMP manufacturing facilities. We currently rely, and expect to continue to rely, on third parties for the cGMP manufacture of BT-11, NX-13 and any other product candidates that we may pursue, for clinical development. Any significant delay, including any delays as a result of the COVID-19 pandemic, in the supply of a product candidate or raw material components for an ongoing clinical trial due to the need to replace a third-party CMO could considerably delay the completion of our clinical trials.

We also expect to rely on third-party manufacturers or third-party collaborators for the manufacture of commercial supply of BT-11, NX-13 and any other product candidates for which we obtain marketing approval. The facilities used by our CMOs to manufacture our product candidates must be inspected by the FDA or other regulatory authorities after we submit our NDA or comparable marketing application to the FDA or other regulatory authority. We do not have control over a supplier's or manufacturer's compliance with laws, regulations and applicable cGMP standards or similar regulatory requirements and other laws and regulations, such as those related to environmental health and safety matters. If our contract manufacturers cannot successfully manufacture material that conforms to our specifications and the strict regulatory requirements of the FDA or other regulatory authorities, we may be unable to obtain regulatory approval of our marketing

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applications. In addition, we have no control over the ability of our contract manufacturers to maintain adequate quality control, quality assurance and qualified personnel. If the FDA or a comparable foreign regulatory authority finds deficiencies with or does not approve these facilities for the manufacture of our product candidates or if it withdraws any such approval in the future, we may need to find alternative manufacturing facilities, which would significantly impact our ability to develop, obtain regulatory approval for or market our product candidates, if approved.

We may be unable to enter into any agreements with future third-party manufacturers or to do so on acceptable terms. Even if we enter into such agreements, qualifying and validating such manufacturers may take a significant period of time and reliance on third-party manufacturers entails additional risks, including:

- reliance on the third party for regulatory compliance and quality assurance;
- the possible breach of the manufacturing agreement by the third party;
- the incurrence of upfront scale-up costs prior to commercial approval;
- the possible misappropriation of our proprietary information, including our trade secrets and know-how;
- the possible increase in costs for the raw materials for our product candidates; and
- the possible termination or nonrenewal of any agreement by any third party at a time that is costly or inconvenient for us.

Our failure, or the failure of our third-party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us, including clinical holds, fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of product candidates or drugs, operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supply of our products.

Our product candidates, and any drugs that we may develop, may compete with other product candidates and drugs for access to manufacturing facilities. The performance of our third-party manufacturers may also be interrupted by production shortages or other supply interruptions resulting from the ongoing COVID-19 pandemic. There are no assurances we would be able to enter into similar commercial arrangements with other manufacturers that operate under cGMP regulations and that might be capable of manufacturing for us in a timely manner. Any performance failure on the part of our existing or future manufacturers could delay clinical development or marketing approval.

We may seek collaborations with third parties for the development or commercialization of our product candidates. If those collaborations are not successful, we may not be able to capitalize on the market potential of these product candidates.

We may seek third-party collaborators for the development and commercialization of our product candidates, including for the commercialization of any of our product candidates that are approved for marketing outside the United States. Our likely collaborators for any such arrangements include regional and national pharmaceutical companies and biotechnology companies. If we enter into any additional such arrangements with any third parties, we will likely have limited control over the amount and timing of resources that our collaborators dedicate to the development or commercialization of our product candidates. Our ability to generate revenue from these arrangements will depend on our collaborators' abilities to successfully perform the functions assigned to them in these arrangements.

Collaborations involving our product candidates would pose the following risks to us:

- collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations;

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- collaborators may not perform their obligations as expected;
- collaborators may not pursue development and commercialization of any product candidates that achieve regulatory approval or may elect not to continue or renew development or commercialization programs based on clinical trial results, changes in the collaborators' strategic focus or available funding, or external factors, such as an acquisition, that divert resources or create competing priorities;
- collaborators may delay clinical trials, provide insufficient funding for a clinical trial program, stop a clinical trial or abandon a product candidate, repeat or conduct new clinical trials or require a new formulation of a product candidate for clinical testing;
- collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our product candidates if the collaborators believe that competitive products are more likely to be successfully developed or can be commercialized under terms that are more economically attractive than ours;
- product candidates discovered in collaboration with us may be viewed by our collaborators as competitive with their own product candidates or drugs, which may cause collaborators to cease to devote resources to the commercialization of our product candidates;
- a collaborator with marketing and distribution rights to one or more of our product candidates that achieve regulatory approval may not commit sufficient resources to the marketing and distribution of such products;
- disagreements with collaborators, including disagreements over proprietary rights, contract interpretation or the preferred course of development, might cause delays or termination of the research, development or commercialization of product candidates, might lead to additional responsibilities for us with respect to product candidates, or might result in litigation or arbitration, any of which would be time-consuming and expensive;
- collaborators may not properly maintain or defend our or their intellectual property rights or may use our or their proprietary information in such a way as to invite litigation that could jeopardize or invalidate such intellectual property or proprietary information or expose us to potential litigation;
- collaborators may infringe the intellectual property rights of third parties, which may expose us to litigation and potential liability; and
- collaborations may be terminated for the convenience of the collaborator and, if terminated, we could be required to raise additional capital to pursue further development or commercialization of the applicable product candidates.

Collaboration agreements may not lead to development or commercialization of product candidates in the most efficient manner or at all. If any future collaborator of ours were to be involved in a business combination, the continued pursuit and emphasis on our product development or commercialization program could be delayed, diminished or terminated.

We face significant competition in seeking appropriate collaborators. Whether we reach a definitive agreement for any collaboration will depend, among other things, upon our assessment of the collaborator's resources and expertise, the terms and conditions of the proposed collaboration and the proposed collaborator's evaluation of a number of factors. Those factors may include the design or results of clinical trials, the likelihood of approval by the FDA or similar regulatory authorities outside the United States, the potential market for the subject product candidate, the costs and complexities of manufacturing and delivering such product candidate to patients, the potential of competing products, the existence of uncertainty with respect to our ownership of

technology, which can exist if there is a challenge to such ownership without regard to the merits of the challenge and industry and market conditions generally. The collaborator may also consider alternative product candidates or technologies for similar indications that may be available to collaborate on and whether such a collaboration could be more attractive than the one with us for our product candidate. Collaborations are complex and time-consuming to negotiate and document. In addition, there have been a significant number of recent business combinations among large pharmaceutical companies that have resulted in a reduced number of potential future collaborators.

We may not be able to negotiate additional collaborations on a timely basis, on acceptable terms, or at all. If we are unable to do so, we may have to curtail the development of such product candidate, reduce or delay its development program or one or more of our other development programs, delay its potential commercialization or reduce the scope of any sales or marketing activities, or increase our expenditures and undertake development or commercialization activities at our own expense. If we elect to increase our expenditures to fund development or commercialization activities on our own, we may need to obtain additional capital, which may not be available to us on acceptable terms or at all. If we do not have sufficient funds, we may not be able to further develop our product candidates or bring them to market and generate revenue.

Risks related to our intellectual property

If we are unable to obtain or protect intellectual property rights related to any of our product candidates, we may not be able to compete effectively in our market.

We rely upon a combination of patents, trade secret protection and confidentiality agreements to protect the intellectual property related to our product candidates and our LANCE platform. Our success depends in large part on our ability to obtain and maintain patent and other intellectual property protection in the United States and in other countries with respect to our proprietary technology and product candidates.

As of the date of this prospectus, our patent estate contains at least nine patent families that we own or in-license that protect various aspects of our product candidates. We own or have rights in eight United States patents, 12 United States patent applications, nine foreign patents and 32 foreign patent applications. We cannot offer any assurances about which of our patent applications will issue, the breadth of any resulting patent or whether any of the issued patents will be found invalid and unenforceable or will be threatened by third parties. We cannot offer any assurances that the breadth of our granted patents will be sufficient to stop a competitor from developing and commercializing a product, including a biosimilar product that would be competitive with one or more of our product candidates. Furthermore, any successful challenge to these patents or any other patents owned by or licensed to us after patent issuance could deprive us of rights necessary for the successful commercialization of any of our product candidates. Further, if we encounter delays in regulatory approvals, the period of time during which we could market a product candidate under patent protection could be reduced.

The patent prosecution process is expensive and time-consuming. We may not be able to prepare, file and prosecute all necessary or desirable patent applications at a commercially reasonable cost or in a timely manner or in all jurisdictions. It is also possible that we 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. Moreover, depending on the terms of any future in-licenses to which we may become a party, we may not have the right to control the preparation, filing and prosecution of patent applications, or to maintain the patents, covering technology in-licensed from third parties. Therefore, these patents and patent applications may not be prosecuted and enforced in a manner consistent with the best interests of our business.

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In addition to the protection provided by our patent estate, we rely on trade secret protection and confidentiality agreements to protect proprietary know-how that is not amenable to patent protection. Although we generally require all of our employees to assign their inventions to us, and all of our employees, consultants, advisors and any third parties who have access to our proprietary know-how, information, or technology to enter into confidentiality agreements, we cannot provide any assurances that all such agreements have been duly executed, or that our trade secrets and other confidential proprietary information will not be disclosed. Moreover, our competitors may independently develop knowledge, methods and know-how equivalent to our trade secrets. Competitors could purchase our products, if approved, and replicate some or all of the competitive advantages we derive from our development efforts for technologies on which we do not have patent protection. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor, 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 any of our trade secrets were to be disclosed to or independently developed by a competitor, our competitive position would be harmed.

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, our agreements or security measures may be breached, and we may not have adequate remedies for any breach. Also, if the steps taken to maintain our trade secrets are deemed inadequate, we may have insufficient recourse against third parties for misappropriating the trade secret. In addition, others may independently discover our trade secrets and proprietary information. For example, the FDA is considering whether to make additional information publicly available on a routine basis, including information that we may consider to be trade secrets or other proprietary information, and it is not clear at the present time how the FDA's disclosure policies may change in the future. If we are unable to prevent material disclosure of the non-patented intellectual property related to our technologies to third parties, and there is no guarantee that we will have any such enforceable trade secret protection, we may not be able to establish or maintain a competitive advantage in our market, which could materially adversely affect our business, results of operations and financial condition.

Patent terms may be inadequate to protect our competitive position on our products for an adequate amount of time, and if we do not obtain protection under the Hatch-Waxman Amendments and similar non-United States legislation for extending the term of patents covering each of our product candidates, our business may be materially harmed.

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. Depending upon the timing, duration and conditions of FDA marketing approval of our product candidates, one or more of our United States patents may be eligible for limited patent term extension under the Drug Price Competition and Patent Term Restoration Act of 1984, referred to as the Hatch-Waxman Amendments, and similar legislation in the European Union. The Hatch-Waxman Amendments permit a patent term extension of up to five years for a patent covering an approved product as compensation for effective patent term lost during product development and the FDA regulatory review process. A patent term extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval. Only one patent may be extended, and only those claims covering the approved drug, a method for using it, or a method for manufacturing it may be extended. However, we may not receive an extension if we fail to apply within applicable deadlines, fail to apply prior to expiration of relevant patents or otherwise fail to satisfy applicable requirements. Moreover, the length of the extension could be less than we request. If we are unable to obtain patent term extension or the term of any such extension is less than we request, the period during which we can enforce our patent rights for that product will be shortened and our competitors may obtain

approval to market competing products sooner. As a result, our revenue from applicable products could be reduced and could have a material adverse effect on our business.

If we fail to comply with our obligations in any future intellectual property licenses with third parties, we could lose rights that are important to our business.

Although we do not currently rely upon any licenses to certain patent rights and proprietary technology for the development our product candidates or the LANCE platform, we may choose to enter into license agreements in the future. These license agreements may impose diligence, development and commercialization timelines and milestone payment, royalty, insurance and other obligations on us. If we fail to comply with our obligations, our licensors may have the right to terminate such licenses, in which event we might not be able to develop, manufacture or market any product that is covered by the intellectual property we in-license from such licensor and may face other penalties. Such an occurrence would materially adversely affect our business prospects.

Licenses to additional third-party technology and materials that may be required for our development programs may not be available in the future or may not be available on commercially reasonable terms, or at all, which could have a material adverse effect on our business and financial condition. We may require the cooperation of our licensors and any upstream licensor for the prosecution, maintenance and enforcement of the licensed and sublicensed intellectual property relating to relevant product candidates, which may not be forthcoming. Therefore, we cannot be certain that the prosecution, maintenance and enforcement of these patent rights will be in a manner consistent with the best interests of our business. If we or our licensor fail to maintain such patents, or if we or our licensor lose rights to those patents or patent applications, the rights we have licensed 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. In addition to the foregoing, the risks associated with patent rights that we license from third parties will also apply to patent rights we may own in the future. Further, if we fail to comply with our development obligations under our license agreements, we may lose our patent rights with respect to such agreement on a territory-by-territory basis, which would affect our patent rights worldwide.

Termination of any future license agreements would reduce or eliminate our rights under these agreements and may result in our having to negotiate new or reinstated agreements with less favorable terms or cause us to lose our rights under these agreements, including our rights to important intellectual property or technology. Any of the foregoing could prevent us from commercializing relevant product candidates, which could have a material adverse effect on our operating results and overall financial condition.

In addition, intellectual property rights that we in-license in the future may be sublicenses under intellectual property owned by third parties, in some cases through multiple tiers. The actions of our licensors may therefore affect our rights to use our sublicensed intellectual property, even if we are in compliance with all of the obligations under our license agreements. Should our licensors or any of the upstream licensors fail to comply with their obligations under the agreements pursuant to which they obtain the rights that are sublicensed to us, or should such agreements be terminated or amended, our ability to develop and commercialize our product candidates may be materially harmed.

Patent reform legislation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our future patents.

Our ability to obtain patents is highly uncertain because, to date, some legal principles remain unresolved, and there has not been a consistent policy regarding the breadth or interpretation of claims allowed in patents in the United States. Furthermore, the specific content of patents and patent applications that are necessary to support and interpret patent claims is highly uncertain due to the complex nature of the relevant legal, scientific, and factual issues. Changes in either patent laws or interpretations of patent laws in the United

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States and other countries may diminish the value of our intellectual property or narrow the scope of our patent protection.

For example, on September 16, 2011, the Leahy-Smith America Invents Act, or the Leahy-Smith Act, was signed into law. The Leahy-Smith Act included a number of significant changes to United States patent law. These included provisions that affect the way patent applications will be prosecuted and may also affect patent litigation. The United States Patent and Trademark Office, or USPTO, has developed new and untested regulations and procedures to govern the full implementation 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, became effective in March 2013. The Leahy-Smith Act has also introduced procedures making it easier for third parties to challenge issued patents, as well as to intervene in the prosecution of patent applications. Finally, the Leahy-Smith Act contained new statutory provisions that require the USPTO to issue new regulations for their implementation, and it may take the courts years to interpret the provisions of the new statute. It is too early to tell what, if any, impact the Leahy-Smith Act will have on the operation of our business and the protection and enforcement of our intellectual property. However, the Leahy-Smith Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our future patents. Further, the United States Supreme Court has ruled on several patent cases in recent years, either narrowing the scope of patent protection available in certain circumstances or weakening the rights of patent owners in certain situations. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents, once obtained. Depending on actions by the United States Congress, the federal courts and the USPTO, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce patents that we have owned or licensed or that we might obtain in the future. An inability to obtain, enforce, and defend patents covering our proprietary technologies would materially and adversely affect our business prospects and financial condition.

Similarly, changes in patent laws and regulations in other countries or jurisdictions, changes in the governmental bodies that enforce them or changes in how the relevant governmental authority enforces patent laws or regulations may weaken our ability to obtain new patents or to enforce patents that we may obtain in the future. Further, the laws of some foreign countries do not protect proprietary rights to the same extent or in the same manner as the laws of the United States. As a result, we may encounter significant problems in protecting and defending our intellectual property both in the United States and abroad. For example, if the issuance in a given country of a patent covering an invention is not followed by the issuance in other countries of patents covering the same invention, or if any judicial interpretation of the validity, enforceability or scope of the claims or the written description or enablement, in a patent issued in one country is not similar to the interpretation given to the corresponding patent issued in another country, our ability to protect our intellectual property in those countries may be limited. Changes in either patent laws or in interpretations of patent laws in the United States and other countries may materially diminish the value of our intellectual property or narrow the scope of our patent protection.

We may be involved in lawsuits to protect or enforce our patents, which could be expensive, time consuming and unsuccessful.

Competitors may infringe the patents we have applied for. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time-consuming. If we initiate legal proceedings against a third party to enforce a patent covering one of our product candidates, the defendant could counterclaim that the patent covering our product or product candidate is invalid and/or unenforceable. In patent litigation in the United States, counterclaims alleging invalidity and/or unenforceability are common, and there are numerous grounds upon which a third party can assert invalidity or unenforceability of a patent.

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In an infringement proceeding, a court may decide that the patent claims we are asserting are invalid and/or unenforceable, or may refuse to stop the other party from using the technology at issue on the grounds that our patent claims do not cover the technology in question. Third parties may also raise similar claims before administrative bodies in the United States or abroad, even outside the context of litigation. Such mechanisms include re-examination, post grant review, *inter partes* review and equivalent proceedings in foreign jurisdictions (for example, opposition proceedings). Such proceedings could result in revocation of or amendment to our patents in such a way that they no longer cover our product candidates. The outcome following legal assertions of invalidity and unenforceability is unpredictable. With respect to the validity question, for example, we cannot be certain that there is no invalidating prior art, of which we, our patent counsel, and the patent examiner were unaware during prosecution. If a defendant were to prevail on a legal assertion of invalidity and/or unenforceability, we would lose at least part, and perhaps all, of the patent protection on our product candidates. An adverse result in any litigation or defense proceedings could put one or more of our patents at risk of being invalidated or interpreted narrowly, could put our patent applications at risk of not issuing and could have a material adverse impact on our business.

Interference proceedings provoked by third parties or brought by us may be necessary to determine the priority of inventions with respect to our patent applications. An unfavorable outcome could require us to cease using the related technology or force us to take a license under the patent rights of the prevailing party, if available. Furthermore, our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms. Our defense of litigation or interference proceedings may fail and, even if successful, may result in substantial costs and distract our management and other employees. We may not be able to prevent misappropriation of our intellectual property rights, particularly in countries where the laws may not protect those rights as fully as in the United States.

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 this type of 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 common stock.

We may be unsuccessful in licensing or acquiring intellectual property from third parties that may be required to develop and commercialize our product candidates.

A third party may hold intellectual property, including patent rights that are important or necessary to the development and commercialization of our product candidates. It may be necessary for us to use the patented or proprietary technology of third parties to commercialize our product candidates, in which case we would be required to acquire or obtain a license to such intellectual property from these third parties, and we may be unable to do so on commercially reasonable terms or at all. The licensing or acquisition of third-party intellectual property rights is a competitive area, and several more established companies may pursue strategies to license or acquire third-party intellectual property rights that we may consider attractive or necessary. These established companies may have a competitive advantage over us due to their size, capital resources and greater clinical development and commercialization capabilities. In addition, companies that perceive us to be a competitor may be unwilling to assign or license rights to us. We also may be unable to license or acquire third-party intellectual property rights on terms that would allow us to make an appropriate return on our investment or at all. If we are unable to successfully obtain rights to required third-party intellectual property rights or maintain the existing intellectual property rights we have, we may have to abandon development of the relevant program or product candidate, which could have a material adverse effect on our business.

Third parties may initiate legal proceedings alleging that we are infringing their intellectual property rights, the outcome of which would be uncertain.

As our current and future product candidates progress toward commercialization, the possibility of a patent infringement claim against us increases. We cannot provide any assurance that our current and future product candidates do not infringe other parties' patents or other proprietary rights, and competitors or other parties may assert that we infringe their proprietary rights in any event. We may become party to, or threatened with, adversarial proceedings or litigation regarding intellectual property rights with respect to our current and future product candidates, including interference or derivation proceedings before the USPTO. Even if we believe such claims are without merit, a court of competent jurisdiction could hold that these third-party patents are valid, enforceable and infringed, which could have a negative impact on our ability to commercialize BT-11, NX-13 or any future product candidates. In order to successfully challenge the validity of any such United States patent in federal court, we would need to overcome a presumption of validity. As this burden is high and requires us to present clear and convincing evidence as to the invalidity of any such United States patent claim, there is no assurance that a court of competent jurisdiction would agree with us and invalidate the claims of any such United States patent. Moreover, given the vast number of patents in our field of technology, we cannot be certain that we do not infringe existing patents or that we will not infringe patents that may be granted in the future.

While we may decide to initiate proceedings to challenge the validity of these or other patents in the future, we may be unsuccessful, and courts or patent offices in the United States and abroad could uphold the validity of any such patent. Furthermore, because patent applications can take many years to issue and may be confidential for 18 months or more after filing, and because pending patent claims can be revised before issuance, there may be applications now pending which may later result in issued patents that may be infringed by the manufacture, use or sale of our product candidates. Regardless of when filed, we may fail to identify relevant third-party patents or patent applications, or we may incorrectly conclude that a third-party patent is invalid or not infringed by our product candidates or activities. If a patent holder believes that one of our product candidates infringes its patent, the patent holder may sue us even if we have received patent protection for our technology. Moreover, we may face patent infringement claims from non-practicing entities that have no relevant drug revenue and against whom our own patent portfolio may thus have no deterrent effect. If a patent infringement suit were threatened or brought against us, we could be forced to stop or delay research, development, manufacturing or sales of the drug or product candidate that is the subject of the actual or threatened suit.

If we are found to infringe a third party's intellectual property rights, we could be required to obtain a license from such third party to continue commercializing our product candidates. However, we may not be able to obtain any required license on commercially reasonable terms or at all. Even if a license can be obtained on acceptable terms, the rights may be non-exclusive, which could give our competitors access to the same technology or intellectual property rights licensed to us. If we fail to obtain a required license, we may be unable to effectively market product candidates based on our technology, which could limit our ability to generate revenue or achieve profitability and possibly prevent us from generating revenue sufficient to sustain our operations. Alternatively, we may need to redesign our infringing products, which may be impossible or require substantial time and monetary expenditure. Under certain circumstances, we could be forced, including by court orders, to cease commercializing our product candidates. In addition, in any such proceeding or litigation, we could be found liable for substantial monetary damages, potentially including treble damages and attorneys' fees, if we are found to have willfully infringed the patent at issue. A finding of infringement could prevent us from commercializing our product candidates or force us to cease some of our business operations, which could harm our business. Any claims by third parties that we have misappropriated their confidential information or trade secrets could have a similar negative impact on our business.

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The cost to us in defending or initiating any litigation or other proceeding relating to patent or other proprietary rights, even if resolved in our favor, could be substantial, and litigation would divert our management's attention. Some of our competitors may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could delay our research and development efforts and limit our ability to continue our operations.

We may be subject to claims that our employees, consultants, or independent contractors have wrongfully used or disclosed confidential information of third parties.

We employ individuals who were previously employed at other biotechnology or biopharmaceutical companies. 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 we or our employees, consultants, or independent contractors have inadvertently or otherwise used or disclosed confidential information of our employees' former employers or other third parties. We may also be subject to claims that former employers or other third parties have an ownership interest in our future patents. Litigation may be necessary to defend against these claims. There is no guarantee of success in defending these claims, and even if we are successful, litigation could result in substantial cost and be a distraction to our management and other employees.

We may be subject to claims challenging the inventorship or ownership of our future patents and other intellectual property.

We may also be subject to claims that former employees, collaborators, or other third parties have an ownership interest in our patent applications, our future patents, or other intellectual property. We may be subject to ownership disputes in the future arising, for example, from conflicting obligations of consultants or others who are involved in developing our product candidates. Although it is our policy to require our employees and contractors who may be involved in the conception or 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, conceives or develops intellectual property that we regard as our own, and we cannot be certain that our agreements with such parties will be upheld in the face of a potential challenge, or that they will not be breached, for which we may not have an adequate remedy. The assignment of intellectual property rights may not be self-executing or the assignment agreements may be breached, and litigation may be necessary to defend against these and other claims challenging inventorship or ownership. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, valuable intellectual property. Such an outcome could have a material adverse effect on our business. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees.

Reliance on third parties requires us to share our trade secrets, which increases the possibility that a competitor will discover them or that our trade secrets will be misappropriated or disclosed.

If we rely on third parties to manufacture or commercialize BT-11, NX-13 or any future product candidates, or if we collaborate with additional third parties for the development of BT-11, NX-13 or any future product candidates, we must, at times, share trade secrets with them. We may also conduct joint research and development programs that may require us to share trade secrets under the terms of our research and development partnerships or similar agreements. We seek to protect our proprietary technology in part by entering into confidentiality agreements and, if applicable, material transfer agreements, consulting agreements or other similar agreements with our advisors, employees, third-party contractors and consultants prior to beginning research or disclosing proprietary information. These agreements typically limit the rights of the third parties to use or disclose our confidential information, including our trade secrets. Despite the

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contractual provisions employed when working with third parties, the need to share trade secrets and other confidential information increases the risk that such trade secrets become known by our competitors, are inadvertently incorporated into the technology of others, or are disclosed or used in violation of these agreements. Given that our proprietary position is based, in part, on our know-how and trade secrets, a competitor's discovery of our trade secrets or other unauthorized use or disclosure could have an adverse effect on our business and results of operations.

In addition, these agreements typically restrict the ability of our advisors, employees, third-party contractors and consultants to publish data potentially relating to our trade secrets. Despite our efforts to protect our trade secrets, we may not be able to prevent the unauthorized disclosure or use of our technical know-how or other trade secrets by the parties to these agreements. Moreover, we cannot guarantee that we have entered into such agreements with each party that may have or have had access to our confidential information or proprietary technology and processes. Monitoring unauthorized uses and disclosures is difficult, and we do not know whether the steps we have taken to protect our proprietary technologies will be effective. If any of the collaborators, scientific advisors, employees, contractors and consultants who are parties to these agreements breaches or violates the terms of any of these agreements, we may not have adequate remedies for any such breach or violation, and we could lose our trade secrets as a result. Moreover, if confidential information that is licensed or disclosed to us by our partners, collaborators, or others is inadvertently disclosed or subject to a breach or violation, we may be exposed to liability to the owner of that confidential information. Enforcing a claim that a third party illegally obtained and is using our trade secrets, like patent litigation, is expensive and time consuming, and the outcome is unpredictable. In addition, courts outside the United States are sometimes less willing to protect trade secrets.

We may enjoy only limited geographical protection with respect to certain patents and we may not be able to protect our intellectual property rights throughout the world.

Filing and prosecuting patent applications and defending patents covering our product candidates in all countries throughout the world would be prohibitively expensive. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products and, further, may export otherwise infringing products to territories where we have patent protection, but enforcement rights are not as strong as that in the United States or Europe. These products may compete with our product candidates, and our future patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

In addition, we may decide to abandon national and regional patent applications before they are granted. The examination of each national or regional patent application is an independent proceeding. As a result, patent applications in the same family may issue as patents in some jurisdictions, such as in the United States, but may issue as patents with claims of different scope or may even be refused in other jurisdictions. It is also quite common that depending on the country, the scope of patent protection may vary for the same product candidate or technology.

While we intend to protect our intellectual property rights in our expected significant markets, we cannot ensure that we will be able to initiate or maintain similar efforts in all jurisdictions in which we may wish to market our product candidates. Accordingly, our efforts to protect our intellectual property rights in such countries may be inadequate, which may have an adverse effect on our ability to successfully commercialize our product candidates in all of our expected significant foreign markets. If we encounter difficulties in protecting, or are otherwise precluded from effectively protecting, the intellectual property rights important for our business in such jurisdictions, the value of these rights may be diminished, and we may face additional competition from others in those jurisdictions.

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The laws of some jurisdictions do not protect intellectual property rights to the same extent as the laws or rules and regulations in the United States and Europe, and many companies have encountered significant difficulties in protecting and defending such rights in such jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents, trade secrets, and other intellectual property rights, which could make it difficult for us to stop the infringement of our future patents or marketing of competing products in violation of our proprietary rights generally. Proceedings to enforce our patent rights in other jurisdictions, whether or not successful, could result in substantial costs and divert our efforts and attention from other aspects of our business, could put our future patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing as patents, 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.

Some countries also have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In addition, some countries limit the enforceability of patents against government agencies or government contractors. In those countries, the patent owner may have limited remedies, which could materially diminish the value of such patents. If we are forced to grant a license to third parties with respect to any patents relevant to our business, our competitive position may be impaired.

Obtaining and maintaining our patent protection depends on compliance with various procedural, document submission, fee payment, and other requirements imposed by government patent agencies, and our patent protection could be reduced or eliminated for non-compliance with these requirements.

Periodic maintenance fees, renewal fees, annuity fees and various other government fees on patents and/or applications will be due to be paid to the USPTO and various government patent agencies outside of the United States over the lifetime of our patents and/or applications and any patent rights we may obtain in the future. Furthermore, the USPTO and various non-United States government patent agencies require compliance with several procedural, documentary, fee payment and other similar provisions during the patent application process. In many cases, an inadvertent lapse of a patent or patent application can be cured by payment of a late fee or by other means in accordance with the applicable rules. There are situations, however, in which non-compliance can result in abandonment or lapse of the patents or patent applications, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, potential competitors might be able to enter the market, which could have a material adverse effect on our business.

Any trademarks we have obtained or may obtain may be infringed or otherwise violated, or successfully challenged, resulting in harm to our business.

We expect to rely on trademarks as one means to distinguish our product candidates, if approved for marketing, from the drugs of our competitors. Once we select new trademarks and apply to register them, our trademark applications may not be approved. Third parties may oppose or attempt to cancel our trademark applications or trademarks, or otherwise challenge our use of the trademarks. In the event that our trademarks are successfully challenged, we could be forced to rebrand our drugs, which could result in loss of brand recognition and could require us to devote resources to advertising and marketing new brands. Our competitors may infringe or otherwise violate our trademarks and we may not have adequate resources to enforce our trademarks. Any of the foregoing events may have a material adverse effect on our business.

Intellectual property rights do not necessarily address all potential threats to our competitive advantage.

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. The following examples are illustrative:

- others may be able to make products that are similar to or otherwise competitive with our product candidates but that are not covered by the claims of our current or future patents;
- an in-license necessary for the manufacture, use, sale, offer for sale or importation of one or more of our product candidates may be terminated by the licensor;
- we or future collaborators might not have been the first to make the inventions covered by our issued or future issued patents or our pending patent applications;
- we or future collaborators might not have been the first to file patent applications covering certain of our inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights;
- it is possible that our pending patent applications will not lead to issued patents;
- issued patents that we own or in-license may be held invalid or unenforceable as a result of legal challenges by our competitors;
- issued patents that we own or in-license may not provide coverage for all aspects of our product candidates in all countries;
- our competitors 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; and
- the patents of others may have an adverse effect on our business.

Should any of these events occur, they could significantly harm our business, results of operations and prospects.

Risks related to legal and regulatory compliance matters

Our relationships with customers, healthcare providers, physicians and third-party payors are subject, directly or indirectly, to federal and state healthcare fraud and abuse laws, false claims laws, and other healthcare laws and regulations. If we are unable to comply, or have not fully complied, with such laws, we could face substantial penalties.

Healthcare providers, physicians and third-party payors in the United States and elsewhere will play a primary role in the recommendation and prescription of any product candidates for which we obtain marketing approval. Our current and future arrangements with healthcare professionals, principal investigators, consultants, customers and third-party payors subject us to various federal and state fraud and abuse laws and other healthcare laws, including, without limitation, the federal Anti-Kickback Statute, the federal civil and criminal false claims laws and transparency laws, including the law commonly referred to as the Physician Payments Sunshine Act, and regulations promulgated under such laws. These laws will impact, among other

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things, our clinical research, proposed sales, marketing and educational programs, and other interactions with healthcare professionals. The laws that will affect our operations include, but are not limited to:

- the federal Anti-Kickback Statute, which prohibits, among other things, individuals or entities from 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 in return for, or to induce, either the referral of an individual, or the purchase, lease, order or arrangement for or recommendation of the purchase, lease, order or arrangement for 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. The term “remuneration” has been broadly interpreted to include anything of value. Although there are a number of statutory exceptions and regulatory safe harbors protecting some common activities from prosecution, the exceptions and safe harbors are drawn narrowly. Practices that involve remuneration that may be alleged to be intended to induce prescribing, purchases or recommendations may be subject to scrutiny if they do not qualify for an exception or safe harbor. A person does not need to have actual knowledge of this statute or specific intent to violate it in order to have committed a violation;
- the federal civil and criminal false claims laws, including, without limitation, the civil False Claims Act, which can be enforced by private citizens through civil whistleblower or qui tam actions, and civil monetary penalty laws which prohibit, among other things, individuals or entities from knowingly presenting, or causing to be presented, claims for payment or approval from the federal government, including Medicare, Medicaid and other government payors, that are false or fraudulent or knowingly making, using or causing to be made or used a false record or statement material to a false or fraudulent claim or to avoid, decrease or conceal an obligation to pay money to the federal government. A claim includes “any request or demand” for money or property presented to the United States federal government. Several pharmaceutical and other healthcare companies have been prosecuted under these laws for, among other things, allegedly providing free product to customers with the expectation that the customers would bill federal programs for the product. Other companies have been prosecuted for causing false claims to be submitted because of the companies’ marketing of products for unapproved, and thus non-reimbursable, uses. In addition, 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 False Claims Act;
- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which created additional federal criminal statutes which prohibit, among other things, a person from knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program, including private third-party payors and knowingly and willfully falsifying, concealing or covering up 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. Similar to 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 federal transparency laws, including the federal Physician Payments Sunshine Act, which requires certain manufacturers of drugs, medical devices, biologicals and medical supplies for which payment is available under Medicare, Medicaid or the Children’s Health Insurance Program, with specific exceptions, to report annually to the Centers for Medicare & Medicaid Services, or CMS, information related to: (1) payments or other “transfers of value” made during the previous year to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors), and teaching hospitals, and (2) ownership and investment interests held by such physicians and their immediate family members, and, beginning in 2022, will also require applicable manufacturers to report information related to payments and other transfers of value provided in the previous year to physician assistants, nurse practitioners, clinical nurse specialists, certified registered nurse anesthetists, and certified nurse midwives; and

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- state and foreign law equivalents of each of the above federal laws and regulations; state laws that require manufacturers to report information related to payments and other transfers of value to physicians and other healthcare providers, marketing expenditures or drug pricing; state 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 that otherwise restrict payments that may be made to healthcare providers; and state and local laws that require the registration of pharmaceutical sales representatives.

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 could be subject to challenge under one or more of such laws. 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 penalties, including, without limitation, civil, criminal and administrative penalties, damages, fines, disgorgement, imprisonment, exclusion from participating in federal and state funded healthcare programs, such as Medicare and Medicaid, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, contractual damages, diminished profits and future earnings, reputational harm and the curtailment or restructuring of our operations, any of which could harm our business.

The risk of our being found in violation of these laws is increased by the fact that many of them have not been fully interpreted by the regulatory authorities or the courts, and their provisions are open to a variety of interpretations. Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. Any action against us for violation of these laws, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business. The shifting compliance environment and the need to build and maintain robust and expandable systems to comply with multiple jurisdictions with different compliance and/or reporting requirements increases the possibility that a healthcare company may run afoul of one or more of the requirements.

Even if we obtain regulatory approval for BT-11, NX-13 or any future product candidates, they will remain subject to ongoing regulatory oversight.

Even if we obtain any regulatory approval for BT-11, NX-13 or any future product candidates, such product candidates, once approved, will be subject to ongoing regulatory requirements applicable to manufacturing, labeling, packaging, storage, advertising, promoting, sampling, record-keeping and submitting of safety and other post-market information, among other things. Any regulatory approvals that we receive for BT-11, NX-13 or any future product candidates may also be subject to a risk evaluation and mitigation strategy, limitations on the approved indicated uses for which the drug may be marketed or to the conditions of approval, or requirements that we conduct potentially costly post-marketing testing, including Phase 4 trials and surveillance to monitor the quality, safety and efficacy of the drug. An unsuccessful post-marketing study or failure to complete such a study could result in the withdrawal of marketing approval. We will further be required to immediately report any serious and unexpected adverse events and certain quality or production problems with our products to regulatory authorities along with other periodic reports.

Any new legislation addressing drug safety issues could result in delays in product development or commercialization, or increased costs to assure compliance. We will also have to comply with requirements concerning advertising and promotion for our products. Promotional communications with respect to prescription drug products are subject to a variety of legal and regulatory restrictions and must be consistent

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with the information in the product's approved label. As such, we will not be allowed to promote our products for indications or uses for which they do not have approval, commonly known as off-label promotion. Physicians, on the other hand, may prescribe products for off-label uses. Although the FDA and other regulatory agencies do not regulate a physician's choice of drug treatment made in the physician's independent medical judgment, they do restrict promotional communications from companies or their sales force with respect to off-label uses of products for which marketing approval has not been issued. However, companies may share truthful and not misleading information that is otherwise consistent with a product's FDA approved labeling. The holder of an approved NDA must submit new or supplemental applications and obtain prior approval for certain changes to the approved product, product labeling, or manufacturing process. A company that is found to have improperly promoted off-label uses of their products may be subject to significant civil, criminal and administrative penalties.

In addition, drug manufacturers are subject to payment of user fees and continual review and periodic inspections by the FDA and other regulatory authorities for compliance with cGMP requirements and adherence to commitments made in the NDA or foreign marketing application. If we, or a regulatory authority, discover previously unknown problems with a drug, such as adverse events of unanticipated severity or frequency, or problems with the facility where the drug is manufactured or if a regulatory authority disagrees with the promotion, marketing or labeling of that drug, a regulatory authority may impose restrictions relative to that drug, the manufacturing facility or us, including requesting a recall or requiring withdrawal of the drug from the market or suspension of manufacturing.

If we fail to comply with applicable regulatory requirements following approval of BT-11, NX-13 or any future product candidates, a regulatory authority may:

- issue an untitled letter or warning letter asserting that we are in violation of the law;
- seek an injunction or impose administrative, civil or criminal penalties or monetary fines;
- suspend or withdraw regulatory approval;
- suspend any ongoing clinical trials;
- refuse to approve a pending NDA or comparable foreign marketing application (or any supplements thereto) submitted by us or our strategic partners;
- restrict the marketing or manufacturing of the drug;
- seize or detain the drug or otherwise require the withdrawal of the drug from the market;
- refuse to permit the import or export of product candidates; or
- refuse to allow us to enter into supply contracts, including government contracts.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response and could generate negative publicity. The occurrence of any event or penalty described above may inhibit our ability to commercialize BT-11, NX-13 or any future product candidates and harm our business, financial condition, results of operations and prospects.

Healthcare legislative or regulatory reform measures may have a negative impact on our business and results of operations.

In the United States and some foreign jurisdictions, there have been, and continue to be, several legislative and regulatory changes and proposed changes regarding the healthcare system that could prevent or delay marketing approval of product candidates, restrict or regulate post-approval activities, and affect our ability to profitably sell any product candidates for which we obtain marketing approval.

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Among policy makers and payors in the United States and elsewhere, there is significant interest in promoting changes in healthcare systems with the stated goals of containing healthcare costs, improving quality and/or expanding access. In the United States, the pharmaceutical industry has been a particular focus of these efforts and has been significantly affected by major legislative initiatives. In March 2010, the ACA was passed, which substantially changed the way healthcare is financed by both the government and private insurers, and significantly impacts the United States pharmaceutical industry. The ACA, among other things: (1) established an annual, nondeductible fee on any entity that manufactures or imports certain specified branded prescription drugs and biologic agents apportioned among these entities according to their market share in some government healthcare programs; (2) expanded the entities eligible for discounts under the 340B drug pricing program; (3) increased the statutory minimum rebates a manufacturer must pay under the Medicaid Drug Rebate Program to 23.1% and 13% of the average manufacturer price for most branded and generic drugs, respectively, and capped the total rebate amount for innovator drugs at 100% of the Average Manufacturer Price, or AMP; (4) expanded the eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to additional individuals and by adding new mandatory eligibility categories for individuals with income at or below 133% of the federal poverty level, thereby potentially increasing manufacturers' Medicaid rebate liability; (5) addressed a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for certain drugs and biologics that are inhaled, infused, instilled, implanted or injected; (6) introduced a new Medicare Part D coverage gap discount program in which manufacturers must now agree to offer 70% point-of-sale discounts off negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period as a condition for the manufacturer's outpatient drugs to be covered under Medicare Part D; (7) created a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research; and (8) established a Center for Medicare and Medicaid Innovation at CMS to test innovative payment and service delivery models to lower Medicare and Medicaid spending, potentially including prescription drug spending.

There remain judicial and Congressional challenges to certain aspects of the ACA, as well as efforts by the Trump administration to repeal or replace certain aspects of the ACA. While Congress has not passed comprehensive repeal legislation, several bills affecting the implementation of certain taxes under the ACA have been signed into law. 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." In addition, the 2020 federal spending package permanently eliminated, effective January 1, 2020, the ACA-mandated "Cadillac" tax on high-cost employer-sponsored health coverage and medical device tax and, effective January 1, 2021, also eliminates the health insurer tax. The Bipartisan Budget Act of 2018, or the BBA, among other things, amended the ACA, effective January 1, 2019, to close the coverage gap in most Medicare drug plans, commonly referred to as the "donut hole." In December 2018, CMS published a new final rule permitting further collections and payments to and from certain ACA qualified health plans and health insurance issuers under the ACA risk adjustment program in response to the outcome of federal district court litigation regarding the method CMS uses to determine this risk adjustment. On April 27, 2020, the United States Supreme Court reversed a Federal Circuit decision that previously upheld Congress' denial of \$12 billion in "risk corridor" funding. On December 14, 2018, a Texas United States District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Act. Additionally, on December 18, 2019, the United States Court of Appeals for the 5th Circuit upheld the District Court ruling that the individual mandate was unconstitutional and remanded the case back to the District Court to determine whether the remaining provisions of the ACA are invalid as well. On March 2, 2020, the United States Supreme Court granted the petitions for writs of certiorari and held oral argument on November 10, 2020. The case is expected to be decided by mid-2021. It is unclear how such litigation, and other efforts to repeal, replace or challenge the ACA will impact the ACA and our business.

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Other legislative changes have been proposed and adopted since the ACA was enacted. These changes include aggregate reductions to Medicare payments to providers of 2% per fiscal year pursuant to the Budget Control Act of 2011, which began in 2013, and due to subsequent legislative amendments to the statute, will remain in effect through 2030, with the exception of a temporary suspension from May 1, 2020 through December 31, 2020 implemented under the Coronavirus Aid, Relief and Economic Security Act, or CARES Act, unless additional Congressional action is taken. In addition, the American Taxpayer Relief Act of 2012, among other things, further reduced Medicare payments to several providers and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. These laws may result in additional reductions in Medicare and other healthcare funding, which could have an adverse effect on customers for our product candidates, if approved, and, accordingly, our financial operations.

Additionally, there has been heightened governmental scrutiny in the United States of pharmaceutical pricing practices in light of the rising cost of prescription drugs and biologics. Such scrutiny has resulted in several recent congressional inquiries and proposed and enacted federal and state legislation designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for products. At the federal level, the Trump administration's budget proposal for fiscal year 2021 includes a \$135 billion allowance to support legislative proposals seeking to reduce drug prices, increase competition, lower out-of-pocket drug costs for patients, and increase patient access to lower-cost generic and biosimilar drugs. On March 10, 2020, the Trump administration sent "principles" for drug pricing to Congress, calling for legislation that would, among other things, cap Medicare Part D beneficiary out-of-pocket pharmacy expenses, provide an option to cap Medicare Part D beneficiary monthly out-of-pocket expenses, and place limits on pharmaceutical price increases. Further, the Trump administration previously released a "Blueprint" to lower drug prices and reduce out of pocket costs of drugs that contained 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. On July 24, 2020 and September 13, 2020, President Trump announced a number of executive orders related to prescription drug pricing that collectively attempt to implement several of the administration's proposals. Further, on November 20, 2020, HHS finalized a regulation removing safe harbor protection for price reductions from pharmaceutical manufacturers to plan sponsors under Part D, either directly or through pharmacy benefit managers, unless the price reduction is required by law. The rule also creates a new safe harbor for price reductions reflected at the point-of-sale, as well as a safe harbor for fixed fees to pharmacy benefit managers for certain services rendered to manufacturers. The probability of success of the other recently announced policies under the Trump administration, which would require additional authorization to be effective, and their impact on our products, if approved, is uncertain, particularly in light of the new incoming Biden administration. The FDA also recently released a final rule, effective November 30, 2020, implementing a portion of President Trump's Executive Order announced on July 24, 2020 that directed HHS to finalize the Canadian drug importation proposed rule previously issued by HHS and make other changes allowing for personal importation of drugs from Canada. The FDA final rule provides guidance for states to build and submit importation plans for drugs from Canada. At the state level, legislatures have increasingly passed legislation and implemented regulations designed to control pharmaceutical and biological 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.

We expect that these and other healthcare reform measures that may be adopted in the future may result in more rigorous coverage criteria and in additional downward pressure on the price that we receive for any approved drug. Any reduction in reimbursement from Medicare or other government programs may result in a similar reduction in payments from private payors. The implementation of cost containment measures or other

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healthcare reforms may prevent us from being able to generate revenue, attain profitability, or commercialize our drugs. It is also possible that additional governmental action is taken to address the COVID-19 pandemic.

In addition, FDA regulations and guidance may be revised or reinterpreted by the FDA in ways that may significantly affect our business and our products. The Trump administration also took several executive actions, including the issuance of a number of Executive Orders, that could impose significant burdens on, or otherwise materially delay, the 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 whether or how these requirements will be interpreted and implemented or whether they will be rescinded or replaced under a Biden administration. If executive actions impose restrictions on the FDA's ability to engage in oversight and implementation activities in the normal course, our business may be negatively impacted. Any new regulations or guidance, or revisions or reinterpretations of existing regulations or guidance, may impose additional costs or lengthen FDA review times for BT-11, NX-13 or any future product candidates. We cannot determine how changes in regulations, statutes, policies, or interpretations when and if issued, enacted or adopted, may affect our business in the future. Such changes could, among other things, require:

- additional clinical trials to be conducted prior to obtaining approval;
- changes to manufacturing methods;
- recalls, replacements, or discontinuance of one or more of our products; and
- additional recordkeeping.

Such changes would likely require substantial time and impose significant costs, or could reduce the potential commercial value of BT-11, NX-13 or other product candidates, and could materially harm our business and our financial results. In addition, delays in receipt of or failure to receive regulatory clearances or approvals for any other products would harm our business, financial condition, and results of operations. Further, we cannot predict the likelihood, nature, or extent of healthcare reform initiatives that may arise from future legislation or administrative action, particularly as a result of the recent U.S. presidential election.

Our business activities will be subject to the Foreign Corrupt Practices Act, or FCPA, and similar anti-bribery and anti-corruption laws.

As we expand our business activities outside of the United States, including our clinical trial efforts, we will be subject to the FCPA and similar anti-bribery or anti-corruption laws, regulations or rules of other countries in which we operate. The FCPA generally prohibits offering, promising, giving, or authorizing others to give anything of value, either directly or indirectly, to a non-United States government official in order to influence official action, or otherwise obtain or retain business. The FCPA also requires public companies to make and keep books and records that accurately and fairly reflect the transactions of the corporation and to devise and maintain an adequate system of internal accounting controls. Our business is heavily regulated and therefore involves significant interaction with public officials, including officials of non-United States governments. Additionally, in many other countries, the healthcare providers who prescribe pharmaceuticals are employed by their government, and the purchasers of pharmaceuticals are government entities; therefore, our dealings with these prescribers and purchasers will be subject to regulation under the FCPA. Recently the SEC and Department of Justice have increased their FCPA enforcement activities with respect to biotechnology and pharmaceutical companies. There is no certainty that all of our employees, agents, suppliers, manufacturers, contractors, or collaborators, or those of our affiliates, will comply with all applicable laws and regulations, particularly given the high level of complexity of these laws. Violations of these laws and regulations could result in fines, criminal sanctions against us, our officers, or our employees, the closing down of facilities,

including those of our suppliers and manufacturers, requirements to obtain export licenses, cessation of business activities in sanctioned countries, implementation of compliance programs, and prohibitions on the conduct of our business. Any such violations could include prohibitions on our ability to offer our products in one or more countries as well as difficulties in manufacturing or continuing to develop our products, and could materially damage our reputation, our brand, our international expansion efforts, our ability to attract and retain employees, and our business, prospects, operating results, and financial condition.

Risks related to employee matters and managing our growth

Our future success depends on our ability to retain key executives and to attract, retain and motivate qualified personnel.

We are highly dependent on the management, development, clinical, financial and business development expertise of our executive officers, particularly Dr. Josep Bassaganya-Riera, our Chairman, President and Chief Executive Officer. Each of our executive officers may currently terminate their employment with us at any time. We do not maintain “key person” insurance for any of our executives or employees.

Recruiting and retaining qualified scientific and clinical personnel and, if we progress the development of our product pipeline toward scaling up for commercialization, manufacturing and sales and marketing personnel, will also be critical to our success. The loss of the services of our executive officers or other key employees could impede the achievement of our development and commercialization objectives and seriously harm our ability to successfully implement our business strategy. Furthermore, replacing executive officers and key employees may be difficult and may take an extended period of time because of the limited number of individuals in our industry with the breadth of skills and experience required to successfully develop, gain regulatory approval of and commercialize products. Competition to hire from this limited pool is intense, and we may be unable to hire, train, retain or motivate these key personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for similar personnel. We also experience competition for the hiring of scientific and clinical personnel from universities and research institutions. In addition, we rely on consultants and advisors, including scientific and clinical advisors, to assist us in formulating our development and commercialization strategy. Our consultants and advisors may be employed by employers other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us. If we are unable to continue to attract and retain high quality personnel, our ability to pursue our growth strategy will be limited.

We expect to expand our clinical development and regulatory capabilities and potentially implement sales, marketing and distribution capabilities, and as a result, we may encounter difficulties in managing our growth, which could disrupt our operations.

As of September 30, 2020, we had 33 employees. As our development progresses, we expect to experience significant growth in the number of our employees and the scope of our operations, particularly in the areas of clinical product development, regulatory affairs and, if any of our product candidates receives marketing approval, sales, marketing and distribution. To manage our anticipated future growth, we must continue to implement and improve our managerial, operational and financial systems, expand our facilities and continue to recruit and train additional qualified personnel. Due to our limited financial resources and the limited experience of our management team in managing a company with such anticipated growth, we may not be able to effectively manage the expansion of our operations or recruit and train additional qualified personnel. The expansion of our operations may lead to significant costs and may divert our management and business development resources. Any inability to manage growth could delay the execution of our business plans or disrupt our operations.

Our employees, independent contractors, consultants, commercial collaborators, principal investigators, CROs, suppliers and vendors may engage in misconduct or other improper activities, including non-compliance with regulatory standards and requirements.

We are exposed to the risk that our employees, independent contractors, consultants, commercial collaborators, principal investigators, CROs, suppliers and vendors may engage in fraudulent conduct or other illegal activity. Misconduct by these parties could include intentional, reckless and/or negligent conduct or disclosure of unauthorized activities to us that violates FDA regulations, including those laws requiring the reporting of true, complete and accurate information to the FDA, manufacturing standards, federal and state healthcare laws and regulations, and laws that require the true, complete and accurate reporting of financial information or data. In particular, sales, marketing and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Misconduct by these parties could also involve the improper use of individually identifiable information, including, without limitation, information obtained in the course of clinical trials, which could result in regulatory sanctions and serious harm to our reputation. We have adopted a code of business conduct and ethics, but it is not always possible to identify and deter misconduct, and the precautions we take to detect and prevent this activity 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. 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 significant civil, criminal and administrative penalties, including, without limitation, damages, fines, disgorgement, imprisonment, exclusion from participation in government healthcare programs, such as Medicare and Medicaid, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, and the curtailment or restructuring of our operations.

Risks related to this offering, ownership of our common stock and our status as a public company

There has been no prior public market for our common stock. An active trading market for our common stock may not develop and you may not be able to resell your shares of our common stock at or above the initial offering price, if at all.

Prior to this offering, there has been no public market for our common stock. The initial public offering price for our common stock was determined through negotiations with the underwriters and may not be indicative of the price at which our common stock will trade after the closing of this offering. Although we have applied to list our common stock on the Nasdaq Global Market, there is no guarantee that we will be approved for listing and an active trading market for our shares may never develop or be sustained following this offering. If an active market for our common stock does not develop or is not sustained, it may be difficult for you to sell shares you purchased in this offering at an attractive price or at all.

The trading price of the shares of our common stock may be volatile, and purchasers of our common stock could incur substantial losses.

Our stock price may be volatile and subject to wide fluctuations in response to various factors, some of which we cannot control. The stock market in general and the market for biopharmaceutical companies in particular have experienced extreme volatility that has often been unrelated to the operating performance of particular

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companies. As a result of this volatility, investors may not be able to sell their common stock at or above the price paid for the shares. The market price for our common stock may be influenced by many factors, including:

- the commencement, enrollment or results of our clinical trials of BT-11 or NX-13 or any future clinical trials we may conduct, or changes in the development status of our product candidates;
- any delay in our regulatory filings for BT-11, NX-13 or any other product candidate we may develop, 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;
- the success of competitive products or announcements by potential competitors of their product development efforts;
- adverse results from, delays in or termination of clinical trials;
- adverse regulatory decisions, including failure to receive regulatory approval of our product candidates;
- developments or disputes concerning patent applications, issued patents or other proprietary rights;
- unanticipated serious safety concerns related to the use of BT-11, NX-13 or any other product candidate;
- changes in financial estimates by us or by any equity research analysts who might cover our stock;
- conditions or trends in our industry;
- changes in the market valuations of similar companies;
- stock market price and volume fluctuations of comparable companies and, in particular, those that operate in the biopharmaceutical industry;
- publication of research reports about us or our industry or positive or negative recommendations or withdrawal of research coverage by securities analysts;
- announcements by us or our competitors of significant acquisitions, strategic collaborations, joint ventures, capital commitments or divestitures;
- announcements of investigations or regulatory scrutiny of our operations or lawsuits filed against us;
- investors' general perception of our company and our business;
- recruitment or departure of key personnel;
- overall performance of the equity markets;
- trading volume of our common stock;
- sales of common stock by us, our insiders or our other stockholders;
- expiration of market stand-off or lock-up agreements;
- 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;
- changes in the structure of healthcare payment systems;
- general political and economic conditions; and
- other events or factors, many of which are beyond our control.

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The stock market in general, and the Nasdaq Global Market and biotechnology companies in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of these companies, including very recently in connection with the ongoing COVID-19 pandemic, which has resulted in decreased stock prices for many companies notwithstanding the lack of a fundamental change in their underlying business models or prospects. Broad market and industry factors, including potentially worsening economic conditions and other adverse effects or developments relating to the ongoing COVID-19 pandemic, may negatively affect the market price of our common stock, regardless of our actual operating performance. The realization of any of the above risks or any of a broad range of other risks, including those described in this section, could have a significant and material adverse impact on the market price of our common stock.

In addition, in the past, stockholders have initiated class action lawsuits against pharmaceutical and biotechnology companies following periods of volatility in the market prices of these companies' stock. Such litigation, if instituted against us, could cause us to incur substantial costs and divert management's attention and resources from our business.

If you purchase shares of our common stock in this offering, you will suffer immediate dilution of your investment.

The initial public offering price of our common stock is substantially higher than the net tangible book value per share of our common stock. Therefore, if you purchase shares of our common stock in this offering, you will pay a price per share that substantially exceeds our pro forma as adjusted net tangible book value per share after this offering. Based on the 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, you will experience immediate dilution of \$ per share, representing the difference between our pro forma as adjusted net tangible book value per share as of September 30, 2020 and the assumed initial public offering price.

If equity research analysts do not publish research or reports, or publish unfavorable research or reports, about us, our business or our market, our stock price and trading volume could decline.

The trading market for our common stock will be influenced by the research and reports that equity research analysts publish about us, our business and our market. We do not currently have and may never obtain research coverage by securities or industry analysts, and such lack of research coverage may adversely affect the market price of our common stock. In the event we do have equity research analyst coverage, we will not have any control over the analysts or the content and opinions included in their reports. The price of our stock could decline if one or more equity research analysts downgrade our stock or issue other unfavorable commentary or research. If one or more equity research analysts ceases coverage of our company or fails to publish reports on us regularly, demand for our stock could decrease, which in turn could cause our stock price or trading volume to decline.

A significant portion of our total outstanding shares are restricted from immediate resale but may be sold into the market in the near future. This could cause the market price of our common stock to drop significantly, even if our business is doing well.

Sales of a substantial number of shares of our common stock in the public market could occur at any time. If our stockholders sell, or the market perceives that our stockholders intend to sell, substantial amounts of our common stock in the public market, the market price of our common stock could decline significantly.

Upon the closing of this offering, we will have outstanding shares of common stock, after giving effect to the automatic conversion of our redeemable convertible preferred stock outstanding as of December 31, 2019 into 11,260,608 shares of our common stock, and assuming no exercise of outstanding options or other outstanding warrants to purchase shares of our redeemable convertible preferred stock. Of these shares, the shares sold in this offering will be freely tradable and substantially all of the additional shares of

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common stock will be available for sale in the public market beginning 180 days after the date of this prospectus following the expiration of lock-up agreements between some of our stockholders and the underwriters. We may release these stockholders from their lock-up agreements with the underwriters at any time and without notice, which would allow for earlier sales of shares in the public market.

In addition, promptly following the closing of this offering, we intend to file one or more registration statements on Form S-8 under the Securities Act of 1933, as amended, or the Securities Act, registering the issuance of _____ shares of common stock subject to options or other equity awards issued or reserved for future issuance under our equity incentive plans. Shares registered under these registration statements on Form S-8 will be available for sale in the public market subject to vesting arrangements and exercise of options, the lock-up agreements described above and the restrictions of Rule 144 in the case of our affiliates.

Additionally, after this offering, the holders of an aggregate of 11,260,608 shares of our common stock, or their transferees, will have rights, subject to some conditions, to require us to file one or more registration statements covering their shares or to include their shares in registration statements that we may file for ourselves or other stockholders. If we were to register the resale of these shares, they could be freely sold in the public market. If these additional shares 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.

Raising additional capital may cause dilution to our existing stockholders or restrict our operations.

We may seek additional capital through a variety of means, including through public or private equity, debt financings or other sources. To the extent that we raise additional capital through the sale of equity or convertible debt or equity securities, your ownership interest will be diluted, and the terms may include liquidation or other preferences that adversely affect your rights as a stockholder. Such financing may result in dilution to stockholders, imposition of debt covenants, increased fixed payment obligations or other restrictions that may affect our business. If we raise additional funds through up-front payments or milestone payments pursuant to strategic collaborations with third parties, we may have to relinquish valuable rights to our product candidates, or grant licenses on terms that are not favorable to us. In addition, we may seek additional capital due to favorable market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans.

Provisions in our corporate charter documents and under Delaware law may prevent or frustrate attempts by our stockholders to change our management and hinder efforts to acquire a controlling interest in us, and the market price of our common stock may be lower as a result.

There are provisions in our certificate of incorporation and bylaws that may make it difficult for a third party to acquire, or attempt to acquire, control of our company, even if a change of control was considered favorable by you and other stockholders. For example, our board of directors has the authority to issue up to _____ shares of preferred stock. The board of directors can fix the price, rights, preferences, privileges, and restrictions of the preferred stock without any further vote or action by our stockholders. The issuance of shares of preferred stock may delay or prevent a change of control transaction. As a result, the market price of our common stock and the voting and other rights of our stockholders may be adversely affected. An issuance of shares of preferred stock may result in the loss of voting control to other stockholders. Our charter documents also contain other provisions that could have an anti-takeover effect, including:

- only one of our three classes of directors will be elected each year;
- stockholders will not be entitled to remove directors other than by a 66 2/3% vote and only for cause;
- stockholders will not be permitted to take actions by written consent;
- stockholders cannot call a special meeting of stockholders; and

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- stockholders must give advance notice to nominate directors or submit proposals for consideration at stockholder meetings.

In addition, we are subject to the anti-takeover provisions of Section 203 of the Delaware General Corporation Law, which regulates corporate acquisitions by prohibiting Delaware corporations from engaging in specified business combinations with particular stockholders of those companies. These provisions could discourage potential acquisition proposals and could delay or prevent a change of control transaction. They could also have the effect of discouraging others from making tender offers for our common stock, including transactions that may be in your best interests. These provisions may also prevent changes in our management or limit the price that investors are willing to pay for our stock.

Concentration of ownership of our common stock among our existing executive officers, directors and principal stockholders may prevent new investors from influencing significant corporate decisions.

Our executive officers, directors and current beneficial owners of 5% or more of our common stock and their respective affiliates beneficially own % of our outstanding common stock. As a result, these persons, acting together, would be able to significantly influence all matters requiring stockholder approval, including the election and removal of directors, any merger, consolidation, sale of all or substantially all of our assets, or other significant corporate transactions.

Some of these persons or entities may have interests different than yours. For example, because many of these stockholders purchased their shares at prices substantially below the current market price of our common stock and have held their shares for a longer period, they may be more interested in selling our company to an acquirer than other investors, or they may want us to pursue strategies that deviate from the interests of other stockholders.

We are an “emerging growth company” and a “smaller reporting company” and, as a result of the reduced disclosure and governance requirements applicable to emerging growth companies and smaller reporting companies, our common stock may be less attractive to investors.

We are an “emerging growth company” as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act, and we intend to take advantage of some of the exemptions from 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 in the assessment of our internal control over financial reporting;
- not being required to comply with any requirement that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation or a supplement to the auditor’s report providing additional information about the audit and the financial statements;
- reduced disclosure obligations regarding executive compensation in our periodic reports, proxy statements and registration statements; and
- not being required to hold a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved.

We cannot predict if investors will find our common stock less attractive because we will 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. We may take advantage of these reporting exemptions until we are no longer an emerging growth company. 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 closing of our initial public 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 means the market value of our common stock

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that is held by non-affiliates exceeds \$700 million as of the prior June 30th, and (2) the date on which we have issued more than \$1.0 billion in non-convertible debt during the prior three-year period.

Under Section 107(b) of the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have irrevocably elected not to avail ourselves of this exemption from new or revised accounting standards and, therefore, we will be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies. Even after we no longer qualify as an emerging growth company, we may, under certain circumstances, still qualify as a “smaller reporting company,” which would allow us to take advantage of many of the same exemptions from disclosure requirements, including reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements.

If we fail to maintain proper and effective internal controls, our ability to produce accurate financial statements on a timely basis could be impaired.

After the closing of this offering, we will be subject to the reporting requirements of the Securities Exchange Act of 1934, the Sarbanes-Oxley Act of 2002, or the Sarbanes-Oxley Act, and the rules and regulations of the stock market on which our common stock is listed. The Sarbanes-Oxley Act requires, among other things, that we maintain effective disclosure controls and procedures and internal control over financial reporting.

Commencing with our fiscal year ending December 31, 2020, we must perform system and process evaluation and testing of our internal control over financial reporting to allow management to report on the effectiveness of our internal control over financial reporting in our Form 10-K filing for that year, as required by Section 404 of the Sarbanes-Oxley Act. This will require that we incur substantial additional professional fees and internal costs to expand our accounting and finance functions and that we expend significant management efforts. Prior to this offering, we have never been required to test our internal control within a specified period, and, as a result, we may experience difficulty in meeting these reporting requirements in a timely manner.

We may identify weaknesses in our system of internal financial and accounting controls and procedures that could result in a material misstatement of our financial statements. Our internal control over financial reporting will not prevent or detect all errors and all fraud. A control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control system’s objectives will be met. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud will be detected.

If we are not able to comply with the requirements of Section 404 of the Sarbanes-Oxley Act in a timely manner, or if we are unable to maintain proper and effective internal controls, we may not be able to produce timely and accurate financial statements. If that were to happen, the market price of our stock could decline and we could be subject to sanctions or investigations by the stock exchange on which our common stock is listed, the Securities and Exchange Commission or other regulatory authorities.

We will have broad discretion in the use of proceeds from this offering and may invest or spend the proceeds in ways with which you do not agree and in ways that may not increase the value of your investment.

We will have broad discretion over the use of proceeds from this offering. You may not agree with our decisions, and our use of the proceeds may not yield any return on your investment. We expect to use the net proceeds to us from this offering, together with our existing cash and cash equivalents, to In addition, we may use a portion of the proceeds from this offering to pursue our strategy to in-license or acquire additional product candidates. Our failure to apply the net proceeds from this offering effectively could compromise our ability to pursue our growth strategy and we might not be able to yield a significant return, if any, on our investment of these net proceeds. You will not have the opportunity to influence our decisions on how to use our net proceeds from this offering.

Our effective tax rate may fluctuate, and we may incur obligations in tax jurisdictions in excess of accrued amounts.

We are subject to taxation in more than one tax jurisdiction. As a result, our effective tax rate is derived from a combination of applicable tax rates in the various places that we operate. In preparing our financial statements, we estimate the amount of tax that will become payable in each of such places. Nevertheless, our effective tax rate may be different than experienced in the past due to numerous factors, including passage of the newly enacted federal income tax law, changes in the mix of our profitability from jurisdiction to jurisdiction, the results of examinations and audits of our tax filings, our inability to secure or sustain acceptable agreements with tax authorities, changes in accounting for income taxes and changes in tax laws. Any of these factors could cause us to experience an effective tax rate significantly different from previous periods or our current expectations and may result in tax obligations in excess of amounts accrued in our financial statements.

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

Our net operating loss carryforwards, or NOLs, and certain other tax attributes could expire unused and be unavailable to offset future income tax liabilities because of their limited duration or because of restrictions under U.S. tax law. Our NOLs generated in the taxable year ended on or before December 31, 2017 are only permitted to be carried forward for 20 taxable years under applicable U.S. federal tax law. As of December 31, 2019, we had U.S. federal and state NOLs of \$15.4 million and \$15.4 million, respectively. The federal NOLs include \$1.9 million that may be used to offset up to 100% of future taxable income and will begin to expire in 2037, unless previously utilized. We have a full valuation allowance for deferred tax assets including NOLs. Under the Tax Act, as modified by the CARES Act, federal net operating losses incurred in taxable years ended after December 31, 2017 and in future years may be carried forward indefinitely, but the deductibility of federal net operating losses generated in taxable years beginning after December 31, 2017, and particularly for tax years beginning after December 31, 2020, is limited.

In addition, under Section 382 of the Code, and corresponding provisions of state law, if a corporation undergoes an “ownership change,” which is generally defined as a cumulative change, by value, in our ownership by “5-percent stockholders” that exceeds 50 percentage points over a rolling three-year period, the corporation’s ability to use its pre-change NOLs and other pre-change tax attributes to offset its post-change income or taxes may be limited. We have not determined whether we have undergone an ownership change in the past or if we will undergo an ownership change as a result of this offering. If an ownership change occurs and our ability to use our net operating loss carryforwards is materially limited, it would harm our future operating results by effectively increasing our future tax obligations.

Because we do not anticipate paying any cash dividends on our common stock in the foreseeable future, capital appreciation, if any, will be your sole source of gains and you may never receive a return on your investment.

You should not rely on an investment in our common stock to provide dividend income. We have not declared or paid cash dividends on our common stock to date. We currently intend to retain our future earnings, if any, to fund the development and growth of our business. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future. Investors seeking cash dividends should not purchase our common stock.

We will incur increased costs and demands upon management as a result of being a public company.

As a public company listed in the United States, we will incur significant additional legal, accounting and other costs, which we anticipate could be between \$1.0 million and \$2.0 million annually. These additional costs could negatively affect our financial results. In addition, changing laws, regulations and standards relating to corporate governance and public disclosure, including regulations implemented by the SEC and The Nasdaq

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Stock Market, may increase legal and financial compliance costs and make some activities more time-consuming. These laws, regulations and standards are subject to varying interpretations and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. We intend to invest resources to comply with evolving laws, regulations and standards, and this investment may result in increased general and administrative expenses and a diversion of management's time and attention from revenue-generating activities to compliance activities. If notwithstanding our efforts to comply with new laws, regulations and standards, we fail to comply, regulatory authorities may initiate legal proceedings against us and our business may be harmed.

Failure to comply with these rules might also make it more difficult for us to obtain some types of insurance, including director and officer liability insurance, and we might be forced to accept reduced policy limits and coverage or incur substantially higher costs to obtain the same or similar coverage. The impact of these events could also make it more difficult for us to attract and retain qualified persons to serve on our board of directors, on committees of our board of directors or as members of senior management.

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware and the federal district courts of the United States of America will be the exclusive forums for substantially all disputes between us and our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers or employees.

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware is the exclusive forum for (1) any derivative action or proceeding brought on our behalf, (2) any action asserting a claim for breach of a fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders, (3) any action asserting a claim arising pursuant to any provision of the Delaware General Corporation Law, our amended and restated certificate of incorporation or our amended and restated bylaws or (4) any action asserting a claim governed by the internal affairs doctrine. Our amended and restated certificate of incorporation further provides that the federal district courts of the United States of America will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act.

These exclusive forum provisions may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage such lawsuits against us and our directors, officers and other employees. For example, stockholders who do bring a claim in the Court of Chancery could face additional litigation costs in pursuing any such claim, particularly if they do not reside in or near the State of Delaware. The Court of Chancery and federal district courts 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 or results may be more favorable to us than to our stockholders. Some companies that adopted a similar federal district court forum selection provision are currently subject to a suit in the Chancery Court of Delaware by stockholders who assert that the provision is not enforceable. If a court were to find either choice of forum provision contained in our amended and restated certificate of incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions, which could adversely affect our business and financial condition.

Recently, the Court of Chancery of the State of Delaware issued an opinion invalidating the federal district court exclusive forum provision, which decision has been appealed. In light of that recent decision, we will not attempt to enforce this provision of our amended and restated certificate of incorporation, unless the decision is reversed on appeal. As a result, we may incur additional costs associated with resolving disputes that would otherwise be restricted by that provision in other jurisdictions, which could seriously harm our business. However, if the decision is reviewed on appeal and ultimately overturned by the Delaware Supreme Court, we would enforce the federal district court exclusive forum provision.

Special note regarding forward-looking statements

This prospectus contains forward-looking statements that involve substantial risks and uncertainties. Any statements contained herein that are not statements of historical facts may be deemed to be forward-looking statements. The forward-looking statements are contained principally in the sections entitled "Prospectus summary," "Risk factors," "Management's discussion and analysis of financial condition and results of operations," "Business" and elsewhere in this prospectus. In some cases, you can identify forward-looking statements by terms such as "may," "will," "should," "expect," "plan," "anticipate," "could," "intend," "target," "project," "estimate," "believe," "estimate," "predict," "potential" or "continue" or the negative of these terms or other similar expressions intended to identify statements about the future. These statements speak only as of the date of this prospectus and involve known and unknown risks, uncertainties and other important 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 the forward-looking statements. We have based these forward-looking statements largely on our current expectations and projections about future events and financial trends that we believe may affect our business, financial condition and results of operations. These forward-looking statements include, without limitation, statements about the following:

- the timing, progress and results of our clinical trials of BT-11, NX-13 and any other product candidates, including statements regarding the timing of initiation and completion of studies or trials and related preparatory work, the period during which the results of the trials will become available and our research and development programs;
- the timing of any submission of filings for regulatory approval of, and our ability to obtain and maintain regulatory approvals for, BT-11, NX-13 and any other product candidates for any indication;
- our expectations regarding the size of the patient populations, market acceptance and opportunity for and clinical utility of our product candidates, if approved for commercial use;
- our manufacturing capabilities and strategy, including the scalability and commercial viability of our manufacturing methods and processes;
- our expectations regarding the scope of any approved indication for BT-11, NX-13 or any other product candidate;
- our ability to successfully commercialize our product candidates;
- our ability to leverage our LANCE platform to identify and develop future product candidates;
- our estimates of our expenses, ongoing losses, future revenue, capital requirements and our needs for or ability to obtain additional funding;
- our ability to establish or maintain collaborations or strategic relationships;
- our ability to identify, recruit and retain key personnel;
- our ability to protect and enforce our intellectual property position for our product candidates, and the scope of such protection;
- our financial performance;
- our expected use of proceeds from this offering;
- our competitive position and the development of and projections relating to our competitors or our industry;

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- the impact of laws and regulations;
- the impact of the COVID-19 pandemic; and
- our expectations regarding the time during which we will be an emerging growth company under the JOBS Act.

Because forward-looking statements are inherently subject to risks and uncertainties, some of which cannot be predicted or quantified and some of which are beyond our control, you should not rely on these forward-looking statements as predictions of future events. The events and circumstances reflected in our forward-looking statements may not be achieved or occur and actual results could differ materially from those projected in the forward-looking statements. You should refer to the “Risk factors” section of this prospectus for a discussion of important factors that may cause our actual results to differ materially from those expressed or implied by our forward-looking statements. Moreover, we operate in an evolving environment. New risk factors and uncertainties may emerge from time to time, and it is not possible for management to predict all risk factors and uncertainties. As a result of these factors, we cannot assure you that the forward-looking statements in this prospectus will prove to be accurate. Except as required by applicable law, we do not plan to publicly update or revise any forward-looking statements contained herein, whether as a result of any new information, future events, changed circumstances or otherwise. You should, however, review the factors and risks and other information we describe in the reports we will file from time to time with the SEC after the date of this prospectus.

You should read this prospectus and the documents that we reference in this prospectus and have filed 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 what we expect. We qualify all of our forward-looking statements by these cautionary statements.

Industry and other data

Unless otherwise indicated, the industry, statistical and market data in this prospectus are based on our own internal estimates and research as well as from industry and general publications and research, surveys and studies conducted by third parties. All of the market data used in this prospectus involve a number of assumptions and limitations, and the sources of such data cannot guarantee the accuracy or completeness of such information. While we believe that each of these studies and publications is reliable, the industry in which we operate is subject to a high degree of uncertainty and risk due to a variety of important factors, including those described in the section titled "Risk factors." These and other factors could cause our results to differ materially from those expressed in the estimates made by third parties and by us.

Use of proceeds

We estimate that the net proceeds to us from our issuance and 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, which is the midpoint of the price range set forth on the cover page of this prospectus, and after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

Each \$1.00 increase (decrease) in the 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, would increase (decrease) the net proceeds to us from 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 the estimated underwriting discounts and commissions and estimated offering expenses payable by us. Each increase (decrease) of 1.0 million in the number of shares we are offering would increase (decrease) the net proceeds to us from this offering, after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us, by approximately \$ _____ million, assuming the assumed initial public offering price stays the same.

We intend to use the net proceeds from this offering, together with our existing cash, cash equivalents and marketable securities, as follows:

- approximately \$ _____ million to _____ ;
- approximately \$ _____ million to _____ ; and
- the remainder for working capital and other general corporate purposes.

We may also use a portion of the remaining net proceeds to in-license, acquire or invest in complementary businesses, technologies, products or assets, although we have no current agreements, commitments or understandings to do so.

We believe that the net proceeds of this offering, together with through our existing cash, cash equivalents and marketable securities, will enable us to fund our operations through _____. Based on our current operational plans and assumptions, we expect our cash and cash equivalents, together with the net proceeds from this offering, will be sufficient to _____. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we expect. After this offering, we will require substantial capital in order to advance our current and future product candidates through clinical trials, regulatory approval and, if approved, commercialization. We may satisfy our future cash needs through the sale of equity securities, debt financings, working capital lines of credit, corporate collaborations or license agreements, grant funding, interest income earned on invested cash balances, or a combination of one or more of these sources.

This expected use of net proceeds from this offering and our existing cash, cash equivalents and marketable securities represents our intentions based upon our current plans and business conditions, which could change in the future as our plans and business conditions evolve. The amounts and timing of our actual expenditures may vary significantly depending on numerous factors, including the progress of our development, the status of and results from clinical trials, as well as any collaborations that we may enter into with third parties for our drug candidates, and any unforeseen cash needs.

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As a result, our management will have broad discretion in the application of the net proceeds from this offering, and investors will be relying on the judgment of our management regarding the application of those net proceeds. The timing and amount of our actual expenditures will be based on many factors, including cash flows from operations and the anticipated growth of our business. Pending these uses, we plan to invest these net proceeds in short-term, interest bearing obligations, investment-grade instruments, certificates of deposit or direct or guaranteed obligations of the United States.

Dividend policy

We have never declared or paid, and do not anticipate declaring or paying, in the foreseeable future, 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. Any future determination related to our dividend policy will be made at the discretion of our board of directors and will depend upon, 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.

Capitalization

The following table sets forth our cash, cash equivalents and marketable securities, and our capitalization as of September 30, 2020:

- on an actual basis;
- on a pro forma basis to give effect to:
 - the conversion of all outstanding shares of our convertible preferred stock into an aggregate of 11,260,608 shares of our common stock, which will occur immediately prior to the closing of this offering; and
 - the filing and effectiveness of our amended and restated certificate of incorporation, which will occur immediately prior to the closing of this offering; and
- on a pro forma as adjusted basis to give further effect to our issuance and sale of _____ shares of common stock in this offering at 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 the estimated underwriting discounts and estimated offering expenses payable by us.

Our capitalization following the closing of this offering will depend on the actual initial public offering price and other terms of this offering determined at pricing. You should read this information in conjunction with our financial statements and the related notes appearing at the end of this prospectus, the "Management's discussion and analysis of financial condition and results of operations" section and other financial information contained in this prospectus.

(in thousands, except share and per share data)	As of September 30, 2020		
	Actual (unaudited)	Pro forma (unaudited)	Pro forma as adjusted (unaudited)
Cash, cash equivalents and marketable securities	\$ 35,331	\$ 35,331	\$
Convertible preferred stock, \$0.01 par value; 11,260,608 shares authorized, issued and outstanding, actual; no shares authorized, issued or outstanding, pro forma and pro forma as adjusted	\$ 73,037	\$ —	\$ —
Stockholders' (deficit) equity:			
Common stock, \$0.01 par value, 20,500,000 shares authorized, actual and pro forma; 6,775,000 shares issued and outstanding, actual; 18,035,608 shares issued and outstanding, pro forma; _____ shares authorized, _____ shares issued and outstanding, pro forma as adjusted	67	180	
Additional paid-in capital	51	72,975	
Accumulated other comprehensive loss	36	36	
Accumulated deficit	(44,388)	(44,388)	
Total stockholders' (deficit) equity	(44,234)	28,803	
Total capitalization	\$ 28,803	\$ 28,803	\$

Each \$1.00 increase (decrease) in the 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, would increase (decrease) the pro forma as adjusted amount of each of cash and cash equivalents, additional paid in capital, total stockholders' equity and total capitalization by approximately \$ _____ million, assuming that the number of shares offered

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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 at the assumed initial public offering price per share of \$ _____ per share, which is 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 each of additional paid in capital, total stockholders' equity and total capitalization by approximately \$ _____ million.

The number of shares of our common stock outstanding in the table above excludes:

- 2,003,956 shares of our common stock reserved for future issuance under our 2019 Plan, as well as any automatic increases in the number of shares of common stock reserved for future issuance under the 2019 Plan.

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 and the pro forma as adjusted net tangible book value per share of our common stock immediately after this offering.

As of September 30, 2020, we had a historical net tangible book value (deficit) of \$(44.2) million, or \$(6.53) per share of common stock. Our historical net tangible book value per share represents total tangible assets less total liabilities and convertible preferred stock, divided by the number of shares of our common stock outstanding as of September 30, 2020.

Our pro forma net tangible book value as of September 30, 2020 was \$28.8 million, or \$1.60 per share of our common stock. Pro forma net tangible book value represents the amount of our total tangible assets less our total liabilities, after giving effect to the conversion of all shares of our convertible preferred stock into an aggregate of 11,260,608 shares of our common stock, which will occur immediately prior to the closing of this offering. Pro forma net tangible book value per share represents pro forma net tangible book value divided by the total number of shares outstanding as of September 30, 2020, after giving effect to the pro forma adjustment described above.

After giving further effect to the sale of _____ shares of common stock in this offering at 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, and after deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us, our pro forma as adjusted net tangible book value as of September 30, 2020 would have been approximately \$ _____ million, or approximately \$ _____ per share. This amount represents an immediate increase in pro forma as adjusted net tangible book value of \$ _____ per share to our existing stockholders and immediate dilution of approximately \$ _____ per share to new investors in this offering. We determine dilution by subtracting the pro forma as adjusted net tangible book value per share after this offering from the amount of cash that a new investor paid for a share of common stock in this offering.

The following table illustrates this dilution on a per share basis:

Assumed initial public offering price per share	\$
Historical net tangible book value (deficit) per share as of September 30, 2020	\$(6.53)
Increase in net tangible book value per share attributable to the pro forma adjustments described above	8.13
Pro forma net tangible book value per share as of September 30, 2020	1.60
Increase in pro forma net tangible book value per share attributable to new investors participating in this offering	_____
Pro forma as adjusted net tangible book value per share after this offering	_____
Dilution per share to new investors participating in this offering	\$

Each \$1.00 increase (decrease) in the 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, would increase (decrease) the pro forma as adjusted net tangible book value per share after this offering by approximately \$ _____, and dilution in pro forma net tangible book value per share to new investors by approximately \$ _____, assuming that 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 of 1.0 million shares in the number of shares we are offering would

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increase the pro forma as adjusted net tangible book value per share after this offering by \$ _____ and decrease the dilution per share to new investors participating in this offering by \$ _____, assuming no change in the assumed initial public offering price per share and after deducting the estimated underwriting discounts and commissions. A decrease of 1.0 million shares in the number of shares we are offering would decrease the pro forma as adjusted net tangible book value per share after this offering by \$ _____ and increase the dilution per share to new investors participating in this offering by \$ _____, assuming no change in the assumed initial public offering price per share and after deducting the estimated underwriting discounts and commissions.

If the underwriters exercise their option to purchase additional shares of our common stock in full, the pro forma as adjusted net tangible book value after this offering would be \$ _____ per share, the increase in pro forma net tangible book value per share would be \$ _____ and the immediate dilution per share to new investors would be \$ _____ per share, in each case assuming an initial public offering price of \$ _____ per share, which is the midpoint of the price range set forth on the cover page of this prospectus.

The following table summarizes, as of September 30, 2020, on the pro forma as adjusted basis described above, the differences between the number of shares purchased from us, the total consideration paid, or to be paid, to us in cash and the average price per share paid by existing stockholders and to be paid by new investors in this offering. The calculation below is 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, before deducting the estimated underwriting discounts and commissions and estimated offering expenses payable by us.

	<u>Shares purchased</u>		<u>Total consideration</u>		<u>Weighted average price per share</u>
	<u>Number</u>	<u>Percent</u>	<u>Amount</u>	<u>Percent</u>	
Existing stockholders before this offering	18,035,608	%	\$	%	\$
New investors participating in this offering					
Total		100%	\$	100%	

Each \$1.00 increase (decrease) in the assumed initial public offering price of \$ _____ per share, the midpoint of the estimated price range set forth on the cover page of this prospectus, would increase (decrease) the total consideration paid by new investors and total consideration paid by all stockholders by approximately \$ _____ million, assuming that the number of shares of common stock 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.

The table above assumes no exercise of the underwriters' option to purchase additional shares in this offering. If the underwriters' option to purchase additional shares is exercised in full, the number of shares of our common stock held by existing stockholders would be reduced to _____ % of the total number of shares of our common stock outstanding after this offering, and the number of shares of common stock held by new investors purchasing common stock in this offering would be increased to _____ % of the total number of shares of our common stock outstanding after this offering.

The foregoing tables and calculations are based on the number of shares of our common stock outstanding as of September 30, 2020, and excludes:

- 2,003,956 shares of our common stock reserved for future issuance under our 2019 Plan, as well as any automatic increases in the number of shares of common stock reserved for future issuance under the 2019 Plan.

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To the extent that stock options are exercised, new stock options are issued under our equity incentive plan, or we issue additional shares of common stock in the future, there will be further dilution to investors participating in this offering. In addition, we may choose to raise additional capital because of market conditions or strategic considerations, even if we believe that we have sufficient funds for our current or future operating plans. If we raise additional capital through the sale of equity or convertible debt securities, the issuance of these securities could result in further dilution to our stockholders.

Selected consolidated financial data

The following tables summarize our selected consolidated financial data. You should read the following selected consolidated financial data together with our consolidated financial statements and the related notes thereto included elsewhere in this prospectus and the "Management's discussion and analysis of financial condition and results of operations" sections of this prospectus. We have derived the consolidated statement of operations data for the years ended December 31, 2018 and 2019 from our audited consolidated financial statements appearing at the end of this prospectus. We have derived the following consolidated statement of operations data for the nine months ended September 30, 2019 and 2020 and the balance sheet data as of September 30, 2020 from our unaudited interim condensed consolidated financial statements appearing at the end of this prospectus. The unaudited interim condensed consolidated financial statements reflect, in the opinion of management, adjustments of a normal, recurring nature that are necessary for a fair statement of the unaudited interim consolidated financial statements. Our historical results are not necessarily indicative of the results that should be expected in the future.

(in thousands, except share and per share data)	Year ended December 31,		Nine months ended	
	2018	2019	2019	September 30, 2020
			(unaudited)	
Consolidated statement of operations data:				
Operating expenses:				
Research and development	\$ 6,803	\$ 11,812	\$ 8,455	\$ 15,379
General and administrative	1,136	1,478	1,097	3,898
Total operating expenses	7,939	13,290	9,552	19,277
Loss from operations	(7,939)	(13,290)	(9,552)	(19,277)
Other income (expense):				
Research and development incentive income	2,005	—	—	—
Interest expense	(4)	(304)	(304)	—
Loss from foreign exchange	(106)	(33)	(103)	37
Other income, net	—	160	—	437
Other income (expense), net	1,895	(177)	(407)	474
Net loss	\$ (6,044)	\$ (13,467)	\$ (9,959)	\$ (18,803)
Net loss per share, basic and diluted ⁽¹⁾	\$ (1.07)	\$ (2.16)	\$ (1.61)	\$ (2.84)
Weighted average common shares outstanding, basic and diluted	5,637,905	6,243,382	6,190,123	6,613,248
Pro forma net loss per share, basic and diluted (unaudited) ⁽¹⁾		\$ (1.06)		\$ (1.05)
Pro forma weighted average common shares outstanding, basic and diluted (unaudited) ⁽¹⁾		12,660,028		17,873,856
Net loss	\$ (6,044)	\$ (13,467)	\$ (9,959)	\$ (18,803)
Unrealized gain (loss) on available-for-sale securities	—	(77)	—	113
Comprehensive loss	\$ (6,044)	\$ (13,544)	\$ (9,959)	\$ (18,690)

(1) See Note 10 to our consolidated financial statements included elsewhere in this prospectus for an explanation of the method used to calculate pro forma net loss per share and pro forma weighted average common shares outstanding.

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(in thousands)	As of December 31,		Nine months ended September 30, 2020 (Unaudited)
	2018	2019	
Balance sheet data:			
Cash and cash equivalents	\$ 359	\$ 9,808	\$ 2,477
Working capital(1)	696	47,084	27,618
Total assets	2,796	50,480	36,762
Convertible preferred stock	—	73,037	73,037
Total stockholders' equity (deficit)	1,000	(25,583)	(44,234)

(1) We define working capital as current assets less current liabilities. See our consolidated financial statements included elsewhere in this prospectus.

Management's discussion and analysis of financial condition and results of operations

Overview

We are a clinical-stage biopharmaceutical company focused on the discovery and development of oral therapeutics for patients with autoimmune diseases that are the first to target new mechanisms of action, including the LANCL2, NLRX1 and PLXDC2 immunometabolic pathways. Our core expertise is in the development of therapeutic candidates that target novel pathways at the interface of immunity and metabolism. Based on our understanding of the role that a cell's metabolic pathways have on modulating inflammatory responses, we aim to inhibit these inflammatory responses by changing the metabolic processes in target cells. We leverage our proprietary AI-based precision medicine platform, which we refer to as our LANCE platform, to identify novel therapeutic targets based on predictions of immunometabolic function and create therapeutic candidates to engage those targets in areas of unmet medical need. Through our LANCE platform, we have identified seven novel immunometabolic targets and product candidates to date across 14 indications, including ulcerative colitis, or UC, Crohn's disease, or CD, lupus, rheumatoid arthritis, nonalcoholic steatohepatitis, multiple sclerosis, Alzheimer's disease, asthma, psoriasis, atopic dermatitis, eosinophilic esophagitis, chronic obstructive pulmonary disease, diabetic neuropathy and type 1 diabetes. We are currently conducting a Phase 2 clinical trial of our lead product candidate, BT-11, for mild to moderate UC in the United States and Europe and expect to report results in the second half of 2020. We expect to initiate a Phase 2 trial of BT-11 for the treatment of moderate to severe CD in the first half of 2021.

Through our LANCE platform, we have progressed BT-11 from initial discovery to an ongoing Phase 2 clinical trial in less than three years, and in a capital efficient manner. We have progressed NX-13 from initial discovery to a Phase 1 clinical trial in less than 18 months. We have initiated a new clinical trial every year for the last three years. In addition to the LANCL2, NLRX1 and PLXDC2 pathways, the LANCE platform has identified four new targets in early preclinical stages of development. We intend to continue to leverage the LANCE platform to further advance a pipeline of product candidates for the treatment of autoimmune diseases, with the potential to file one to two investigational new drug applications, or INDs, per year over the next five years, including three new INDs in 2021.

We have a limited operating history. Since our inception in 2017, our operations have focused on developing our clinical and preclinical product candidates and our LANCE platform, organizing and staffing our company, business planning, raising capital, establishing our intellectual property portfolio and conducting clinical trials and preclinical studies. We do not have any product candidates approved for sale and have not generated any revenue from product sales. We have funded our operations primarily through the sale of equity securities. Since inception, we have raised an aggregate of \$70.0 million of gross proceeds from the sale of shares of our preferred stock and convertible promissory notes.

Since inception, we have incurred significant operating losses. Our net loss was \$6.0 million and \$13.5 million for the years ended December 31, 2018 and 2019, respectively. Our net loss was \$9.7 million and \$18.8 million for the nine months ended September 30, 2019 and 2020, respectively. As of September 30, 2020, we had an accumulated deficit of \$44.4 million. We expect to continue to incur significant expenses and operating losses for the foreseeable future. We anticipate that our expenses will increase significantly in connection with our ongoing activities, as we:

- conduct our ongoing and planned clinical trials of BT-11 and NX-13, as well as initiate and complete additional clinical trials, as needed;
- pursue regulatory approval of BT-11 and NX-13 for the treatment of UC and CD;

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- leverage our LANCE platform to discover and develop additional product candidates for the treatment of autoimmune diseases;
- scale up our clinical and regulatory capabilities;
- establish a commercialization infrastructure and scale up external manufacturing and distribution capabilities to commercialize any product candidates for which we may obtain regulatory approval, including BT-11 and NX-13;
- adapt our regulatory compliance efforts to incorporate requirements applicable to marketed products;
- maintain, expand and protect our intellectual property portfolio;
- hire additional clinical, manufacturing and scientific personnel;
- add operational, financial and management information systems and personnel, including personnel to support our product development and planned future commercialization efforts; and
- incur additional legal, accounting and other expenses in operating as a public company.

Components of our results of operations

Research and development expenses

Research and development expenses consist primarily of costs incurred in connection with our research activities, including our discovery efforts, and the development of our product candidates, and include:

- salaries, benefits, stock-based compensation and other related costs for personnel engaged in research and development functions;
- expenses incurred under agreements with third parties, including CROs and other third parties that conduct research, preclinical activities and clinical trials on our behalf, as well as CMOs that manufacture drug material for use in our clinical trials and preclinical studies;
- costs of outside consultants, including their fees, and related travel expenses;
- the costs of laboratory supplies and acquiring, developing and manufacturing preclinical and clinical trial supply; and
- allocated expenses for rent and maintenance of facilities and other operating costs.

We expense research and development costs as incurred. We track external development costs by product candidate or development program, but we do not allocate personnel costs, or other internal costs to specific development programs or product candidates.

Research and development activities are central to our business model. Product candidates in later stages of clinical development generally have a higher development costs than those in earlier stages of clinical development, primarily due to the increased size and duration of later-stage clinical trials. We expect that our research and development expenses will continue to increase substantially for the foreseeable future and will comprise a larger percentage of our total expenses as we complete our ongoing clinical trials, initiate new clinical trials, continue to discover and develop additional product candidates and prepare regulatory filings for any product candidates that successfully complete clinical development.

The successful development of our product candidates is highly uncertain. At this time, we cannot determine with certainty the duration and costs of our existing and future clinical trials of our product candidates or any other product candidate we may develop or if, when, or to what extent we will generate revenue from the commercialization and sale of any product candidate for which we obtain marketing approval. We may never

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succeed in obtaining marketing approval for any product candidate. The duration, costs and timing of clinical trials and development of our product candidates and any other product candidate we may develop in the future will depend on a variety of factors, including:

- per patient trial costs;
- the number of patients who enroll in each trial;
- the number of trials required for approval;
- the number of sites included in the trials;
- the countries in which the trials are conducted;
- the length of time required to enroll eligible patients;
- the drop-out or discontinuation rates of patients;
- potential additional safety monitoring requested by regulatory agencies;
- the duration of patient participation in the trials and follow-up;
- the phase of development of the product candidate; and
- the efficacy and safety profile of the product candidate.

Our expenditures are subject to additional uncertainties, including the terms and timing of regulatory approvals, and the expense of filing, prosecuting, defending and enforcing any patent claims or other intellectual property rights. We may never succeed in achieving regulatory approval for our product candidates. We may obtain unexpected results from our clinical trials. We may elect to discontinue, delay or modify clinical trials of our product candidates. A change in the outcome of any of these variables with respect to the development of a product candidate could mean a significant change in the costs and timing associated with the development of that product candidate. For example, if the FDA or another regulatory authority were to require us to conduct clinical trials beyond those that we anticipate will be required for the completion of clinical development of a product candidate, or if we experience significant delays in our clinical trials due to patient enrollment or other reasons, we would be required to expend significant additional financial resources and time on the completion of clinical development.

General and administrative expenses

General and administrative expenses consist primarily of salaries and other related costs for personnel in our executive, finance, business development and administrative functions. General and administrative expenses also include legal fees relating to intellectual property and corporate matters, professional fees for accounting, auditing, tax and consulting services; insurance costs, travel expenses and facility-related expenses, which include direct depreciation costs and allocated expenses for rent and maintenance of facilities and other operating costs.

We expect that our general and administrative expenses will increase in the future as we increase our personnel headcount to support our expanded infrastructure, including the development of a commercialization infrastructure for any product candidates for which we may obtain regulatory approval. We also expect to incur increased expenses associated with being a public company, including costs of accounting, audit, legal, regulatory and tax-related services associated with maintaining compliance with stock exchange and SEC requirements, director and officer insurance costs and investor and public relations costs. We anticipate the additional costs for these services will increase our general and administrative expenses by between \$1.0 million and \$2.0 million on an annual basis.

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Research and development incentive income

Research and development incentive income consists of tax incentive credits that our subsidiary Landos Australia is eligible to receive based on a percentage of certain research and development activities undertaken in Australia.

Interest expense

Interest expense consists of interest due on our convertible promissory notes that were outstanding during the period prior to the conversion of the notes into Series B convertible preferred stock in August 2019.

Income taxes

Since our inception in January 2017, we have generated cumulative federal and state net operating loss for which we have not recorded any net tax benefit due to uncertainty around utilizing these tax attributes within their respective carryforward periods.

As of December 31, 2019, we had federal net operating loss carryforwards, or NOLs, of \$15.4 million and state NOLs of \$15.4 million that may be available to offset future taxable income. The federal NOLs include \$1.9 million available to reduce 100% of future taxable income, which will begin to expire in 2037, if not utilized, and \$13.5 million, which can be carried forward indefinitely. The state NOLs will begin to expire in 2037, if not utilized.

Utilization of the net operating losses and credits may be subject to a substantial annual limitation due to ownership change limitations provided by the Internal Revenue Code of 1986, as amended. The annual limitation may result in the expiration of our net operating losses and credits before we can use them. We have recorded a valuation allowance on all of our deferred tax assets, including our deferred tax assets related to our net operating loss and research and development tax credit carryforwards.

Results of operations

Comparison of the nine months ended September 30, 2019 and 2020

The following table summarizes our results of operations for the nine months ended September 30, 2019 and 2020:

	Nine months ended September 30,	
	2019	2020
	(in thousands) (unaudited)	
Operating expenses		
Research and development	\$ 8,455	\$ 15,379
General and administrative	1,097	3,898
Total operating expenses	9,552	19,277
Loss from operations	(9,552)	(19,277)
Other income (expense);		
Interest expense	(304)	—
Loss from foreign exchange	(103)	37
Other income, net	—	437
Other income (expense), net	(407)	474
Net loss	\$(9,959)	\$(18,803)

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Research and development expenses

Research and development expenses were \$8.5 million for the nine months ended September 30, 2019 compared to \$15.4 million for the nine months ended September 30, 2020. The increase of \$6.9 million was primarily attributable to increased costs associated with ongoing Phase 2 clinical trial activities for BT-11.

The following table summarizes our research and development expenses by product candidate or development program for the nine months ended September 30, 2019 and 2020:

	Nine months ended September 30,	
	2019	2020
	(in thousands) (unaudited)	
BT-11	\$ 7,429	\$ 11,971
BT-104	—	104
NX-13	604	2,717
Other discovery pipeline and unallocated costs	422	587
Total research and development expenses	\$ 8,455	\$ 15,379

General and administrative expenses

General and administrative expenses were \$1.0 million for the nine months ended September 30, 2019 compared to \$3.9 million for the nine months ended September 30, 2020. The increase of \$2.9 million was primarily attributable to increases in patent costs, related legal fees and other outside professional services.

Comparison of the years ended December 31, 2018 and 2019

The following table summarizes our results of operations for the years ended December 31, 2018 and 2019:

	Year ended December 31,	
	2018	2019
	(in thousands)	
Operating expenses		
Research and development	\$ 6,803	\$ 11,812
General and administrative	1,136	1,478
Total operating expenses	7,939	13,290
Loss from operations	(7,939)	(13,290)
Other income (expense);		
Research and development incentive income	2,005	—
Interest expense	(4)	(304)
Loss from foreign exchange	(106)	(33)
Other income, net	—	160
Other income (expense), net	1,895	(177)
Net loss	\$(6,044)	\$(13,467)

Research and development expenses

Research and development expenses were \$6.8 million for the year ended December 31, 2018 compared to \$11.8 million for the year ended December 31, 2019. The increase of \$5.0 million was primarily attributable to

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increased costs associated with clinical development activities relating to BT-11 and IND-enabling activities for NX-13.

The following table summarizes our research and development expenses by product candidate or development program for the years ended December 31, 2018 and 2019:

	Year ended December 31,	
	2018	2019
	(in thousands)	
BT-11	\$6,165	\$10,621
NX-13	—	657
Other discovery pipeline and unallocated costs	638	534
Total research and development expenses	\$6,803	\$11,812

General and administrative expenses

General and administrative expenses were \$1.1 million for the year ended December 31, 2018 compared to \$1.5 million for the year ended December 31, 2019. The increase of \$0.4 million was primarily attributable to increases in patent costs, related legal fees and other outside professional services.

Research and development incentive income

Research and development incentive income was \$2.0 million for the year ended December 31, 2018, related to tax incentive credits that our subsidiary Landos Australia received. We did not have any research and development incentive income for the year ended December 31, 2019.

Liquidity and capital resources

Since our inception, we have incurred significant operating losses and negative cash flows from our operations. We expect to incur significant expenses and operating losses for the foreseeable future as we advance the preclinical and clinical development of our research programs and product candidates. We expect that our research and development and general and administrative costs will increase in connection with conducting additional preclinical studies and clinical trials for our current and future research programs and product candidates, including BT-11 and NX-13, discovering and developing new product candidates using the LANCE precision medicine platform, contracting with CMOs to support preclinical studies and clinical trials, expanding our intellectual property portfolio, and providing general and administrative support for our operations. As a result, we will need additional capital to fund our operations, which we may obtain from additional equity or debt financings, collaborations, licensing arrangements, or other sources.

We do not currently have any approved products and have never generated any revenue from product sales. To date, we have financed our operations primarily through private financings. Since we were formed, we have raised a total of \$70.0 million in gross proceeds from the sale of shares of our Series A and B convertible preferred stock and convertible promissory notes. As of September 30, 2020, we had \$35.3 million in cash, cash equivalents and marketable securities and an accumulated deficit of \$44.4 million. We had no indebtedness as of September 30, 2020. As of December 31, 2019, we had \$50.0 million in cash, cash equivalents and marketable securities and an accumulated deficit of \$25.6 million. We had no indebtedness as of December 31, 2019.

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The following table summarizes our sources and uses of cash for each of the periods set forth below:

	Year ended December 31,		Nine months ended September 30,	
	2018	2019	2019	2020
	(in thousands)			
	(unaudited)			
Net cash used in operating activities	\$(6,896)	\$ (9,874)	\$ (7,058)	\$ (14,571)
Net cash provided by (used in) investing activities	(43)	(40,325)	(159)	7,201
Net cash provided by financing activities	5,000	59,648	59,648	—
Net increase (decrease) in cash and cash equivalents	\$(1,939)	\$ 9,449	\$ 52,431	\$ (7,370)

Operating activities

Net cash used in operating activities for the nine months ended September 30, 2020 was \$14.6 million, consisting primarily of our net loss of \$18.8 million as we incurred expenses associated with research activities for our lead product candidates and incurred general and administrative expenses. Net cash used in operating activities for the nine months ended September 30, 2019 was \$7.1 million, consisting primarily of our net loss of \$9.9 million as we incurred expenses associated with research activities for our lead product candidates and incurred general and administrative expenses. The net loss was partially offset by a decrease in incentive and tax receivables of \$2.1 million.

Net cash used in operating activities for the year ended December 31, 2019 was \$9.9 million, consisting primarily of our net loss of \$13.5 million as we incurred expenses associated with research activities for our lead product candidates and incurred general and administrative expenses. Net cash used in operating activities for the year ended December 31, 2018 was \$6.9 million, consisting primarily of our net loss of \$6.0 million as we incurred expenses associated with research activities for our lead product candidates and incurred general and administrative expenses.

Investing activities

Net cash provided by investing activities for the nine months ended September 30, 2020 was \$7.2 million, consisting of net proceeds from sales, purchases and return of principal in relation to our available-for-sale marketable securities. Net cash used in investing activities for the nine months ended September 30, 2019 was less than \$0.2 million, consisting of purchases of property and equipment.

Net cash used in investing activities for the year ended December 31, 2019 was \$40.3 million, consisting of purchase of investments and property and equipment. Net cash used in investing activities for the year ended December 31, 2018 was less than \$0.1 million, consisting of purchases of property and equipment.

Financing activities

We did not have any financing activities in the nine months ended September 30, 2020. Net cash provided by financing activities in the nine months ended September 30, 2019 was \$59.7 million, primarily related to net proceeds from the issuance of convertible promissory notes.

Net cash provided by financing activities in the year ended December 31, 2019 of \$59.6 million was related to net proceeds of \$51.7 million from the issuance of our Series B convertible preferred stock and \$8.0 million from the issuance of our convertible promissory notes that were subsequently converted into Series B convertible preferred stock. Net cash provided by financing activities in the year ended December 31, 2018 of \$5.0 million primarily related to net proceeds from the issuance of our Series A convertible preferred stock.

Funding requirements

To date, we have not generated any revenues from the commercial sale of approved drug products, and we do not expect to generate substantial revenue for at least the next few years. If we fail to complete the development of our product candidates in a timely manner or fail to obtain their regulatory approval, our ability to generate future revenue will be compromised. We do not know when, or if, we will generate any revenue from our product candidates, and we do not expect to generate significant revenue unless and until we obtain regulatory approval of, and commercialize, our product candidates. We expect our expenses to increase in connection with our ongoing activities, particularly as we continue the research and development of, continue or initiate clinical trials of and seek marketing approval for our product candidates. In addition, if we obtain approval for any of our product candidates, we expect to incur significant commercialization expenses related to sales, marketing, manufacturing and distribution. Furthermore, following the completion of this offering, we expect to incur additional costs associated with operating as a public company. We anticipate that we will need substantial additional funding in connection with our continuing operations. If we are unable to raise capital when needed or on attractive terms, we could be forced to delay, reduce or eliminate our research and development programs or future commercialization efforts.

Identifying potential product candidates and conducting preclinical studies and clinical trials is a time-consuming, expensive and uncertain process that takes many years to complete, and we may never generate the necessary data or results required to obtain marketing approval and achieve product sales. In addition, our product candidates, if approved, may not achieve commercial success. Our commercial revenues, if any, will be derived from sales of product candidates that we do not expect to be commercially available in the near term, if at all.

We believe that the anticipated net proceeds from this offering, together with our existing cash and cash equivalents, will enable us to fund our operating expenses and capital expenditure requirements through . We have based these estimates on assumptions that may prove to be imprecise, and we could utilize our available capital resources sooner than we expect.

Because of the numerous risks and uncertainties associated with research, development and commercialization of pharmaceutical drugs, it is difficult to estimate with certainty the amount of our working capital requirements. Our future funding requirements will depend on many factors, including:

- the scope, progress, costs and results of our ongoing and planned clinical trials of BT-11 and NX-13;
- the costs and results of discovery work using our LANCE precision medicine platform;
- the scope, progress, costs and results of preclinical development, laboratory testing and clinical trials for any future product candidates we may decide to pursue;
- the extent to which we in-license or acquire rights to other products, product candidates or technologies;
- the costs and timing of process development and manufacturing scale-up activities associated with our product candidates and other programs we advance them through preclinical and clinical development;
- the number and development requirements of other product candidates that we may pursue;
- the costs, timing and outcome of regulatory review of our product candidates;
- the costs and timing of future commercialization activities, including product manufacturing, marketing, sales and distribution, for any of our product candidates for which we receive marketing approval;
- the revenue, if any, received from commercial sales of our product candidates for which we receive marketing approval;

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- our ability to establish and maintain strategic collaborations, licensing or other agreements and the financial terms of such agreements; and
- the costs and timing of preparing, filing and prosecuting patent applications, maintaining and protecting our intellectual property rights and defending against any intellectual property-related claims.

Further, our operating results may change in the future, and we may need additional funds to meet operational needs and capital requirements associated with such operating plans.

Our future commercial revenue, if any, will be derived from sales of products that we do not expect to be commercially available for several years, if at all. Until such time, if ever, that we can generate product revenue sufficient to achieve profitability, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaboration agreements, other third-party funding, strategic alliances, licensing arrangements and marketing and distribution arrangements. Adequate additional financing may not be available to us on acceptable terms, or at all. We currently have no credit facility or committed sources of capital. 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 of these securities may include liquidation or other preferences that adversely affect your rights as a common stockholder. Debt financing and preferred equity financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through other third-party funding, collaboration agreements, strategic alliances, licensing arrangements or marketing and distribution arrangements, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or product candidates or grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce or terminate our product development or future commercialization efforts or grant rights to develop and market products or product candidates that we would otherwise prefer to develop and market ourselves.

Contractual obligations, commitments and contingencies

The following table summarizes our contractual obligations as of December 31, 2019 and the effects that such obligations are expected to have on our liquidity and cash flows in future periods:

(in thousands)	Payments due by period				
	Total	Less than 1 year	1 to 3 years	4 to 5 years	More than 5 years
Operating lease commitments(1)	\$ 33	\$ 33	—	—	—
Total	\$ 33	\$ 33	—	—	—

(1) Amounts in the table reflect payments due for our headquarters in Blacksburg, Virginia under an operating lease agreement that expires in July 2021.

We enter into contracts in the normal course of business with third-party contract organizations for clinical trials, preclinical studies, manufacturing and other services and products for operating purposes. These contracts generally provide for termination following a certain period after notice and therefore we believe that our non-cancelable obligations under these agreements are not material.

Off-balance sheet arrangements

We have not entered into any off-balance sheet arrangements.

Critical accounting policies and significant judgments and estimates

Our management's discussion and analysis of financial condition and results of operations is based on our consolidated financial statements, which have been prepared in accordance with generally accepted accounting principles in the United States. The preparation of our consolidated financial statements and related disclosures requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities, costs and expenses and the disclosure of contingent assets and liabilities in our consolidated financial statements. We base our estimates on historical experience, known trends and events and various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. We evaluate our estimates and assumptions on an ongoing basis. Our actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are described in more detail in the notes to our consolidated financial statements appearing at the end of this prospectus, we believe that the following accounting policies are those most critical to the judgments and estimates used in the preparation of our consolidated financial statements.

Research and development expenses

The majority of our operating expenses to date have been incurred in research and development activities. As part of the process of preparing our consolidated financial statements, we estimate our accrued research and development expenses at each consolidated balance sheet date. This process involves reviewing purchase orders and open contracts, communicating with our personnel to identify services that have been performed on our behalf and estimating the level of service performed and the associated costs incurred for the services when we have not yet been invoiced or otherwise notified of the actual cost. The majority of our service providers invoice us monthly in arrears for services performed or when contractual milestones are met; however, some require advance payments. We make estimates of our accrued expenses as of each consolidated balance sheet date in our consolidated financial statements based on facts and circumstances known to us at that time. We periodically confirm the accuracy of our estimates with the service providers and make adjustments as necessary. The significant estimates in our accrued research and development expenses include the costs incurred for services performed by CROs with research and development activities for which we have not yet been invoiced.

We base our expenses related to research and development activities on our estimates of the services received and efforts expended pursuant to quotes and contracts with vendors that conduct research and development on our behalf. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. There may be instances in which payments made to our vendors will exceed the level of services provided and result in a prepayment of the research and development expense. In accruing service fees, we estimate the time period over which services will be performed and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from our estimate, we adjust the accrual or prepaid accordingly.

Research and development incentive income

We are eligible to obtain certain research and development tax credits, including the Australian research and development tax incentive credit, or the Australia R&D credit, through a program administered through the Australian Tax Office, or the ATO, which provides for a cash refund based on a percentage of certain research and development activities undertaken in Australia by our Australian subsidiary, Landos Australia. The cash refund currently provides for a 43.5% refundable tax offset if eligible companies meet certain criteria, including annual aggregate revenue of less than \$20.0 million (Australian) during the reimbursable period, if the intellectual property being developed is Australian owned or has intercompany agreements to support the

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Australian ownership, file an research and development tax incentive application to register its research and development activities and analyze its research and development expense to ensure such activities are qualified under Australian Industry guidelines.

The tax incentives are available on the basis of specific criteria with which we must comply. Although the tax incentive may be administered through the local tax authority, we have accounted for the incentives outside of the scope of ASC Topic 740, Income Taxes, since the incentives are not linked to our taxable income and can be realized regardless of whether we have generated taxable income in the respective jurisdictions.

The Australian Tax Office has the right to review the reimbursed amounts for eligibility until February 2023. We may be exposed to risks if the Australian Tax Office determines these expenses to be ineligible. We evaluate the exposure under ASC 450, Commitments and Contingencies.

In addition, Landos Australia incurs goods and services tax, or GST, on services provided by Australian vendors. As an Australian entity, Landos Australia is entitled to a refund of the GST paid. Our estimate of the amount of cash refund we expect to receive related to GST incurred is included in incentive and tax receivables in our balance sheet and accompanying financial statement notes.

Quantitative and qualitative disclosures about market risk

Our primary exposure to market risk is interest rate sensitivity, which is affected by changes in the general level of U.S. interest rates, particularly because our cash is held in interest-bearing money market accounts. 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.

Inflation generally affects us by increasing our cost of labor and clinical trial costs. We do not believe that inflation had a material effect on our business, financial condition or results of operations during the years ended December 31, 2018 and 2019.

Recent accounting pronouncements

A description of recent accounting pronouncements that may potentially impact our financial position, results of operations or cash flows is disclosed in Note 2 to our audited consolidated financial statements included elsewhere in this prospectus.

Emerging growth company status

We qualify as an “emerging growth company,” as defined in the Jumpstart Our Business Startups Act of 2012, as amended, or JOBS Act. As an “emerging growth company” we may take advantage of reduced reporting requirements that are otherwise applicable to public companies. These provisions include, but are not limited to:

- the option to present only two years of audited consolidated financial statements and only two years of related “Management’s discussion and analysis of financial condition and results of operations” in this prospectus;
- not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended;
- not being required to comply with any requirements that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation or a supplement to the auditor’s report providing

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- additional information about the audit and the consolidated financial statements (i.e., an auditor discussion and analysis);
- reduced disclosure obligations regarding executive compensation in our periodic reports, proxy statements and registration statements; and
- exemptions from the requirements of holding a non-binding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved.

We may take advantage of these provisions until the last day of our fiscal year following the fifth anniversary of the completion of this offering. However, if any of the following events occur prior to the end of such five-year period, (i) our annual gross revenue exceeds \$1.07 billion, (ii) we issue more than \$1.0 billion of non-convertible debt in any three-year period or (iii) we become a “large accelerated filer,” (as defined in Rule 12b-2 under the Securities Exchange Act of 1934, as amended, or the Exchange Act), we will cease to be an emerging growth company prior to the end of such five-year period. We will be deemed to be a “large accelerated filer” at such time that we (a) have an aggregate worldwide market value of common equity securities held by non-affiliates of \$700.0 million or more as of the last business day of our most recently completed second fiscal quarter, (b) have been required to file annual and quarterly reports under the Exchange Act, for a period of at least 12 months and (c) have filed at least one annual report pursuant to the Exchange Act. 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 reduced disclosure obligations regarding executive compensation in this prospectus and our periodic reports and proxy statements.

We have elected to take advantage of certain of the reduced disclosure obligations in the registration statement of which this prospectus forms a part and may elect to take advantage of other reduced reporting requirements in future filings. As a result, the information that we provide to our stockholders may be different than you might receive from other public reporting companies in which you hold equity interests.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. We have elected to take advantage of this extended transition period.

Business

We are a clinical-stage biopharmaceutical company focused on the discovery and development of oral therapeutics for patients with autoimmune diseases that are the first to target new mechanisms of action, including the LANCL2, NLRX1 and PLXDC2 immunometabolic pathways. Our core expertise is in the development of therapeutic candidates targeting novel pathways at the interface of immunity and metabolism. Based on our understanding of the role that a cell's metabolic pathways have on modulating inflammatory responses, we aim to inhibit these inflammatory responses by changing the metabolic processes in target cells. We leverage our proprietary AI-based precision medicine platform, our LANCE platform, to identify novel therapeutic targets based on predictions of immunometabolic function and create therapeutic candidates to engage those targets in areas of unmet medical need. Through our LANCE platform, we have identified seven novel immunometabolic targets and product candidates to date across 14 indications, including ulcerative colitis, or UC, Crohn's disease, or CD, lupus, rheumatoid arthritis, nonalcoholic steatohepatitis, or NASH, multiple sclerosis, Alzheimer's disease, asthma, psoriasis, atopic dermatitis eosinophilic esophagitis, or EoE, chronic obstructive pulmonary disease, or COPD, diabetic nephropathy and type 1 diabetes. We are currently conducting a Phase 2 clinical trial of our lead product candidate, BT-11, for mild to moderate UC in the United States and Europe and expect to report results in the second half of 2020. We expect to initiate a Phase 2 trial of BT-11 for the treatment of moderate to severe CD in the first half of 2021. We believe the therapeutics we discover and develop, if approved, will have a significant impact on the quality of life of patients suffering from autoimmune diseases.

Background in autoimmune diseases

Autoimmune diseases generally result from the loss of self-tolerance in the immune system, causing the immune system to attack healthy organs and tissues. This leads to inflammation of the organs and tissues, causing chronic pain and deterioration or destruction of the ability of these organs to function. Current therapies either broadly prevent the immune system from functioning, in the case of corticosteroids, aminosaliclates, or ASA, and immunosuppressants, or systemically block specific molecules that promote inflammation in the case of biologics and JAK inhibitors. While great strides have been made, existing approaches continue to leave unmet patient need, due in part to significant safety concerns.

Our approach

Our mission is to create safe and effective therapeutic candidates to engage targets in areas of unmet medical need where current treatments have limited efficacy and safety and tolerability concerns. To pursue this mission, we are developing novel, disease-specific oral therapeutic candidates that are designed to address the therapeutic gap in the current treatment paradigm for autoimmune diseases. We leverage our AI-based integrated computational and experimental LANCE platform to discover novel therapeutic targets based on prediction and validation of immunometabolic function. Through our LANCE platform, we have identified novel pathways that stand at immunometabolic intersections of multiple well-established immune processes. We believe these pathways have a greater potential to restore the immune tolerance that is lost in patients with autoimmune disease.

We begin our discovery process with an *in silico* target discovery and drug development platform. The LANCE precision medicine platform analyzes large datasets from autoimmune disease patients to identify novel expression patterns tied to regulatory functions and ranks and prioritizes new immunometabolic targets that are perturbed in human disease and have high potential to serve as selective portals to the coordination of multiple well-categorized downstream responses tied to autoimmune diseases. We then continue evaluation *in silico*, identifying hundreds of thousands of targets within the human immune system to evaluate and refine

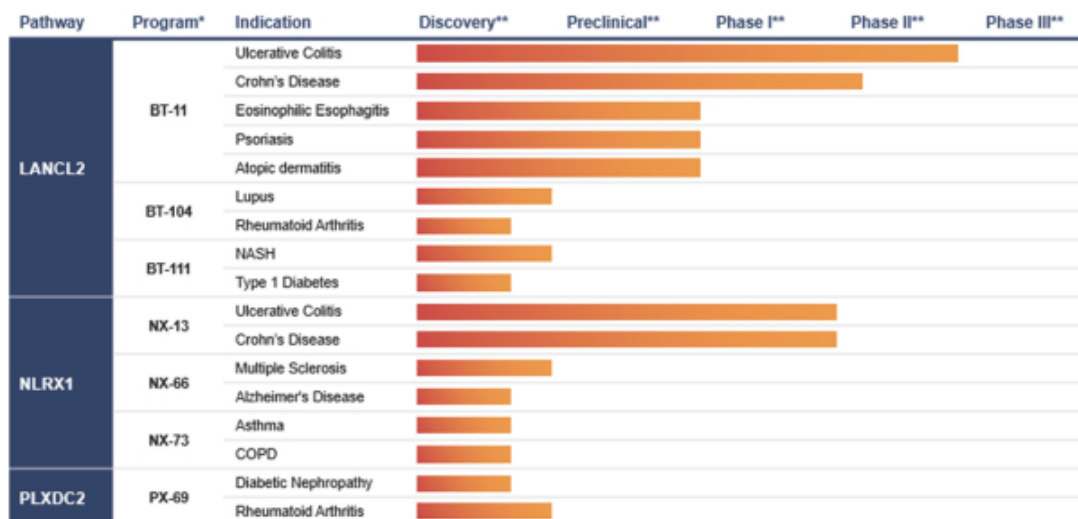
possibilities to maximize efficiency of time and cost. We include multi-scale modeling of immune and disease processes in virtual representation of target tissues for a specific disease to prioritize targets capable of exerting control on the immune response to a level providing meaningful change at the tissue and clinical level. In parallel, targets are filtered for druggability and safety parameters, removing those that are difficult to activate or inhibit or have potential to be linked to toxicity. We prioritize selection of targets with applicable mechanisms to numerous autoimmune and inflammatory diseases while generating predictions for disease-specific potency and optimal pharmacokinetic, or PK, profiles. We then conduct experimental target validation of top ranked targets in cells and in mouse models of disease using loss-of-function and constitutive expression methods. Upon successful target identification, an internal medicinal chemistry program is initiated to optimize preliminary scaffolds into leads. We evaluate lead compounds through a series of in-house robust target engagement, *in vitro* culture, multiple animal models for diseases of interest, PK evaluation, preliminary dose range finding, or DRF, toxicity studies in rats and translational studies in human patient samples. We have used this strategy to identify, evaluate and advance seven product candidates across three targets spanning numerous autoimmune and related disorders. Prioritization of these product candidates occurs based on unmet clinical need, therapeutic market size and opportunity, preclinical safety and efficacy data, and performance in translational biomarkers.

Optimally identifying novel immunometabolic targets with our proprietary LANCE platform

We believe our LANCE platform may have several key advantages as compared to traditional drug discovery paradigm in autoimmune diseases, including improved discovery and significant target generation potential, ability to modulate multiple critical pathways via a single target, and cost advantage. We have leveraged our platform to identify seven novel immunometabolic targets to date, two of which we are evaluating in clinical trials, LANCL2 and NLRX1. Using our LANCE platform, we expect to identify further novel targets and develop new product candidates for additional indications such as lupus, rheumatoid arthritis, NASH, type 1 diabetes, multiple sclerosis, Alzheimer's disease, diabetic nephropathy, asthma, psoriasis, EoE and COPD, with the potential to submit one to two investigational new drug applications, or INDs, per year over the next five years, including at least three new INDs in 2021.

Our portfolio

We are leveraging our LANCE platform, our proprietary computational target discovery engine, to design and develop a pipeline of oral small molecule product candidates with differentiated profiles that are the first to target novel immunometabolic mechanisms to address autoimmune diseases. We currently own worldwide development and commercialization rights to each of our product candidates. Since our inception, we successfully cleared four INDs with the United States Food and Drug Administration, or FDA. We expect to submit at least three additional INDs by the end of 2021. Leveraging our LANCE platform, we have reduced our development time, measured from initial target discovery and Phase 1 clinical trial dosing, from 24 months, in the case of BT-11, to 18 months, in the case of NX-13. Our development time from discovery to Phase 2 ready was 30 months, in the case of BT-11, and 24 months, in the case of NX-13. We believe similar timelines are possible with future product candidates; however, the process of clinical development is inherently uncertain and no guarantee can be made that similar timelines will be achieved. Our ability to execute on our strategy of rapidly advancing development of our product candidates will depend on the results of our ongoing and planned clinical trials.



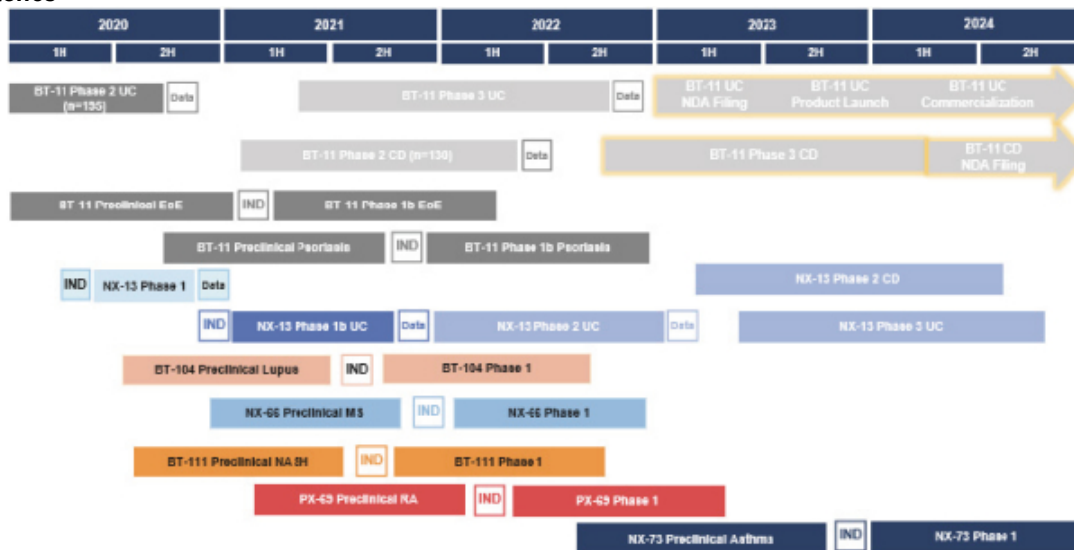
* Subject to feedback from the FDA, we intend to initially submit one IND for each product candidate in order to initiate Phase 1 clinical trials in an indication. We will submit subsequent INDs to proceed to Phase 1 clinical trials in additional indications for that product candidate.

** We define the discovery stage of development as the design, initial synthesis, target binding and preliminary pharmacology testing in in vitro and animal models of disease; the preclinical stage of development as GLP-toxicity and pharmacology studies, metabolism and pharmacokinetics in addition to scale-up chemistry manufacturing and controls for drug substance and drug product; the Phase 1 stage as clinical trials designed to assess safety, tolerability and pharmacokinetics in healthy volunteers or small patient cohorts; the Phase 2 stage as placebo-controlled clinical trials designed to provide proof-of-concept efficacy in the target patient population; and the Phase 3 stage as clinical trials designed to provide the final supporting data for the safety and effectiveness of a drug in the proposed indication to support an NDA filing.

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Numerous anticipated milestones in our portfolio are currently in preparation, as illustrated below. For BT-11, a Phase 3 clinical trial in UC will be initiated in the first half of 2021, a Phase 2 clinical trial in CD will be initiated in the first half of 2021, assuming positive results in our ongoing Phase clinical trial in UC, and Phase 1b clinical trials in EoE and psoriasis will be initiated in the first half of 2021 and the second half of 2021, respectively, in each case assuming acceptance by the FDA of our IND for such program. For NX-13, Phase 2 clinical trials in UC and CD are expected to be initiated in the second half of 2021 and the first half of 2022, respectively. For BT-104, BT-111, and NX-66, IND-enabling studies are expected to be completed in the first half of 2022.

Anticipated milestones*



* The successful clinical development of our product candidates is dependent on many factors beyond our control, including timely and successful completion of preclinical studies and clinical trials required to progress our clinical programs, and the sufficiency of our financial and other internal and external resources to complete such studies and trials, file INDs and NDAs, as appropriate, and commercialize BT-11 for UC, effective INDs from the FDA or comparable foreign applications that allow commencement of our planned clinical trials for discovery or preclinical-stage product candidates, receipt of timely marketing approvals from the FDA or other applicable regulatory authorities, our ability to successfully launch commercial sales of any approved product candidates, whether independently or with partners and our ability to produce and approved product candidates on a commercial scale. See “Risk factors—Risks related to the discovery, development and commercialization of our product candidates,” “Risk factors—Risks related to our dependence on third parties” and “Management’s discussion and analysis of financial condition and results of operations - Liquidity and capital resources.”

BT-11 program overview

Our lead product candidate, BT-11, a gut-restricted oral therapeutic that is the first candidate designed to engage the novel target lanthionine synthetase C-like protein 2, or LANCL2, a membrane receptor that has been shown to modulate immunological mechanisms that are associated with autoimmune diseases such as UC or CD. Approximately 2 million Americans suffer from UC or CD, and the treatment of these two diseases in the United States accounts for an aggregate annual market size of up to \$17 billion. There are currently no approved treatments targeting LANCL2. BT-11 is designed to act locally in the gastrointestinal tract for treatment of

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inflammatory bowel disease, or IBD. We have designed BT-11 to overcome limitations of existing therapies, including with respect to side effect profile, route of administration (injectables) and sustained efficacy. We are currently conducting a Phase 2 clinical trial of BT-11 in patients affected by mild to moderate UC in the United States and Europe and expect to report topline data in the second half of 2020. Following receipt of results from the ongoing Phase 2 trial, we plan to initiate a Phase 3 trial for UC in the first half of 2021 and a Phase 2 trial for the treatment of moderate to severe CD in the first half of 2021. We believe that BT-11, if approved, has the potential to disrupt the treatment paradigm in IBD. In UC, we believe BT-11 has the potential to be utilized as a pre-biologic therapy for mild-to-moderate cases, where 70% to 80% of the patient population exists, due to its novel mechanism of action and tolerability profile, with no dose-limiting toxicities observed in preclinical studies in doses up to 7-fold higher than the proposed clinical therapeutic dose. In CD, we believe that BT-11, if approved, has the potential to serve as a first-line therapy and treat patients prior to their progression into biologics by addressing the main limitations of current therapeutics. We believe that an oral, gut-restricted small molecule delivered once daily in a singular tablet could serve as a first-line therapy in the moderate to severe CD treatment paradigm. We also plan to develop BT-11 for EoE, and expect to initiate a Phase 1b clinical trial in EoE in the first half of 2021. Additionally, we plan to develop BT-11 for psoriasis and expect to initiate a Phase 1b clinical trial in psoriasis in the second half of 2021. We also plan to develop BT-11 for atopic dermatitis.

NX-13 program overview

Our second product candidate, NX-13, is a novel, gut-restricted oral therapeutic that targets NOD-like receptor X1, or NLRX1, a mitochondria-associated receptor that has been associated with the modulation of inflammatory cytokines for UC and CD. There are currently no approved NLRX1-based drugs. NX-13 is designed to target NLRX1 in order to induce anti-inflammatory effects in CD4+ T cells and other immune cells in the gastrointestinal tract. We believe that, if approved, NX-13 could provide an additional treatment option for the up to 50% of UC patients that experience relapse within one year of current therapies and up to 55% of CD patients that relapse within one year of achieving active remission. Mechanistically, NX-13 could provide improvements in fibrosis. We believe NX-13 offers the potential, both as a single agent and in combination with other therapeutics, to address the unmet medical need in UC and CD. We have initiated a Phase 1b trial of NX-13 for the treatment of UC and CD and expect to report topline data in the second half of 2020.

Discovery programs overview:

Our earlier stage pipeline includes numerous product candidates targeting the LANCL2 pathway (BT-104, BT-111), NLRX1 pathway (NX-66 and NX-73) and PLXDC2 pathway (PX-69):

- ***BT-104 for the treatment of lupus and rheumatoid arthritis.*** BT-104 is our oral, small molecule agonist of the LANCL2 pathway product candidate being developed for the treatment of lupus and rheumatoid arthritis. The therapeutic market in lupus is sparsely populated, with sales of the top ten therapeutics for lupus amounting to over \$4 billion annually. The therapeutic market in rheumatoid arthritis is fragmented and represents approximately \$25 billion annually. We intend to submit an IND for BT-104 in the second half of 2021, and to initiate a Phase 1 clinical trial of BT-104 in healthy volunteers thereafter in the second half of 2021.
- ***BT-111 for the treatment of NASH and type 1 diabetes.*** BT-111 is our oral, small molecule agonist of the LANCL2 pathway product candidate being developed for the treatment of NASH and type 1 diabetes. NASH has a wide projected market of approximately \$25 billion annually by 2025 and is a rapidly expanding public health issue. We intend to submit an IND for BT-111 in the second half of 2021, and to initiate a Phase 1 clinical trial of BT-111 in healthy volunteers thereafter in the second half of 2021.
- ***NX-66 for the treatment of multiple sclerosis and Alzheimer's disease.*** NX-66 is our oral, small molecule agonist of the NLRX1 pathway product candidate being developed for the treatment of multiple sclerosis and

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Alzheimer's disease. The combined CNS market in multiple sclerosis and Alzheimer's disease is estimated to be \$22 billion annually. We believe NX-66, if approved, may address the lack of therapeutic options for progressive MS and has the potential to slow cognitive decline in patients with Alzheimer's disease. We intend to submit an IND for NX-66 in the second half of 2021 and to initiate a Phase 1 clinical trial in healthy volunteers thereafter.

- ***NX-73 for the treatment of asthma and COPD.*** NX-73 is our oral, small molecule agonist of the NLRX1 pathway product candidate being developed for the treatment of asthma and COPD. The combined respiratory market in asthma and COPD is estimated at \$25 billion annually. We intend to submit an IND for NX-73 in the second half of 2023 and to initiate a Phase 1 clinical trial in healthy volunteers thereafter.
- ***PX-69 for the treatment of diabetic nephropathy and rheumatoid arthritis.*** PX-69 is our oral, small molecule agonist of the PLXDC2 pathway product candidate being developed for the treatment of diabetic nephropathy and rheumatoid arthritis. The annual markets for diabetic nephropathy, the leading cause of long-term renal dialysis, and rheumatoid arthritis, are estimated at up to \$3 billion and \$25 billion, respectively. We intend to submit an IND for PX-69 in the first half of 2022 and to initiate a Phase 1 clinical trial in healthy volunteers thereafter.

Our culture and team

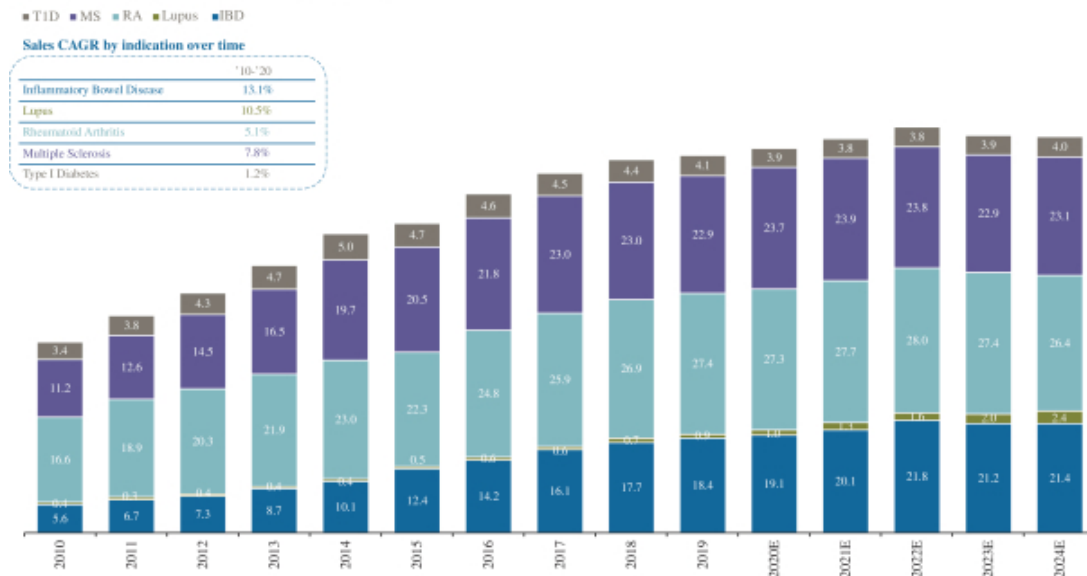
We were founded in January 2017 by Dr. Josep Bassaganya-Riera, our Chairman of our board of directors, President and Chief Executive Officer, who has assembled a management team of biopharmaceutical specialists with extensive experience in building and operating organizations that develop and deliver innovative medicines to patients. Our management team has broad expertise and successful track records in drug discovery, immunology & inflammation, clinical development, regulatory affairs, manufacturing and commercialization of therapies, as well as in business and finance, through previous experiences at leading institutions. We are also guided by our board of directors, and a clinical advisory board composed of key opinion leaders in UC and CD. We are backed by leading life sciences investors, including Perceptive Advisors, or Perceptive, and RTW Investments, or RTW.

Autoimmune market opportunity

We are developing therapeutics for the large and growing autoimmune disease market, which is expected to reach \$153 billion by 2025. Our lead product candidates target a multi-billion dollar market opportunity across 13 different indications.

The UC and CD markets are currently dominated by biologic drugs that generated up to \$17 billion in U.S. sales in 2019. From 2010 to 2020, the IBD market experienced a compound annual growth rate of 13.1%. Approximately 35% of patients treated with biologics fail to enter remission. Meanwhile, greater than 90% of UC patients with active disease have mild to moderate disease and 50% to 60% of IBD patients are biologic naïve. Current market competition in this space is limited to aminosalicylates, steroids and immunosuppressants which have only low efficacy in induction and maintenance of clinical remission. The primary competition in development, falling into two primary classes (JAK inhibitors, S1P modulators), targets a moderate to severe patient population that is primarily comprised of patients who have not responded to biologics, due to inherent safety concerns with these classes. With the exception of Xeljanz, which is FDA-approved for the treatment of UC, oral agents approved for IBD are limited to aminosalicylates, steroids and immunosuppressants that have limited efficacy. We believe we have the potential to address the large IBD market and specific therapeutic gaps in both UC and CD. However, there is no guarantee that any of our product candidates will be approved by the FDA and, even if approved, there is no guarantee that our product candidates will earn revenues comparable to Entyvio, Humira or Stelara. The graphic and table below depict the large market opportunity in IBD.

Evolution of worldwide sales by indication (\$bn)



EvaluatePharma® May 2020, Evaluate Ltd.

Large market opportunities for product candidates targeting IBD



EvaluatePharma® August 2020, Evaluate Ltd.

Our strengths

We believe we are a leader in the discovery of targets through novel multi-modal pathways at the interface of immunity and metabolism. Through our proprietary LANCE precision medicine platform, we have pioneered a promising drug development engine underpinned by advanced computational capabilities applied to the discovery of new therapeutic targets for autoimmune disease.

Our distinctive strengths include:

- **We are pioneering a new treatment paradigm in immunometabolism based on novel pathways.** Historically, innovation in autoimmune drug discovery has focused on the same known targets creating new molecules

whose development has been hampered by toxicity issues connected to the mechanism of action or systemic pathways and which have provided only marginal change to efficacy at best. The late-stage development pipeline in IBD can be summarized by JAK/STAT-, cytokine- and adhesion-based mechanisms of action, while our lead product candidate, BT-11, is the most advanced immunometabolic asset in clinical development. Our unique ability to identify novel targets that intersect and provide upstream control of established inflammatory and regulatory pathways supports a clinical path to develop novel drugs. We are further leveraging these novel immunometabolic targets in a disease-specific way with an aim to provide better and more precise care to patients.

- ***We have discovered and are developing several clinical-stage assets across the LANCL2 and NLRX1 pathways through our LANCE platform and distinctive capabilities.*** To date, we have identified seven novel immunometabolic targets, of which candidates that target two (LANCL2 and NLRX1) have progressed into the clinic. Our lead asset, BT-11, is an orally-active, gut-restricted, small molecule that is the first therapeutic candidate to target the LANCL2 pathway. BT-11 is currently being evaluated in a Phase 2 clinical trial in UC. Following receipt of results from our ongoing Phase 2 trial expected in the second half of 2020, we plan to initiate a Phase 3 trial for UC in the first half of 2021 and a Phase 2 trial for the treatment of moderate to severe CD in the first half of 2021. Our second asset, NX-13, targets the NLRX1 pathway and has entered Phase 1 clinical testing for UC and CD, with data expected in the second half of 2020.
- ***We are developing product candidates with novel mechanisms of action and the potential for use as monotherapy or combination therapy to address therapeutic gaps for IBD patients where current treatments have limited efficacy and safety and tolerability concerns.*** We believe the LANCL2 pathway is not targeted by any other drug in development for IBD. With a dual effect for pro-regulatory and anti-inflammatory signaling, targeting this pathway may offer a unique advantage for longer maintenance of clinical remission, decreasing the high flare rates in IBD. We believe BT-11, if approved, has the potential to disrupt the treatment paradigm in UC as a pre-biologic therapy for mild-to-moderate cases, where greater than 90% of the patient population with active disease exists, due to its novel mechanism of action and no dose-limiting toxicities in doses up to 7-fold higher than the currently proposed therapeutic dose in our completed Phase 1 clinical trial. Additionally, BT-11 and NX-13 are designed to offer a convenient, once-daily oral dose which we believe may provide competitive advantage over the injectable, systemically distributed biologics. Given the novel targets and limited toxicities, we believe BT-11 and NX-13 have potential to be used as monotherapy or in combination with other therapies in IBD.
- ***We are targeting several indications characterized by unmet medical need and therapeutic gaps that represent a broad market opportunity.*** We are developing therapeutics for the large and growing autoimmune disease market, which is expected to reach \$153 billion by 2025. Our lead product candidates target a multi-billion dollar market opportunity across 13 different indications. The global UC market was \$5.3 billion in 2016, and is expected to grow at a 2.5% compound annual growth rate between 2016 and 2026. The global CD market is estimated at approximately \$12 billion and expected to grow at 4% compound annual growth rate between 2019 and 2022. We believe these indications provide a large market opportunity with no established satisfactory standard of care. The primary competition in development targets a moderate-to-severe patient population that is primarily comprised of patients refractory to biologics, due to inherent safety concerns within these classes. Many key opinion leaders expect oral agents to expand the overall autoimmune disease therapeutic market size and accelerate growth in the IBD space. We believe our product candidates, if approved, have the potential to address the large autoimmune disease therapeutic market and specific therapeutic gaps in both UC and CD. Our broad therapeutic pipeline is comprised of potential valuable treatments for other autoimmune diseases, such as lupus, rheumatoid arthritis, multiple sclerosis, and type 1 diabetes, as well as other indications with immunometabolic components, such as NASH, Alzheimer's disease, and asthma.

- **We have a strong intellectual property foundation and we retain global commercial rights to all of our product candidates.** Our intellectual property portfolio includes composition of matter and method of use patents covering both BT-11 and NX-13. Our lead product candidates' patent protection extends until 2035, in the case of BT-11, and 2039, in the case of NX-13. Our intellectual property portfolio includes more than 40 issued patents and patent applications. Furthermore, we have retained exclusive development and commercial rights to all of our product candidates.
- **We have assembled an experienced team comprised of industry leaders in the fields of immunology and inflammation and we are backed by prominent life science investors.** Our management team has broad expertise and successful track records in drug discovery, immunology & inflammation, clinical development, regulatory affairs, manufacturing and commercialization of therapies, as well as in business and finance, through previous experiences at leading institutions. We are also guided by our board of directors, and a clinical advisory board composed of key opinion leaders in CD and UC. We are backed by leading life sciences investors including Perceptive and RTW.

Our strategy

As a leader in the development of therapeutic candidates addressing immunometabolic mechanisms of action, we believe we are distinctly positioned to accelerate the discovery and development of potentially safer and more effective novel therapeutics for autoimmune diseases. We are targeting indications characterized by high unmet clinical need, significant likelihood of success in clinical development and the ability to improve the quality of life for large patient populations. Our strategy consists of the following key components:

- **Maximize and capture value in our LANCE platform by discovering and developing oral therapeutics that are the first to target novel immunometabolic pathways to improve the lives of patients with autoimmune diseases.** We have leveraged our experience in immunology and therapeutic development, underpinned by the guidance of our clinical advisory board, to build the LANCE platform. We will apply our proprietary artificial intelligence, or AI, and advanced computational modeling capabilities to continue to identify novel therapeutic targets based on predictions of immunometabolic function. Through our LANCE platform, we have progressed BT-11 from initial discovery to an ongoing Phase 2 clinical trial in less than three years, and in a capital efficient manner. In addition to LANCL2, NLRX1, and PLXDC2, the LANCE platform has identified four new targets in early preclinical stages of development. We have led the discovery of the immunometabolic mechanisms for these three targets independently of external research and possess the capacity to internally discover novel targets. We intend to continue to leverage the LANCE platform to further advance a pipeline of product candidates for the treatment of autoimmune diseases. The LANCE platform has served and, we believe, will continue to serve in the generation of a seamless therapeutic pipeline ranging from early preclinical to lead selection to clinical development and commercialization.
- **Advance the development of our lead product candidate, BT-11, into Phase 3 clinical trials for the treatment of UC and CD.** We identified LANCL2 as a critical autoimmune pathway for multiple IBD conditions and have designed BT-11 to overcome limitations of existing therapies including with respect to side effect profile, route of administration, efficacy and bridging the therapeutic gap between ASA failures and biologics. Based on data observed in our preclinical studies and the results of our Phase 1 clinical trials, we believe BT-11, if approved, may offer potent disease modification with favorable tolerability relative to competing injectable biologic therapeutics, as well as an added benefit of oral administration. We have progressed BT-11 from initial discovery to an ongoing Phase 2 clinical trial in less than three years. We are currently conducting a Phase 2 clinical trial of BT-11 in patients affected by mild to moderate UC in the United States and Europe and expect to report topline results in the second half of 2020. Following receipt of results from our ongoing Phase 2 trial, we plan to initiate a Phase 3 clinical trial in UC in the first half of 2021. Additionally, we plan to

initiate a Phase 2 randomized, placebo-controlled, double-blind, multicenter study to evaluate the efficacy of oral BT-11 in moderate to severe CD in the first half of 2021.

- **Advance our second clinical candidate, NX-13, into Phase 1b/2 clinical trials for the treatment of UC and CD.** NLRX1 is a novel target at the intersection of the pathogenesis of IBD with the ability to modulate multiple associated complications including deficiencies in the epithelial barrier, interactions with the gut microbiome and underlying inflammation. In less than 18 months, we have advanced our lead NLRX1 product candidate, NX-13, from initial discovery to a Phase 1 clinical trial in healthy volunteers based on robust preclinical data. We have initiated a Phase 1 clinical trial of NX-13 for the treatment of UC and expect to report topline data in the second half of 2020. We intend to explore NX-13 both as a monotherapy and in combination with other therapeutics for the treatment of UC and CD.
- **Continue to develop a franchise of oral therapies from our deep preclinical pipeline of product candidates targeting immunometabolic pathways identified by our LANCE platform.** Recognizing the applicability of our novel targets across a range of autoimmune conditions, and the benefits to patients of disease specific molecules, we intend to advance each of our preclinical assets to exploit the full potential of each pathway or target. We are building upon our precision medicine approach to develop disease-specific molecules by exploring the use of biomarkers to identify patients more likely to benefit from therapies. BT-104, BT-111, NX-66, NX-73 and PX-69 have been identified as possible valuable treatments for autoimmune diseases, such as lupus, rheumatoid arthritis, multiple sclerosis, and type 1 diabetes, as well as other indications with immunometabolic components, such as NASH, Alzheimer's disease, and asthma. We expect to file at least one to two INDs per year over the next five years, including three new INDs in 2021.
- **Maximize the commercial value of our therapeutic pipeline.** We have retained worldwide commercial rights to all of our therapeutic programs. We intend to continue advancing more clinical candidates in various therapeutic areas independently. We plan to become a fully integrated pharmaceutical company by selecting promising programs in specialty pharmaceutical and orphan indications for internal development and commercialization and developing a commercial arm to capture value for shareholders. We will also pursue territory deals that enable partnering on commercialization of lead therapeutic assets outside of the U.S. and European markets. Moreover, we will consider partnering with strategics to develop some of the follow on therapeutic assets as a means of monetizing some of our pipeline assets.

Background on immunometabolism

Alterations in the concentration of metabolic enzymes and substrates in the cell often precede changes in the expression of genes that articulate inflammatory responses in autoimmune diseases. These metabolic processes are critical determinants of the function of immune cells. In the course of autoimmune diseases, multiple receptors transmit information about the environment through pathways at the intersection of immunity and metabolism. Over the past decade, this field of study, known as immunometabolism, has revealed the complex metabolic pathways that underlie autoimmune response in disease and has allowed us to focus on developing ways to manipulate these regulatory networks to enhance and control immunity.

Genes with inflammatory functions, such as TNF or IL-6, tend to be overexpressed during autoimmune responses and are easily identified. The metabolic pathways of immune cells must also be configured to meet the demands of their function. For example, the pro-inflammatory subset of immune cells known as T-effector cells (Th1 and Th17) depend upon glycolysis and oxidative phosphorylation, while cells involved in anti-inflammatory response known as regulatory T-cells utilize predominately fatty acid oxidation. However, genes with immunometabolic roles experience modest change in expression levels though they are critical in modulating inflammation. By altering the signals that drive differentiation and the metabolic pathways that support it, immune tolerance can be reestablished in patients where there is immune dysregulation, such as in autoimmune disease.

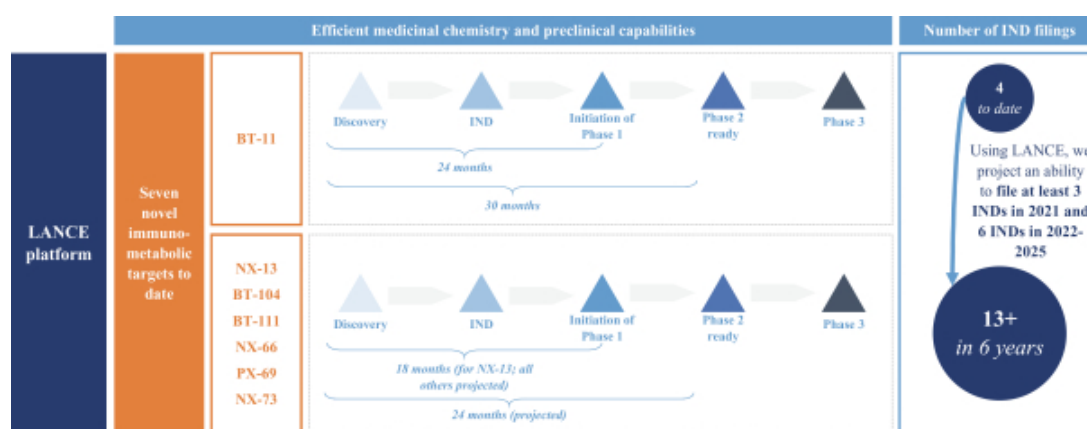
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We are focused on developing therapeutic interventions based on activating molecular targets within these immunometabolic pathways to correct aberrant inflammatory responses. We have developed an AI platform that allows for efficient identification, segregation and prioritization of these genes from high throughput datasets. This platform is designed to accelerate our program of target discovery and product development.

Our LANCE platform

We have built our LANCE precision medicine platform to identify novel targets at the intersection of immunity and metabolism and to develop new therapeutic products for these new targets. Our innovative approach to immunometabolism applies proprietary AI and advanced computational modeling to identify novel therapeutic targets based on predictions of immunometabolic function and create therapeutics to engage those targets in areas of unmet medical need. Upon target discovery, we have efficient medicinal chemistry and preclinical capabilities, as evidenced by the less than 24 months from discovery to Phase 1 initiation with BT-11 and less than 18 months from discovery to Phase 1 initiation with NX-13. Our development time from discovery to Phase 2 ready was 30 months, in the case of BT-11, and 24 months, in the case of NX-13. Using our LANCE platform, we expect to submit one to two INDs per year over the next five years, including at least three INDs in 2021. We believe similar timelines are possible with future product candidates; however, the process of clinical development is inherently uncertain and no guarantee can be made that similar timelines will be achieved.

We have successfully leveraged this iterative process to identify seven novel immunometabolic targets to date, and product candidates which are designed to target two such targets, LANCL2 and NLRX1, have begun clinical trials pursuant to INDs. Using our LANCE platform, we not only expect to identify further novel targets but to also continue to develop disease-specific product candidates for indications such as lupus, rheumatoid arthritis, NASH, type 1 diabetes, multiple sclerosis, EoE, psoriasis, Alzheimer's disease, diabetic nephropathy, asthma and COPD. We believe our innovative precision medicine approach, in which we develop specific products for disease states, enhances our ability to address existing unmet need for patients.



We developed our proprietary LANCE platform to revolutionize the target identification, prioritization and selection process as well as accelerate the development of new therapeutic products for those targets. Our leadership team has deep experience in this field, including Dr. Bassaganya-Riera, a pioneer in computational immunology and precision medicine. The team has published over 30 computationally- and AI-focused peer-reviewed publications, such as in *Artificial Intelligence in Medicine* and *PLOS Computational Biology*, and has created foundational large-scale models of the immune system, including one of the most widely used ordinary differential equation-based model of CD4+ T cell, or Treg, differentiation. The LANCE platform embodies the re-focusing of this know-how into the application of drug development for autoimmune disease.

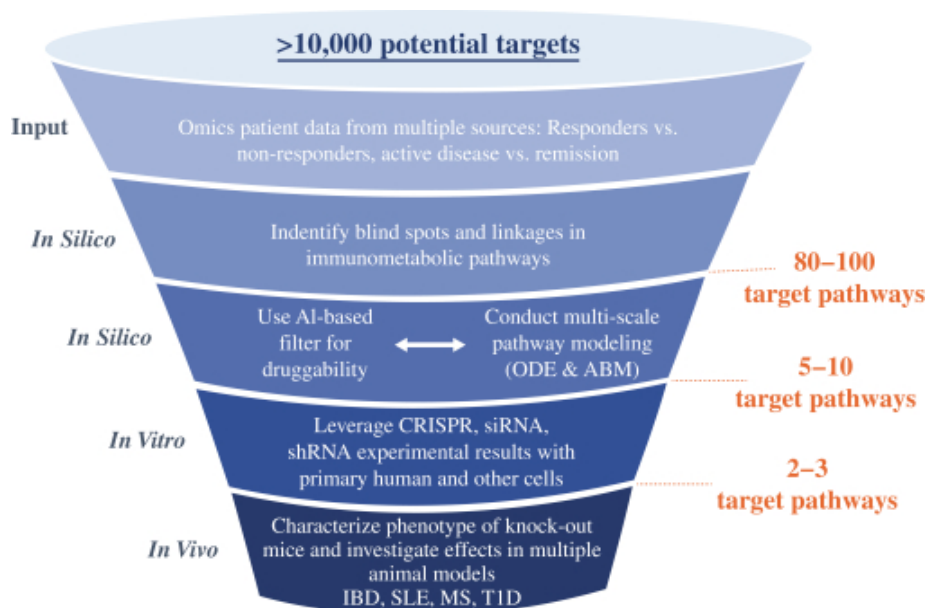
Processes of our platform

The LANCE platform is an innovation engine that uses four main processes to identify novel therapeutic immunometabolic pathways with significant potential to exert immunoregulatory control of autoimmune disease:

- **Data extraction.** We extract data from both proprietary and public omics datasets from human diseases with defined categorical data tied to responders and non-responders, active disease versus remission, and trends and signature patterns over the progression of disease. The output is a disease-agnostic composite database of autoimmune diseases with over 10,000 potential targets. We continually update this database, resulting in new opportunities to identify pathways and the ability to enhance the robustness of previous predictions.
- **Computational target analysis.** We use proprietary AI-based approaches to analyze our database, compiling and inferring hidden blind spots and linkages in signaling networks that may serve as understudied, yet potent, portals into modulating immunometabolism. Our blind spot algorithm specializes in identifying the targets for which the connections to known downstream functional events were previously undiscovered. The output is a ranked priority list of 80 to 100 targets based on relative impact on prominent immune and metabolic pathways. Based on the weighting of individual pathways and subsetting of data analytical methods, the system is versatile enough to offer cross-validation potential and continuous mining of the high-dimensional data.
- ***In silico* immune system modeling.** We perform multiscale modeling of the immune system to link molecular signaling to changes in overall tissue and patient level responses to prioritize targets within a specific disease. The output is narrowed down to five to ten targets identified to have significant *in silico* impact on intricately calibrated models of human autoimmune disease that capture complex interactions between molecules and cells in disease-specific target tissues. This encompasses the colon for UC and CD, the entire gastrointestinal tract for CD, synovium for rheumatoid arthritis, lung for asthma and COPD, brain for multiple sclerosis and Alzheimer's disease, pancreas for type 1 diabetes, liver and adipose tissue for NASH, and germinal centers and sites of immune complex reactions in spleen, kidney, circulation and a variety of other organs for lupus, and kidney for diabetic nephropathy.
- **Preclinical validation and prioritization.** We characterize and validate immune responses using *in vitro* and *in vivo* systems. We prioritize targets based on:
 - **Preclinical efficacy:** We utilize two or more independent animal models, primary patient cells and organotypic systems, as well as flow cytometry, gene expression, histology and metabolic tests, to evaluate preclinical efficacy.
 - **Tolerability:** We strive for a no-observed-adverse-effect-level, or NOAEL, at 50 times the anticipated clinical therapeutic dose using mouse, rat and pig models.
 - **Biomarkers:** We prioritize targets where there are available translational biomarkers to make early preclinical and clinical go/no-go decisions.
 - **Indication:** We prioritize targets that have a significant market size and a greater potential for success in clinical trials.
 - **Competition:** We seek targets where there is an unmet clinical need in the therapeutic indication.

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The result is selection of two to three targets preclinically validated to impact disease pathogenesis, for which medicinal chemistry programs can be established. The graphic below summarizes the selection process of our LANCE platform.



Foundations of the LANCE platform

Across autoimmune disease, the current therapeutic strategy is often the same: block a single cytokine, use a broadly immunosuppressive steroid and alter lymphocyte trafficking. We believe this paradigm fails to effectively modulate the massively and dynamically interacting immunological network to provide sustained therapeutic responses during autoimmune disease. As a result, patients that are non-responsive to one class of drugs have a low likelihood to respond to other classes due to the similarity between classes. In addition, despite chronic treatment with immunosuppressive drugs, relapse and flare rates in all autoimmune diseases are high. In UC and CD, half of patients relapse within a year of starting treatment. In rheumatoid arthritis, 90% or more fail to achieve extended remission. In systemic lupus erythematosus, or SLE, and multiple sclerosis, frequent steroid regimens are needed to address flares.

To address the limitations of current therapies for autoimmune diseases, we utilize our LANCE platform to develop therapeutics based on the following foundational pillars:

Targeting immunometabolism. An abundance of recent evidence supports that the function and phenotype of immune cells, inclusive of both innate and adaptive immune response, is highly conserved and intertwined with metabolic processes. The synthesis of building blocks for cytokines, antibodies and lipid mediators, the preparation for proliferation, the processes of phagocytosis and autophagy, and the generation of long-enduring memory cells require differential metabolism. The therapeutic manipulation of cellular metabolism is a robust multimodal mechanism to shift the balance between effector and regulatory immune cells. These strategies have resulted in resounding successes in the fields of immuno-oncology (such as pembrolizumab, an anti-PD1, ritonavir, a protease inhibitor, and everolimus, an mTOR inhibitor) and metabolism (such as metformin, an antidiabetic, and statins, lipid-lowering drugs) but remain a yet unexploited opportunity in autoimmune disease. With a multitude of genetic instability characterizing autoimmune disease patients,

therapeutics targeting well-conserved and stable immunometabolic processes could prove a successful strategy for therapeutic efficacy.

Prioritizing patient safety. We have prioritized the development of product candidates targeting LANCL2 and NLRX1 based not only on potent anti-inflammatory effects observed in preclinical studies but also on the observed ability to modulate their signaling without dose-limiting toxicities in completed nonclinical and clinical studies. For BT-11, NX-13 and other product candidates in our pipeline, the primary mechanism of action is designed to result in the activation of immunoregulatory effects, as opposed to complete inhibition of natural immunological processes. As a result, our product candidates are designed to result in a functional immune system in which self-tolerance and immune homeostasis are restored. For the majority of autoimmune diseases, including UC and CD, safety concerns are a primary cause of gaps in the treatment paradigm between patients with mild disease severity and patients treated with biologics and other treatment classes with “black-box” label safety warnings.

Restoring immune tolerance. We view the immune system as a massively and dynamically interacting complex system. By inhibiting single cytokines and narrow pathways, multiple compensatory mechanisms can emerge, making any therapeutic improvement in disease short-lived. Each of our lead targets is designed to induce regulatory mechanisms that are conserved, meaning the mechanisms have specific effects on intended pathways. These mechanisms are multi-pronged and are tied to contact-mediated suppression, production of anti-inflammatory cytokines, such as IL-10, and metabolic changes favorable to Tregs; all of which may drive more durable clinical response and remission.

Identifying novel pathways. A primary objective of our LANCE platform is to identify novel pathways with conserved multi-pronged mechanisms with the potential to elicit effects beyond those observed in current classes of drugs targeting autoimmune disease. In particular, our process focuses on identifying central nodes in the network which emanate multiple spokes to coordinate downstream responses. For example, the activation of LANCL2 interacts with CD25/STAT5 signaling, decreases late-stage glycolysis while enhancing oxidative phosphorylation, and influences secondary messenger signaling. Based on our robust dataset, we believe this coordination will enhance the robustness of response to our product candidates through built-in redundancies capable of maintaining coordination should one spoke be rendered non-functional due to a disease-associated mutation in a specific patient. Despite the novelty of the target and certain downstream pathways, our validation is rooted in well-categorized biomarkers of inflammation, including decreases in TNF expression, NF- κ B activity, or fecal calprotectin levels with the activation of LANCL2 and NLRX1. We believe elucidation of these well-validated downstream anchors increases the confidence for the translation of preclinical results when targeting our novel pathways. To date, we have identified seven novel pathways using the LANCE platform with promising potential to innovate the treatment of autoimmune disease.

Through our proprietary LANCE precision medicine platform, we have pioneered a drug development engine underpinned by advanced computational capabilities applied to revolutionizing the discovery of new therapeutic targets for autoimmune disease

Foundational Pillars

- **Targeting Immunometabolism:** With a multitude of genetic instability characterizing autoimmune disease patients, therapeutics targeting well-conserved and stable immunometabolic processes could prove a successful strategy for therapeutic efficacy
- **Prioritizing Patient Safety:** Our product candidates are designed to have improved tolerability and safety profiles which may enable them to move early into the treatment paradigm
- **Restoring Immune Tolerance:** Each of our lead targets is designed to induce conserved regulatory mechanisms, which may drive more durable clinical response and remission
- **Identifying Novel Pathways:** We have identified seven novel pathways using our LANCE platform with promising potential to innovate the treatment of autoimmune disease



Key Advantages

- **Improved Drug Discovery Paradigm in Autoimmune Diseases:** Our LANCE platform is designed to achieve an accelerated discovery timeline, from target identification to lead compound in under 12 months
- **Modulating Multiple Critical Pathways via a Single Target:** The ability to modulate multiple primary targets and several escape mechanisms offers the potential to identify product candidates which could be developed to provide a more durable effect of therapy
- **Cost Advantage and Meaningful Target Generation Potential:** Lower expected discovery and development costs as we accelerate the timeline of discovery to IND and the potential to discover new targets and re-prioritize identified targets with continually evolving input data

Benefits of our LANCE platform

We believe our LANCE platform has several key advantages, including:

- **Improved drug discovery paradigm in autoimmune diseases:** Our LANCE platform is designed to achieve an accelerated discovery timeline, from target identification to lead compound in under 12 months. Our seven identified candidates have moved to *in vitro* and *in vivo* studies without a single discontinuation for observations related to toxicity, efficacy or non-druggability. Finally, customizable *in silico* analysis to identify targets agnostically as overall regulators of immunology or focused on a particular indication of interest broadens the breadth of our opportunities to a series of new potential indications.
- **Modulating multiple critical pathways via a single target:** The LANCE platform provides the potential ability to identify candidates which could coordinate multiple cellular processes into the same overall phenotype to reduce compensatory mechanisms tied to loss of response. The LANCE platform provides robust, well-conserved potential targets in an autoimmune disease space associated with high patient-to-patient variability. The ability to modulate multiple primary targets and several escape mechanisms offers the potential to identify candidates which could be developed to provide a more durable effect of therapy.
- **Cost advantage and meaningful target generation potential:** Given the demonstrated capital efficiency of the initial drug development programs we have undertaken to date, we believe our LANCE platform is likely to continue providing for a decrease in discovery and development costs relative to licensing new product candidates as we accelerate the timeline of discovery to IND. We also believe the LANCE platform may provide meaningful potential to discover new targets and re-prioritize identified targets with continually evolving input data. Streamlined target selection and prioritized list of selected targets may also minimize time and cost dedicated to discovery stage. A rational and efficient product prioritization from the large targets pool offered by our platform is bolstered by efficacy studies with two or more animal models, by toxicity and PK data with target tissue engagement in mice, rats and pigs, as well as by the availability of translational biomarkers to make early preclinical and clinical go/no-go decisions. We are targeting indications characterized by high unmet clinical need, significant likelihood of success in clinical development and market size opportunity.

Our LANCL2 pathway product candidates

The LANCL2 pathway

The LANCL2 receptor triggers a unique reaction at the interface of immunity and metabolism. LANCL2 is a surface membrane-associated receptor and one of three members of the LANCL family, which have been previously studied in detail. Our analysis with the LANCE platform has produced a deeper understanding of the role of the LANCL2 pathway in modulating key cellular and molecular genes tied to autoimmune disease. More specifically, activation of LANCL2 is designed to intercept autoimmune disease at multiple levels through extensively-characterized pathways and signaling molecules, including decrease of inflammation-promoting TNF α , IFN γ , IL-6 and MCP1 and increase in regulatory Tregs anti-inflammatory activities.

Given the differential metabolic preferences of Th1 and Th17 versus Treg cells, whereby the former prefer glycolytic pathways versus the latter prefer oxidative phosphorylation to produce energy, the rewiring of metabolism between oxidative and glycolytic metabolic pathways mediated by LANCL2 activation is designed to produce a functional switch in immune cells that promotes regulatory functions. For instance, highly proliferative effector cells associated with autoimmune reactions produce strongly inflammatory cytokines, such as TNF α and IFN γ , and differentiate into effector Th1 and Th17 CD4+ T cell subsets. Both of these events are associated with lactate, the key metabolite of anaerobic glycolysis. In contrast, when LANCL2 is activated, it promotes the function of enzymes that diminish lactate and favor oxidative phosphorylation. This metabolic switch is supportive of stable expression of FOXP3, the master transcription factor associated with the function of Treg cells.

In inflammatory tissue microenvironments tied to autoimmune disease, loss of CD25 (the IL-2 receptor) is one of the first changes in Tregs to occur, leading to co-production of inflammatory cytokines and an overall weakened suppressive potential. LANCL2 activation provides protection from and restoration of IL-2 signaling by augmenting STAT5 phosphorylation. As a result, LANCL2 activation by BT-11 and other product candidates that target LANCL2 results in stable Tregs that have enhanced suppressive capacity as evidenced by expression of key regulatory molecules such as immune checkpoint inhibitors like PD1. The importance of LANCL2 in Tregs has been independently validated in a proteomics-based screen identifying differential expression of LANCL2 in Tregs compared to non-Treg cells.

The graphics below illustrate key elements of LANCL2 activation by BT-11.

• BT-11 Multimodal MoA:

- Decreases the production of inflammatory mediators tied to IBD (TNF α , IFN γ , MCP1, IL-6, and IL-8)
- Increases anti-inflammatory molecules in Tregs that protect from autoimmunity (IL-10, FOXP3)

• BT-11 generates suppressive regulatory CD4+ T cells (Tregs) that restore and maintain immune tolerance in the GI tract

- Decrease proliferation and differentiation of effector CD4+ T cells (Th1 and Th17)
- Aid in epithelial cell and support the reduction of IL-8 and chemokine-dependent neutrophil influx

Leber, A., et al. *J Immunol*, 2019.

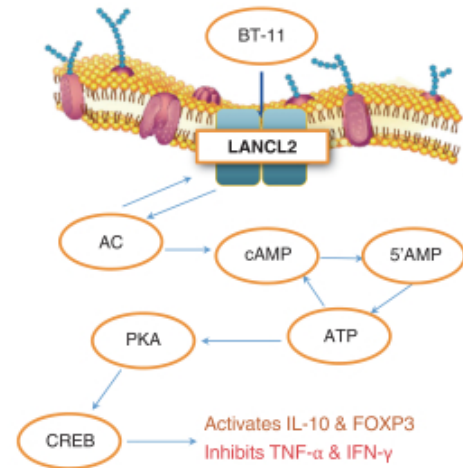
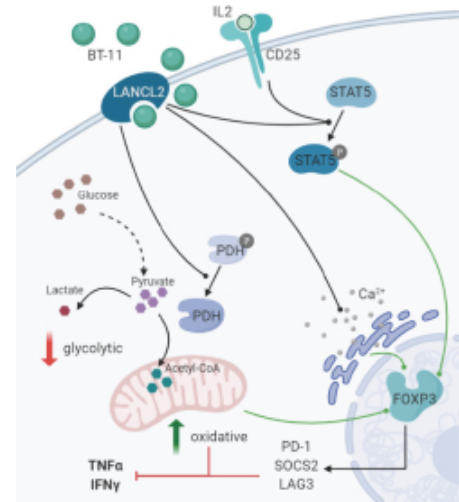


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- Multipronged mechanism of action targeting downstream known immunological targets tied to autoimmune diseases, including IBD.
- BT-11 enhances CD25/STAT5 signaling to support the stable differentiation of regulatory CD4+ T cells with greater anti-inflammatory functionality.
- BT-11 increases PDH activity, resulting in increased oxidative metabolism supporting FOXP3 stability.
- BT-11 downregulates glycolytic pathways associated with TNF- α production and effector CD4+ T cells, including production of lactate and over-expression of ENO1.
- BT-11 increases suppressive effects of Tregs due to enhanced immune checkpoint surface markers (LAG3 and PD-1).



While critical to functions in Tregs, the LANCL2 receptor is expressed in a wide range of immune cells, epithelial cells and cells from metabolic (muscle, adipose and liver) tissues. The effects within these cell types often mirror the described signaling events within Tregs, whereby the promotion of mitochondrial metabolism parallels potent anti-inflammatory markers. In IBD, mitochondrial metabolism pathways account for the majority of downregulated genes relative to healthy controls. A primary cause of this downregulation is a direct result of defective regulation of mitochondrial metabolism in intestinal epithelial cells. In both mouse models of IBD and intestinal epithelial organoids *ex vivo*, activation of mitochondrial function has been observed with LANCL2 activation, restoring this metabolism to healthy levels. When this restoration is achieved, chemokine production from intestinal epithelial cells is decreased, leading to suppression of neutrophil recruitment into the intestinal wall. In IBD, neutrophils are crucial histological markers of active disease as well as the primary source for calprotectin, a highly predictive fecal biomarker of response to treatment since the majority of drugs approved for treating IBD cause a drop in fecal calprotectin concentrations. Neutrophils and fecal calprotectin were significantly decreased by LANCL2 activation in all preclinical models tested and in our Phase 1 clinical trial, fecal calprotectin concentrations were also decreased following BT-11 treatment. In phagocytes (macrophages and dendritic cells), LANCL2 activation of mitochondrial metabolism supports the efficient processing of harmless cellular material from the body taken up by these cells leading to increased production of IL-10 from these cells and lower auto-reactivity to self-antigens. In metabolic tissues, LANCL2 activation results in increased AMPK signaling, which increases mitochondrial function and synergizes with insulin to activate efficient energy storage in both muscle and liver.

With robust control of both immune and metabolic signaling, we believe the novel LANCL2 pathway is relevant in a wide range of autoimmune, inflammatory and metabolic diseases, specifically CD, UC, rheumatoid arthritis, lupus, NASH, type 1 diabetes and psoriasis. We have prioritized IBD as our first indication in the LANCL2 pathway due to the significant unmet clinical need and major therapeutic gaps in both UC and CD and the mechanistic relevance in both Tregs and epithelial cell metabolism. Validation of the LANCL2 pathway in IBD with BT-11 may have wide-reaching implications on the development of new treatments for other diseases. For example, increased Treg stability and IL-10 production from phagocytes may be critical in restoring self-tolerance in systemic lupus erythematosus. In addition, shifting the balance between Treg and Th17 cells and reducing neutrophil recruitment are highly relevant to improvement of symptoms in rheumatoid arthritis. Correcting the underlying deficiencies in insulin sensitivity and reducing chronic low-grade systemic inflammation has potential to improve NASH. Decreasing Th2 responses might provide a therapeutic benefit in

EoE. Modulating T cell responses and TNF in the skin might provide a therapeutic benefit in psoriasis. We are initially focused on developing three product candidates that target the LANCL2 pathway: BT-11, BT-104 and BT-111.

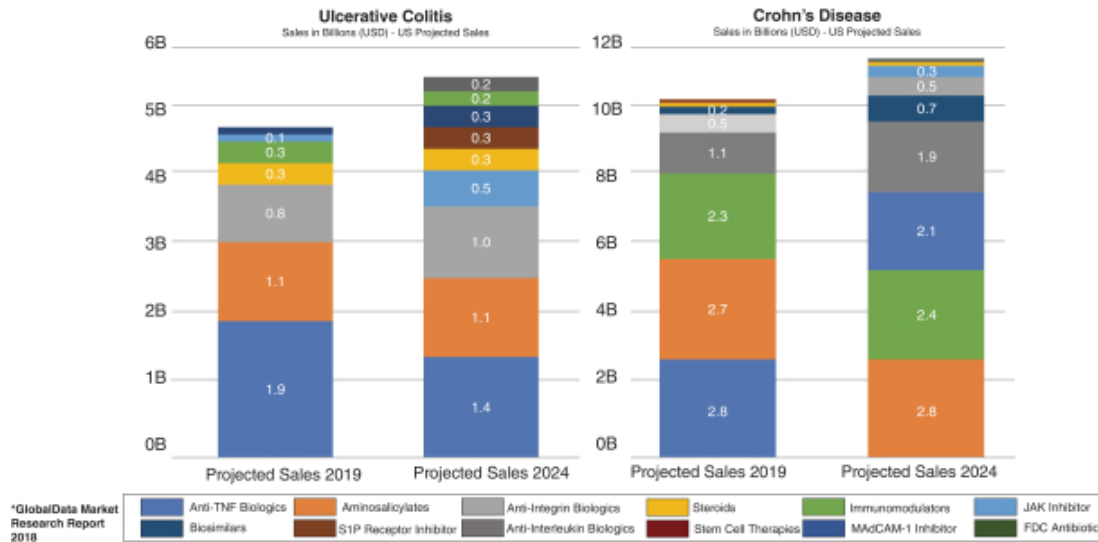
BT-11, an oral LANCL2 agonist for the treatment of ulcerative colitis and Crohn's disease

Overview

BT-11 is an oral, gut-restricted, small molecule that is the first product candidate to target LANCL2 which we are evaluating in clinical trials in both UC and CD. UC and CD are chronic autoimmune diseases with significant therapeutic gaps resulting from safety concerns and modest efficacy of current treatments. We believe that an oral, gut-restricted small molecule delivered once daily in a singular tablet could address the therapeutic gaps in the UC and CD treatment paradigms and have a significant impact on quality of life for IBD patients. BT-11 is a wholly-owned product candidate that has successfully completed a Phase 1 clinical trial. We are currently conducting a Phase 2 clinical trial of BT-11 in patients affected by mild to moderate UC in the United States and Europe and expect to report topline data in the second half of 2020. Following the receipt of results of our ongoing Phase 2 clinical trial, we expect to initiate a Phase 3 clinical trial for UC in the first half of 2021. We expect to commence a Phase 2 proof-of-concept study in CD in the first half of 2021. We expect to submit an IND for a new BT-11 oral formulation for EoE in the first half of 2021.

Background on UC and current treatments

UC is a chronic, autoimmune, inflammatory bowel disease that causes inflammation, irritation, and ulcers in the lining of the large intestine (colon) and rectum. Symptoms include abdominal pain, rectal pain and bleeding, bloody stools, diarrhea, fever, weight loss, and malnutrition. Having UC puts a patient at increased risk of developing colon cancer. Diagnosis typically occurs in early adulthood and the disease requires maintenance treatment for the remainder of the patient's life. UC is estimated to affect over 900,000 patients in the United States and over 1 million patients throughout the rest of the world. The global therapeutics market for UC was \$5.3 billion in 2016 and is expected to grow at a 2.5% compound annual growth rate between 2016 and 2026. Of this global market, the United States market comprised over \$4 billion in 2019. With 70% of addressable patients experiencing a second flare within one year and 30% of patients in remission failing to stay in remission for more than one year, there is an unmet medical need in UC for safer and more efficacious therapeutics.



Source: GlobalData Market Research Report

Patients with UC are classified into mild-to-moderate, comprising 70-80% of patients, and moderate-to-severe, based on the level of symptoms experienced. Accordingly, the current therapeutic treatments for UC depend on the severity of the disease and are broadly divided into five classes:

Mild to moderate UC

The following treatments are typically used in the treatment of mild to moderate UC:

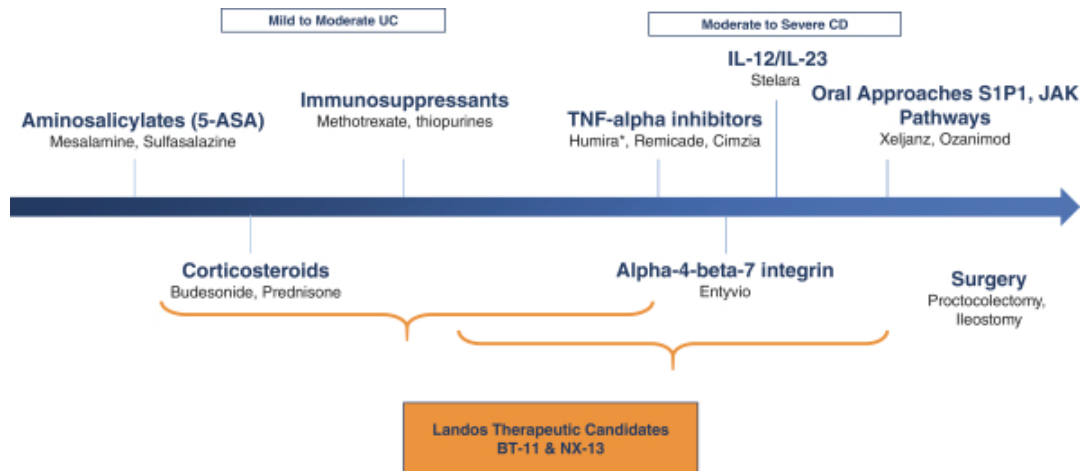
- **Aminosalicylates or 5-ASA** (mesalamine, sulfasalazine) are used as a first-line therapy in UC without a precise mechanism of action. Approximately 80% of patients qualifying as mild to moderate in severity receive mesalamine as a maintenance drug, but many require corticosteroids to address disease flares and eventually lose response progressing into immunosuppressants or biologics. Aminosalicylates are commonly preferred by physicians and patients for the treatment of IBD, due to high tolerability in most patients. Common side effects include headache, nausea, dyspepsia, flatulence and diarrhea. Rare but more serious side effects include pleuritis, pericarditis, myocarditis, pancreatitis, cholestatic hepatitis, nephritis and renal dysfunction.
- **Corticosteroids** (budesonide, prednisone) are used as induction agents and are prescribed for short periods to address disease flares in both mild to moderate and moderate to severe patients. Corticosteroids are generally administered through an oral or rectal route of administration. Common side effects are mild to moderate in intensity and include UC, headache, nausea, mood changes and sleep changes.
- **Immunosuppressants** (methotrexate, thiopurines) are used to wean patients off steroid use and rarely as independent maintenance drugs in moderate to severe patients. Immunosuppressants are orally administered but are systemically distributed agents. Common side effects include a decrease in the number of white blood cells (leucopenia), headache, rash, nausea, and dyspepsia (indigestion), alopecia (hair loss), mild increase in levels of liver enzyme (aspartate aminotransferase), peritoneal abscesses, abnormally low levels of the protein albumin in the blood (hypoalbuminemia).

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Moderate to severe UC

The following treatments are typically used in the treatment of moderate to severe UC:

- **Biologics** (anti-TNF, anti-IL-12/IL-23, anti-integrin) are the primary maintenance therapy in moderate to severe UC and comprised 59% in 2016 of the UC therapeutic market. Biologics are injectable therapies and can be divided into two classes: those targeting cytokines, comprising 80% of the biologics market in UC, and those targeting cell trafficking, comprising the remaining 20%. Side effects include leucopenia, immunosuppression, cancer, infection and death.
- **JAK inhibitors** (tofacitinib) are an induction and maintenance therapy for severe patients that do not respond to other therapies, including biologics. Similar to immunosuppressants, approved JAK inhibitors are oral agents that are systemically distributed. Common side effects of JAK inhibitors include headache and nasopharyngitis, immunosuppression, increased risk for infections, changes in serum lipid levels, mild neutropenia and anemia, and slight increase in the incidence of malignancies (lymphoma, breast cancer, and lung cancer).



We believe that current therapeutics for the treatment of both mild to moderate and moderate to severe UC have the following limitations that we believe BT-11, if approved, may address:

- **Safety and tolerability concerns.** The majority of approved therapeutics for maintenance of UC (biologics and JAK inhibitors) are systemically distributed, resulting in effects on the immune system outside of the gastrointestinal tract. These effects result in increased risks for cancers, infections, blood clots and death. Given the chronic nature of these indications, there is a need for a safer long-term option. Despite a lower severity of disease, many of the mechanisms of action for current drugs in mild-to-moderate space are also tied to known toxicities such as drops in white blood cell counts and increased risk for infection in the case of immunosuppressants, and bone loss, weight gain, lowered quality of life and cardiovascular complications in the case of extended corticosteroid use. Thus, it is difficult to develop drugs with better safety profiles without targeting innovative mechanisms.
- **Inconvenient and costly route of administration.** The main class of therapy in UC is biologics, which are injectable therapies administered through either intravenous or subcutaneous routes. Often, this requires a patient to visit a clinic or specialist care provider which disrupts daily life, increases health care costs and lacks convenience. Aminosalicylates (5-ASAs), the recommended therapy for mild-to-moderate UC by the

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American Gastroenterological Association, requires 2.4 to 4.8 grams per day, amounting to two to six tablets daily when dosed orally. Depending on the response to oral dosing, rectal dosing of mesalamine is sometimes required.

- **Limited efficacy.** Resulting from a lack of innovation that repeatedly aims at very narrow targets, current therapeutics in UC have continually faced a capped effect size, achieving no greater than 25% over that of placebo in remission rate. Late-stage drugs in JAK and sphingosine-1-phosphate, or S1P, modulators barely exceed a 20% effect size. For biologics, in placebo-controlled pivotal studies, the 4-domain remission rate effect size for biologics ranged between approximately 10% and 25%. To illustrate, the Gemini 1 trial for Entyvio provided a remission rate of 16.9% and the Gemini 1 and 2 trials for Humira provided 18.5% and 16.5% remission rates, respectively. Additionally, among patients responsive to treatment with biologics, approximately 40% will lose response within three years due to immunogenicity, development of compensatory inflammatory signaling, or unknown causes. In a complex autoimmune disease with multiple aspects to its pathogenesis, targeting a singular inflammatory pathway may continue to be ineffective in providing extended remission to more than 25% to 30% of patients.
- **Therapeutic gap.** Currently no FDA-approved drugs address the region of the treatment paradigm between the aminosalicylate (5-ASA) failures and biologics, where the majority of patients exist. Patients are faced with the option of staying on a sub-optimal therapy, to which they are losing response, or moving into a class of treatment with drastically higher safety risks. Despite early promise, the emergence of safety concerns for JAK inhibitors and S1P modulators have limited the non-biologic immunomodulators that are currently in development to a biologic-failure class of patients. There is an unmet need for a safer and effective drug that can bridge the treatment paradigm from 5-ASA to biologics.

Our solution for treatment of UC

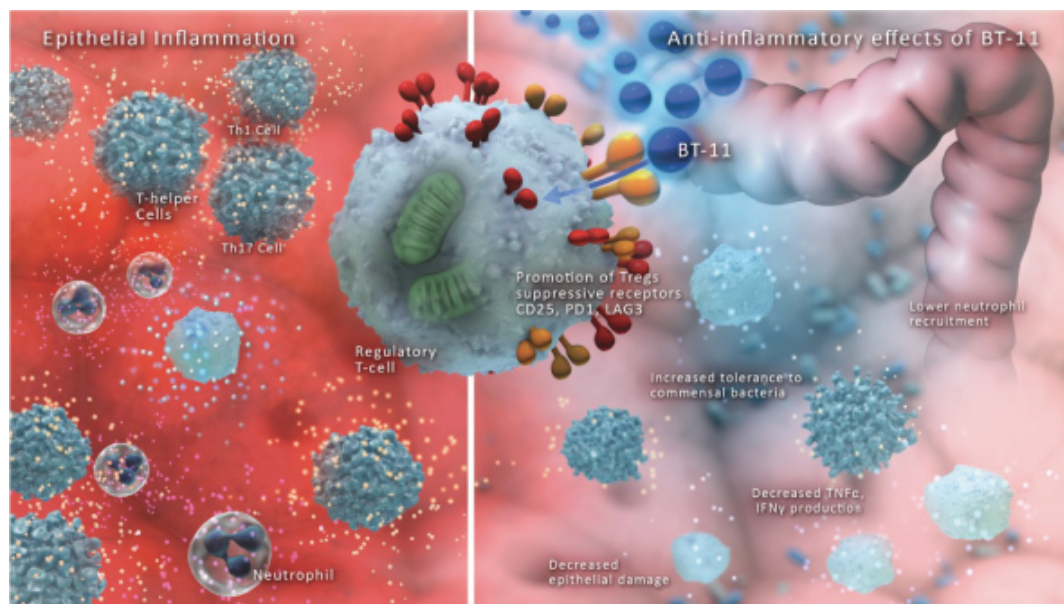
We believe that BT-11, our lead oral UC product candidate, if approved, has the potential to treat patients prior to their progression into biologics and address the main limitations of current therapeutics based on the clinical and preclinical data to date. We believe BT-11, if approved, may offer the following advantages:

- **Gut-restricted PK with low systemic exposure.** In preclinical and clinical studies, a comparison between the gastrointestinal PK of BT-11 versus the systemic PK in five species (mice, rats, dogs, pigs and humans) indicated that 99% of orally administered BT-11 remains in the gut. In our Phase 1 clinical trial, we validated the translation of the gut-restricted PK in humans since gastrointestinal concentrations of BT-11 in human participants were observed to be on average 6,000-fold higher in the colon than the maximum serum concentration, or C_{max}, in blood. In these studies, we observed that BT-11 was highly stable in the gastrointestinal environment and reached the colon in high local concentrations that scale proportionally with oral dose.
- **Tolerability.** In its Phase 1 clinical trial, BT-11 had no differences in presentation of adverse events, or AEs, clinical chemistry, changes in white blood cell counts, electrocardiogram, or ECG, and other clinical measures at doses up to 100 mg/kg (approximately 7,500 mg). Chronic studies in rats for six months and in dogs for nine months have been completed with NOAEL greater than or equal to 1,000 mg/kg, a dose which is 70-fold higher than the highest dose tested in our Phase 2 clinical trials in UC.
- **Convenient, once a day oral dosing.** We designed BT-11 for IBD to be a single, once-a-day oral tablet. In our ongoing Phase 2 clinical trial in patients with mild to moderate UC, we are evaluating BT-11 at two doses (500 and 1,000 mg), each of which are contained in a single tablet.
- **Preclinical and translational testing.** We have evaluated BT-11 in five mouse models of colitis and a pig model of colitis, and have observed consistent reduction of inflammatory markers and improvement of

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histological scores across diverse methods of disease induction including genetic, immunological, bacterial and chemical. In side-by-side comparative preclinical testing, BT-11 greatly exceeded the efficacy of other therapeutics (anti-TNF, 5-ASA, tofacitinib) in reduction of disease activity index, leukocytic infiltration and fecal calprotectin in Mdr1a^{-/-} model of colitis. We believe this robust dataset lends substantial support to the validity of LANCL2 as an innovative immunometabolic pathway, with the potential to be targeted via BT-11 without inherent toxicities and which has demonstrated potent therapeutic activity in a broad range of animal models of IBD.

- **Innovative immunometabolic target not tied to toxicities.** We have designed BT-11 to activate a novel target, LANCL2, to induce immunometabolic effects that favor regulatory responses. In human primary cells and preclinical disease models, BT-11 activated oxidative phosphorylation and promoted FOXP3 stability to enhance the suppressive activity of Tregs and restore local tissue homeostasis and immune tolerance. In addition to potentially being a very powerful monotherapy, given the novel target and lack of toxicities, we believe there is also potential to use BT-11, if approved, as a complementary or combination UC therapy.



Phase 1 clinical trial of BT-11 by single ascending dose and multiple ascending dose in normal healthy participants

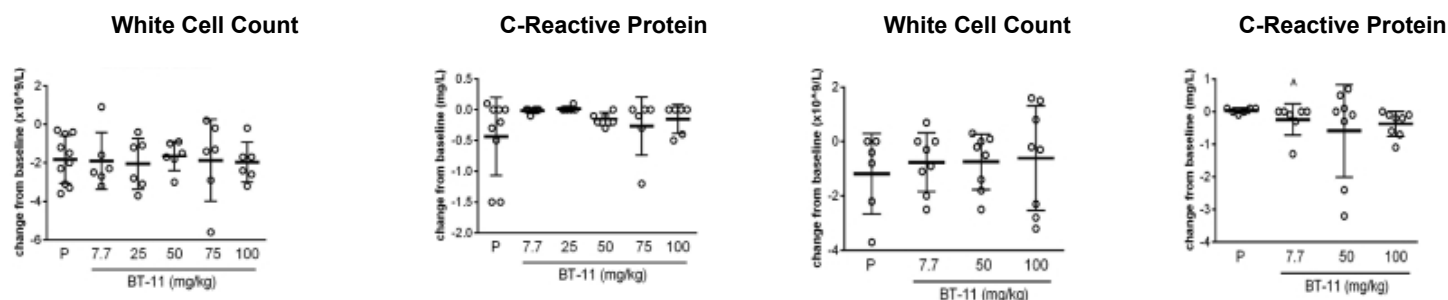
The safety and tolerability of BT-11 was assessed in a two-stage, single-center, double-blinded, randomized, placebo-controlled clinical trial in healthy male and female volunteers. The single ascending dose stage consisted of five groups of eight healthy male and female participants per cohort, each receiving a single oral dose of BT-11 or placebo in a six-hour fasted state. The multiple ascending dose stage consisted of three cohorts of ten healthy male and female participants, each receiving an oral dose of BT-11 or placebo once daily for seven days. Doses were tested ranging from 500 mg to approximately 7,500 mg in the highest cohort of each stage.

Safety and tolerability were assessed through types and frequency of AEs, physical examination, ECGs, biochemistry, hematology and urinalysis. No trends in AE presentation were observed in comparison between BT-11 and placebo or between specific cohorts. No serious adverse events were reported. No AEs were identified.

to have a probable or definite relationship to the study drug. None of the clinical laboratory results, including serum chemistry, hematology, coagulation and urinalysis, outside the reference range were considered to be clinically significant in either the single ascending dose or multiple ascending dose stages. No changes from baseline in white blood cell count or percentages of specific immune cell subsets were observed in blood on day seven of the multiple ascending dose stage relative to placebo in any one cohort or across all participants who received BT-11. No changes in ECG parameters were assessed as clinically significant and no treatment-emergent AEs, or TEAEs, arose from abnormal ECG measurements.

Single Ascending Dose

Multiple Ascending Dose



Change from baseline in white blood cell counts and C-reactive protein levels during single ascending dose (n = 10, placebo; n = 6, active) and multiple ascending dose (n = 6, placebo; n = 8, active) arms of the Phase 1 study of BT-11 in normal healthy volunteers.

PK was assessed in blood, at multiple time points post-dosing, and in stool, on day seven in the multiple ascending dose stage. BT-11 concentrations were quantified within feces on day seven of the multiple ascending dose stage. Concentrations of 2.39 mg/g were observed in participants who received 500 mg of BT-11 daily for seven days. Stool BT-11 levels were observed to scale proportionally in a manner similar to the scaling of oral dosage. In contrast to stool concentrations, a plasma C_{max} of 372 ng/mL at 1.19 hours post-dose was observed in participants receiving 500 mg daily for seven days, a value that is more than 6,000-fold lower than concentrations observed in feces. Plasma concentrations scaled at a less than dose proportional scale when comparing high-dose to low-dose, with only an 8.2-fold increase in AUC₀₋₂₄ relative to a dosage increase of 14.3-fold. Plasma BT-11 was quickly cleared with half-life of 2.7 hours. In parallel with PK analysis, calprotectin concentrations were measured in feces. This study was not powered for detecting statistical differences in biomarkers. Mean fecal calprotectin was observed to be lower in the BT-11 500 mg cohort than those observed in placebo.

Mean fecal calprotectin (µg/g)

	Placebo	BT-11 (500 mg)
Single ascending dose	33.8	12.3
Multiple ascending dose	34.8	6.4

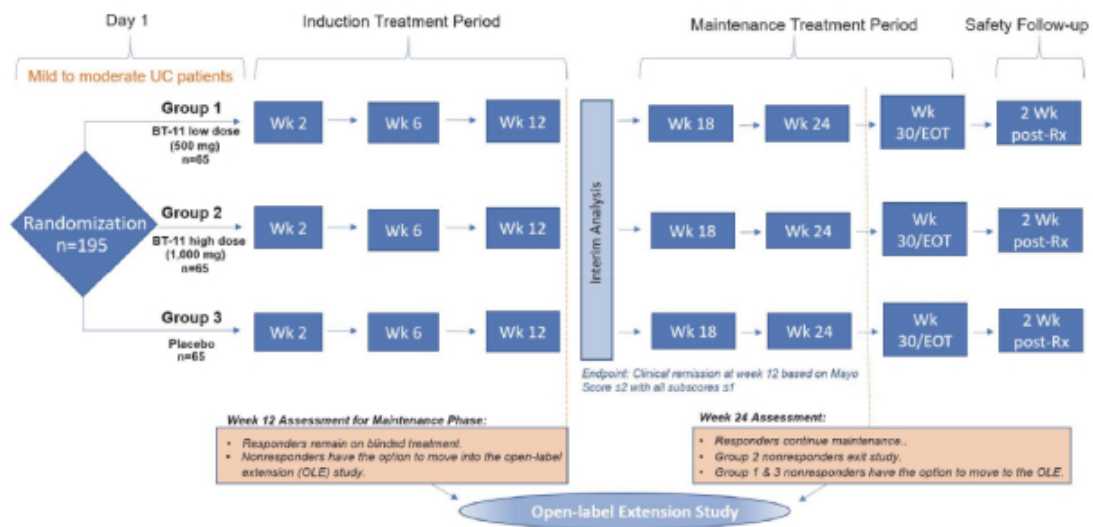


Fecal concentrations of BT-11 on day 2 of single ascending dose (n = 6) and day 7 of multiple ascending dose (n = 8) arms of the Phase 1 study of BT-11 in normal healthy volunteers.

Phase 2 clinical trial of BT-11 in UC

Phase 2 clinical trial design

In August 2019, we initiated dosing in a Phase 2 randomized, placebo-controlled, double-blind, multicenter clinical trial of 195 patients. The primary objective of this trial is to establish efficacy and safety of oral BT-11 in inducing clinical remission in mild to moderate UC using clinical remission rate at week 12 of BT-11 treatment initiation, as defined by total Mayo Score ≤ 2 with all subscores ≤ 1 . The Mayo score is the primary evaluation measure in UC clinical trials, serving as a composite score (0-12) of endoscopic appearance, stool frequency, rectal bleeding and physician assessment. The graphic below shows the design of the Phase 2 clinical trial.



A total of 195 patients with mild to moderate UC (total Mayo Score 4-10; Mayo endoscopic subscore [MES] ≥ 2) will be randomized in a 1:1:1 ratio to receive BT-11 low-dose (500 mg), BT-11 high-dose (1,000 mg) or placebo. Each of the treatment arms will comprise 65 patients. The randomization will be stratified by whether the patient has had prior exposure to biologic therapy for UC and whether the patient has had corticosteroid use at

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baseline. The trial consists of a 28-day screening period, a 12-week induction period, an 18-week maintenance period and a 2-week post-treatment safety follow-up period. Patients that are in clinical response or remission at week 12 will be eligible to continue into the maintenance period. Patients entering the maintenance period will stay in the same blinded group assignment given in the induction phase.

The trial consists of endoscopies at baseline, week 12 (end of induction) and week 30 (end of maintenance). Endoscopic scoring will be centrally read. During each endoscopy, biopsies will be collected for histology, PK, target engagement in addition to other mechanistic and translational evaluations. Blood and stool samples will be collected throughout the trial (baseline, weeks 2, 6, 12, 18, 24 and 30) to assess biomarkers, including calprotectin levels in feces. Rectal bleeding and stool frequency sub-scores will be recorded by patient diary.

Phase 2 clinical trial topline results

We expect to report topline results from the Phase 2 clinical trial in the second half of 2020.

Clinical development plan

Phase 3 clinical trial design of BT-11 in UC

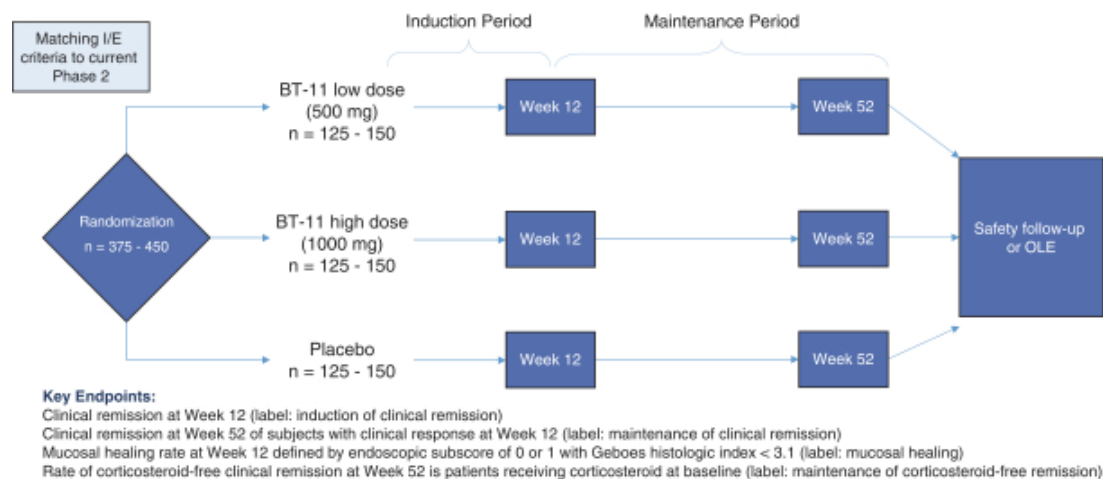
We intend to initiate a Phase 3 clinical trial of BT-11 in UC in the first half of 2021 upon completion of the ongoing Phase 2 trial and review of clinical data and subject to FDA feedback. The Phase 3 trial is expected to be a randomized, placebo-controlled, double-blind, parallel-group multicenter clinical trial. The purpose of this trial will be to evaluate the efficacy and safety of oral BT-11 in the induction and maintenance of remission in patients with mild to moderate UC. The trial will use a co-primary endpoint of clinical remission, as defined by a Mayo stool frequency subscore of 0, Mayo rectal bleeding subscore of 0 and a Mayo endoscopy subscore of 0 or 1, at week 12 and week 52. Secondary endpoints will be included to assess mucosal healing by endoscopic and histologic evaluation, improvement in the endoscopic appearance of the mucosa, maintenance of corticosteroid-free remission, clinical response, fecal calprotectin and changes in individual Mayo subscores.

An estimated total of 375 to 450 patients with mild to moderate UC (total Mayo Score 4-10; Mayo endoscopic subscore [MES] ³ 2) will be randomized in a 1:1:1 ratio to receive BT-11 low-dose (500 mg), BT-11 high-dose (1,000 mg) or placebo. Each of the treatment arms will comprise 125 to 150 patients. The final number of patients may be adjusted based on the effect size observed in our Phase 2 clinical trial. The randomization will be stratified by prior exposure to biologic therapy for UC and corticosteroid use at baseline. The trial will consist of a 28-day screening period, a 12-week induction period, a 40-week maintenance period and a 2-week post-treatment safety follow-up period. A mandatory steroid taper will commence at week 12.

The trial will consist of endoscopies at baseline, week 12 (end of induction) and week 52 (end of maintenance). Endoscopic scoring will be conducted centrally. During each endoscopy, biopsies will be collected for histology, PK, target engagement in addition to other mechanistic and translational evaluations. Blood and stool samples will be collected throughout the study (baseline, weeks 2, 6, 12, 18, 24 and 30) to assess biomarkers, including fecal calprotectin. Rectal bleeding and stool frequency subscores will be recorded by patient diary.

The graphic below depicts the expected design of the Phase 3 clinical trial.

Projected Phase 3 Study Design in ulcerative colitis



Preclinical results

BT-11 has been studied in five mouse models and one pig model of IBD. These five mouse models encompass diverse methods of disease induction including chemical (DSS), cellular (adoptive transfer), genetic (*Mdr1a*^{-/-}, *IL10*^{-/-}) and bacterial (*Citrobacter rodentium*). Key findings from our preclinical studies are summarized in the tables below.

Summary of disease activity and histopathology results from BT-11 in five mouse models of IBD

Model	Challenge	Dose	Length of treatment	Reduction in leukocytic infiltration relative to vehicle	Reduction in final DAI relative to vehicle
DSS	DSS in drinking water	8 mg/kg, oral	7 days	70%*	50%*
Adoptive transfer	4x10 ⁵ CD45RB ^{hi} CD4 ⁺ T cells by IP injection	8 mg/kg, oral	6 weeks	65%*	80%*
Adoptive transfer (cotransfer)	4x10 ⁵ CD45RB ^{hi} CD4 ⁺ T cells and 1x10 ⁵ Treg by IP injection	8 mg/kg, oral	6 weeks	88%*	95%*
Mdr1a ^{-/-}	Spontaneous/genetic	8 mg/kg, oral	6 weeks	73%*	95%*
IL10 ^{-/-}	Spontaneous/genetic	8 mg/kg, oral	12 weeks	75%*	40%*
C. rodentium	1x10 ⁹ CFU/mouse (strain DBS100)	8 mg/kg, oral	3 weeks	85%*	50%*

* P < 0.05

Summary of changes in CD4+ T cells and neutrophils in colon from BT-11 in five mouse models of IBD, measured by flow cytometry

Model	Reduction in Th1 cells relative to vehicle	Reduction in Th17 cells relative to vehicle	Change in Treg cells relative to vehicle	Reduction in neutrophils relative to vehicle
DSS	47%*	66%*	71%*	42%*
Adoptive transfer	22%*	27%*	29%*	49%*
Adoptive transfer (CD45RBhi, Treg co-transfer)	46%*	44%*	68%*	88%*
Mdr1a-/-	40%*	35%*	56%*	79%*
IL10-/-	40%*	35%*	84%*	61%*
<i>C. rodentium</i>	71%*	87%*	140%*	95%*

* P ≤ 0.05

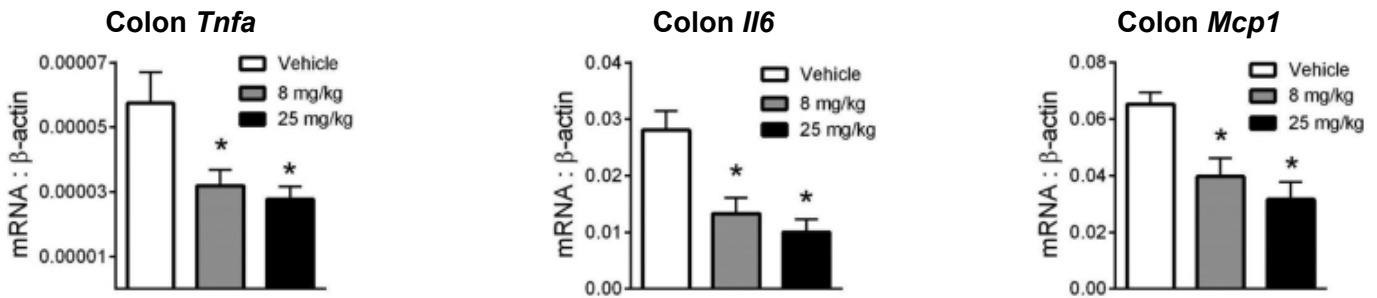
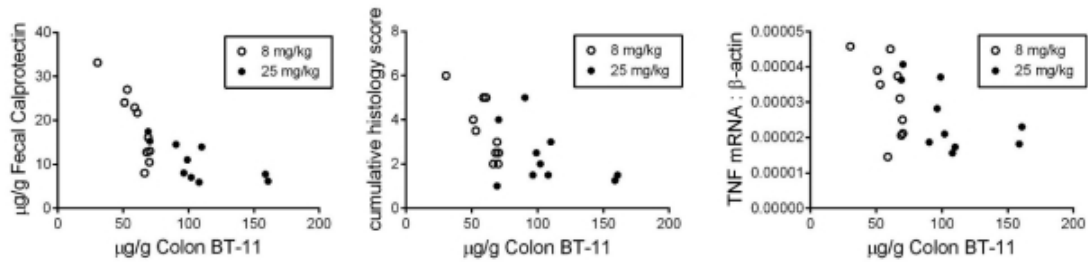
Summary of colonic gene expression results from BT-11 in five mouse models of IBD

Model	Reduction in <i>Tnf</i> relative to vehicle	Reduction in <i>Ifng</i> relative to vehicle	Increase in <i>Il10</i> relative to vehicle
DSS	76%*	47%*	118%*
Adoptive transfer	19%	10%	88%*
Adoptive transfer (CD45RBhi, Treg co-transfer)	31%*	69%*	145%*
Mdr1a-/-	45%*	88%*	21%*
IL10-/-	34%*	52%*	NA
<i>C. rodentium</i>	82%*	73%*	34%*

* P ≤ 0.05

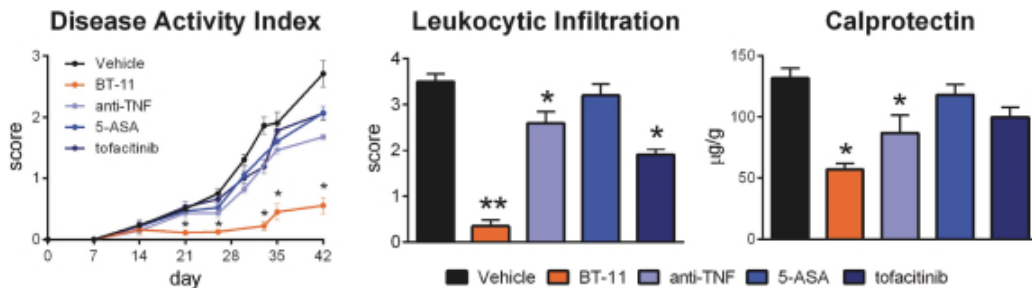
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In the DSS model, correlation between the colonic concentrations of BT-11 with key markers (fecal calprotectin, histologic score and TNF expression) of preclinical efficacy was tested at two doses levels (8 mg/kg, 25 mg/kg). In each marker, an inverse trend was observed with decreasing concentrations or scores with increasing BT-11 concentrations. Fecal calprotectin had the strongest correlation to BT-11 concentration of the parameters tested. Overall, a dose dependent decrease was observed in the colonic expression of TNF α , IL6, and MCP1.



Preclinical biomarker responses to oral BT-11 (8, 25 mg/kg) during DSS colitis (n = 10, * P \leq 0.05).

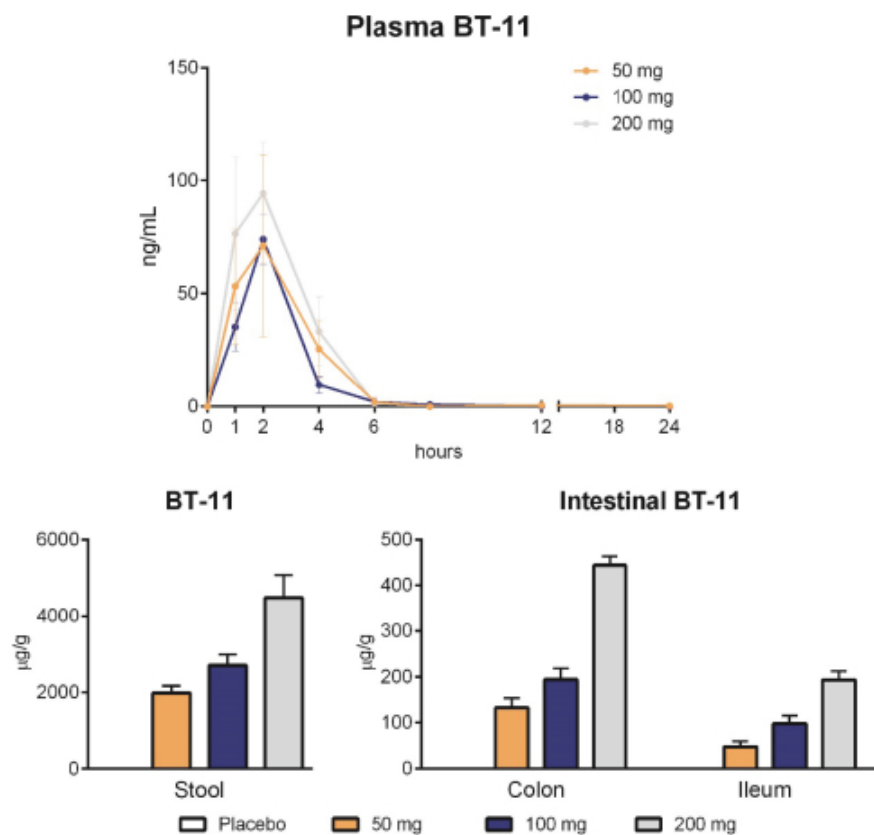
In the *Mdr1a*^{-/-} genetic model, BT-11 (oral, 8 mg/kg) was compared to anti-TNF (2 mg/kg, intravenous), 5-ASA (oral, 25 mg/kg), and tofacitinib (oral, 30 mg/kg). Treatments were administered for six weeks. Disease activity index, a composite measure on a scale of 0-4 of rectal inflammation, stool consistency, weight loss and overall physical condition, was monitored throughout the treatment period. BT-11 provided significantly greater response relative to vehicle and the three comparative therapies, based on a side-by-side comparison. After six weeks of treatment, colon sections were prepared for histology and graded for leukocytic infiltration. Stool was collected for measurement of calprotectin. In both measures, the scores of BT-11 were significantly lower than vehicle and the three comparative therapies, as shown in the graphs below.



Comparative efficacy in disease activity index, leukocytic infiltration, and fecal calprotectin with BT-11 treatment (8 mg/kg) relative to anti-TNF (2 mg/kg), 5-ASA (25 mg/kg) and tofacitinib (30 mg/kg) (n = 9, * P \leq 0.05; ** P \leq 0.01).

Early validation of the local GI PK was conducted in rodents. While informative, the gastrointestinal tract of rodents is significantly different from humans in transit time, gut microenvironment and overall

gastrointestinal physiology. We took an additional step to validate the gut-restricted properties of BT-11 in pigs. Pigs have a nearly 1:1 human equivalent dosing ratio to humans. Twenty-four hours after dosing, colon tissue and colonic stool were collected and assayed for BT-11 content. We observed high, dose-dependent levels of BT-11 in both tissue and stool. The ratio of BT-11 between tissue and stool in pigs was observed to be 1:10. Peak concentrations of less than 150 ng/mL, 3,000-fold lower than tissue and 30,000-fold lower than stool concentrations, were observed in plasma one hour post-dosing. Minimal differences were observed between pigs with IBD and healthy pigs in absorption or local GI PK.



Plasma concentrations of BT-11 from 0 to 24 hours after oral dosing with immediate release tablets (n = 4). Colonic content (stool), ileum and colonic tissue concentrations of BT-11 24 hours after oral dosing with immediate release tablets (50, 100, 200 mg) (n = 4).

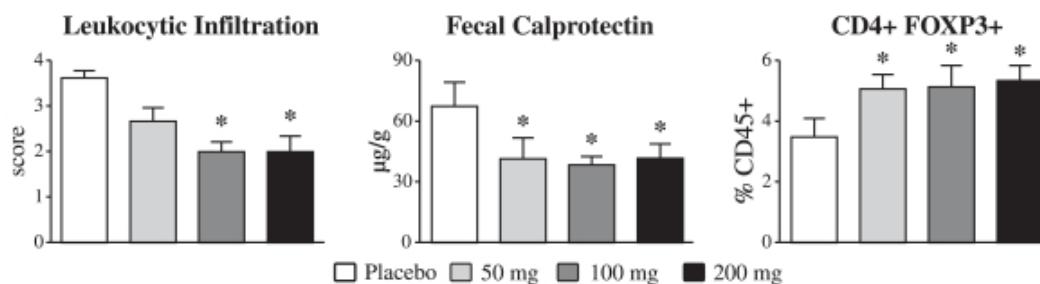
Plasma PK parameters of BT-11 in pigs

Parameter	50 mg	100 mg	200 mg
C_{max} (ng/mL)	64	54	94
$t_{1/2}$ (hr)	0.9	0.9	0.5
AUC (hr * ng/mL)	245	200	287
V_d (L)	0.29	0.35	0.54

In addition to the PK studies, we also used the pig IBD model to measure BT-11 efficacy. We used a seven-day DSS challenge with four groups: placebo and BT-11 at 50 mg, 100 mg or 200 mg, given orally in tablets. Colonic tissue and stool samples were collected at the end of the seven-day study. By histology, the amount of

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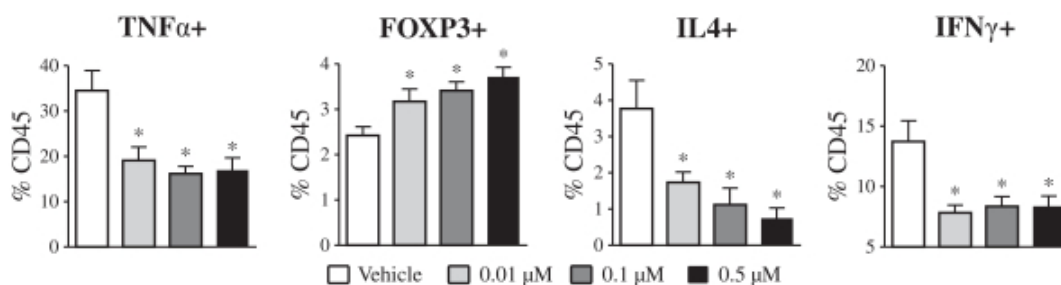
inflammatory cells in the colon was significantly decreased at 100 mg and 200 mg of BT-11. Calprotectin was reduced by approximately half in all BT-11-treated groups. Regulatory CD4+ T Foxp3+ cells that help control inflammation were increased in the colonic wall of all three BT-11 treated groups. As minimal increased in efficacy measures were observed beyond 100 mg, the 500 mg and 1,000 mg dose levels were chosen for preliminary examination in clinical studies based on the pigs used in this study being approximately one-tenth the size of an average human.



Reduction of leukocytic infiltration and fecal calprotectin with increase in colonic CD4+ FOXP3+ cells in pigs challenged with DSS for 7 days and treated with BT-11 tablets (50, 100, 200 mg) daily (n = 9, * P £ 0.05).

In initial translational studies, BT-11 was tested *in vitro* with lamina propria mononuclear cells, or LPMCs, isolated from colonic samples of UC donors. BT-11 significantly reduced TNF α +, IL-4+ and IFN γ +, at concentrations of 0.01, 0.1 and 0.5 μ M. BT-11 also significantly increased FOXP3+ LPMCs at these concentrations, suggesting that BT-11 remained effective in cells isolated from the afflicted target area. While numerous factors differ between *in vivo* and *in vitro* environments, these experiments also provide preliminary insight into the extracellular concentrations of BT-11 necessary to induce immunological changes in human cells.

LPMCs were obtained from colonic resections of UC patients. Cells were treated for 24 hours *ex vivo* with BT-11. Flow cytometry was used to identify TNF+, IL4+, FOXP3+ and IFN γ + CD45+ cells. Statistical significance by treatment group (n = 8) is shown in the tables below.



Reduction of TNF+, IL4+ and IFN γ +, and increase in FOXP3+ cells in LPMC of UC patients treated with BT-11 *ex vivo* (0.01, 0.1, 0.5 μ M) (n = 6, * P £ 0.05). Results are expressed as % within CD45+ (hematopoietic immune cells) obtained from the colon.

Preclinical GLP toxicology results

In non-clinical repeat dose GLP toxicity studies, BT-11 showed no signs of toxicity at all tested doses. These studies have included three-month studies in rats and dogs, six-month studies in rats and nine-month studies in dogs, providing the necessary non-clinical data to support long-term dosing in humans. In these pivotal toxicology studies in rats and dogs, the NOAEL was greater than 1,000 mg/kg. In targeted studies for cardiovascular, respiratory and central nervous system effects, a NOAEL ³ 1,000 mg/kg was also observed with

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no effects on ECG parameters, heart rate, respiratory rate, or functional observational battery. No target organ systems have been identified pre-clinically. BT-11 has not been identified to have any dose-limiting toxicities in animals.

The genotoxicity of BT-11 has been tested in one *in vivo* test and two *in vitro* assays, one of which utilized human cells. The genotoxicity studies have been the standard Ames, chromosomal aberration and micronucleus tests. None of these tests suggested mutagenic potential up to tested limit doses. We plan to conduct carcinogenicity studies of BT-11 in parallel with our planned Phase 3 clinical trial in UC.

BT-11 had minimal inhibitory effects on CYP enzymes and common drug transporters. Combined with limited overall systemic exposure and a high plasma protein, BT-11 has shown low potential for negative drug-drug interactions in our preclinical studies. BT-11 has a long metabolic half-life, but a short systemic half-life of less than three hours in PK studies. Analysis of urine and feces from toxicology studies in rats and dogs indicate that BT-11 is excreted unmetabolized through both routes.

Background on Crohn's disease and current treatments

CD is a chronic, autoimmune, inflammatory bowel disease that causes inflammation, irritation, and ulcers in any segment of the gastrointestinal tract, but most commonly affects the end of the small bowel and the beginning of the colon. It can affect the entire thickness of the bowel wall, and inflammation of the intestine can skip, or leave normal areas in between patches of diseased intestine. Symptoms include abdominal pain, increased abdominal sounds, rectal pain and bleeding, bloody stools, diarrhea, fever, weight loss, and malnutrition. Having CD puts a patient at increased risk of developing colon cancer. CD is estimated to affect over 700,000 patients in the United States. The global therapeutic market for CD was approximately \$9.6 billion in 2016, which is expected to grow at a compound annual growth rate of 3.7% between 2016 and 2026. Of this global market, the United States market comprised approximately \$7.8 billion in 2016. The main current treatments for CD depend on the severity of the disease and are divided into four classes:

Mild to moderate CD

Treatment for mild to moderate CD includes:

- **Aminosalicylates** (5-ASAs) (mesalamine, sulfasalazine) can be prescribed to mild CD patients with colonic disease. Aminosalicylates are generally administered through an oral or rectal route of administration. Unlike UC, for which 5-ASA is commonly accepted as a first-line therapy, the efficacy of oral aminosalicylates in CD is controversial and has limited supporting evidence. Aminosalicylates are generally well-tolerated by patients in the treatment of IBD. Common side effects include headache, nausea, dyspepsia, flatulence and diarrhea. Rare but more serious side effects include pleuritis, pericarditis, myocarditis, pancreatitis, cholestatic hepatitis, nephritis and renal dysfunction.
- **Corticosteroids** (budesonide, prednisone, cortisone) are used as induction agents and are prescribed for short periods to address disease flares across the spectrum of severity in CD patients. Corticosteroids are administered through oral, intravenous and rectal routes of administration in the treatment of CD. Over one-third of CD patients are steroid-dependent defined as a relapse after dose reduction or within 30 days of stopping a steroid regimen. Common side effects are mild to moderate in intensity and include UC, headache, nausea, mood changes and sleep changes.
- **Immunosuppressants** (methotrexate, thiopurines) are used as independent maintenance therapy in CD and can be used in combination with biologics. Immunosuppressants can be orally administered or injected and are systemic agents. Because of the AE profile, use of immunosuppressants can require frequent monitoring.

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Common side effects include leucopenia (a decrease in the number of white blood cells), headache, rash, nausea, and dyspepsia (indigestion), alopecia (hair loss), aspartate aminotransferase (mild increase in levels of liver enzyme), peritoneal abscesses and hypoalbuminemia (abnormally low levels of the protein albumin in the blood).

Moderate to severe CD

Treatment for moderate to severe CD primarily consists of biologics.

- **Biologics** (anti-TNF, anti-IL-12/IL-23, anti-integrin) are the primary maintenance therapy in moderate to severe CD and comprised 59% in 2016 of the UC therapeutic market. Anti-TNF and anti-IL-12/IL-23 comprise 80% to 90% of the biologics used in CD. Anti-integrin biologics have a limited penetrance into the CD market. Biologics are injectable therapies. Biologics, particularly those targeting cytokines, have been associated with increased risks of cancer, infection and death.

We believe that current therapeutic options have the following limitations:

- **Safety concerns.** The primary therapies in CD pose significant health risks. Anti-TNF and anti-IL-12/IL-23 biologics have been associated with higher risks for malignancies and infections. One of two anti-integrin therapies for CD has been associated with greater risk for progressive multifocal leukoencephalopathy. Immunosuppressants are associated with drop in white blood cell counts, liver damage and risk for infection. In addition to the common side effects of corticosteroid outlined above, extended corticosteroid use has been shown to contribute to bone loss, weight gain, lowered quality of life and cardiovascular complications. There are limited options available for patients and clinicians who prioritize safety and low risk for AEs when selecting therapies.
- **Limited efficacy.** Current therapeutics have limited efficacy, with 18% to 25% effect sizes in induction of remission. For instance, up to 20% of CD patients are resistant to steroid treatment and have limited options for induction therapy.
- **Lack of long-term maintenance options.** In placebo-controlled pivotal clinical trials, the most successful biologics achieve an approximate 18% to 25% effect size in Crohn's Disease Activity Index, or CDAI, based remission. Additionally, half of patients who receive biologics as maintenance therapy experience a relapse of disease within one year. Immunosuppressive therapies have a greater risk of side effects that typically result in attempts to withdraw the therapy. Approximately one-third of patients experience a relapse shortly after withdrawal. These frequent disease flares result in greater steroid use which has been associated with a higher risk for developing refractory disease and for need of surgical resection.
- **Inconvenience.** Current marketed biologics require injections, either through subcutaneous or intravenous routes, that can necessitate trips to clinics or care sites for administration, be disruptive to the lives of patients, and result in slight decreases in compliance. Current oral drugs for CD require high doses taken multiple times daily.
- **Therapeutic gaps.** Gaps exist on both ends of the CD treatment paradigm. There is no consensus first-line therapy in CD. The main competition in biologic naïve patients are immunosuppressants. No current therapeutic effectively treats patients who are refractory to biologics. These patients require frequent steroids and surgery.

Our solution for treatment of CD

We believe that BT-11, if approved, has the potential to serve as a first-line CD therapy, offering treatment for patients prior to their progression into biologics by addressing the main limitations of current therapeutics. We

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believe that an oral, gut-restricted small molecule delivered once daily in a singular tablet could serve as a first-line therapy in the moderate to severe CD treatment paradigm. In clinical trials to date, BT-11 has been observed to have the following characteristics in the treatment of CD:

- **Gut-restricted PK with low systemic exposure.** GI concentrations of BT-11 are on average 6,000-fold higher in the colon than in blood. A gut-restricted PK profile may assist in limiting the number of observed systemic adverse side effects.
- **Tolerability.** Clinical studies (>7-fold) and preclinical studies (>100-fold) of BT-11 to date have not identified any dose-limiting toxicities well above the proposed therapeutic window. No systemic suppression of white blood cells, a common feature of biologics, immunosuppressant and other drugs in development, has been observed with BT-11.
- **Convenient, oral, once a day dosing.** We have designed BT-11 to be a single, once-a-day oral tablet. We are evaluating BT-11 in our ongoing Phase 2 clinical trial in patients with CD at a 1,000 mg dose contained in a single tablet per day.
- **Preclinical and translational testing.** BT-11 has been evaluated in five mouse models of IBD and a pig model of IBD providing consistent efficacy across diverse methods of disease induction including genetic, immunological, bacterial and chemical. Comparative efficacy studies in animal models indicate a doubling of response relative to anti-TNF. In human primary cells, BT-11 significantly downregulated TNF and IFN γ at low concentrations. We believe that these preclinical results support advancement of BT-11 in the treatment of CD.
- **Innovative target.** BT-11 is the first therapeutic candidate to target and activate LANCL2, a novel target, to induce immunometabolic effects. With the high frequency of switching treatments observed in IBD due to lack or loss of response, we believe additional differentiated mechanisms of action are needed.

Phase 1 clinical trial results

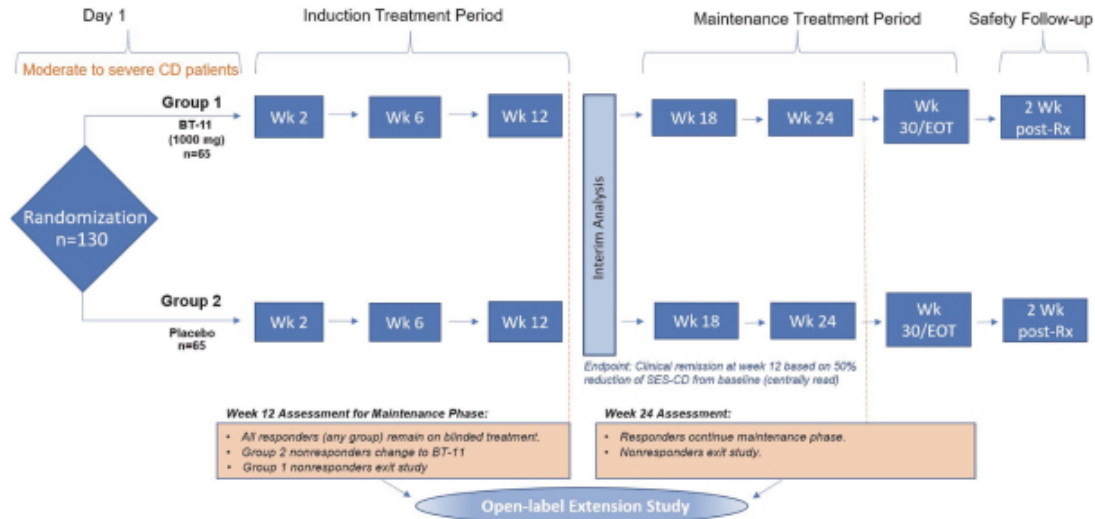
The Phase 1 clinical trial of BT-11 in normal healthy volunteers tested oral doses up to 7,500 mg for up to seven days. No treatment-related adverse event differences were noted between all BT-11 cohorts and placebo.

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Clinical development plan

Phase 2 clinical trial design of BT-11 in Crohn's disease

Following our receipt of topline results from the ongoing Phase 2 clinical trial of BT-11 in UC, we plan to initiate a Phase 2 randomized, placebo-controlled, double-blind, multicenter clinical trial to evaluate the efficacy of oral BT-11 in moderate to severe CD. The primary objective of this trial will be to establish the efficacy of oral BT-11 in inducing clinical remission at week 12 in patients with moderate to severe CD. The co-primary endpoints will be proportion of patients achieving clinical remission at week 12 defined by CDAI of less than 150 and proportion of patients with an endoscopic response at week 12 defined by 50% reduction from baseline in the simplified endoscopic index of severity for Crohn's disease, or SES-CD, score. The graphic below depicts the planned design of the Phase 2 clinical trial.



A total of 130 patients with moderate to severe, active CD will be randomized at a 1:1 ratio, in a centralized manner, to receive 1,000 mg of BT-11 or placebo. Moderate to severe, active CD will be defined as:

- a CDAI score of 220 to 450;
- a patient-reported outcome (PRO-2) liquid/very soft stool frequency (SF) score ³ 4 and/or abdominal pain (AP) ³ 2, (seven-day average); and
- a SES-CD score ³ 6 (³ 4 for isolated ileitis) (confirmed by a central reader).

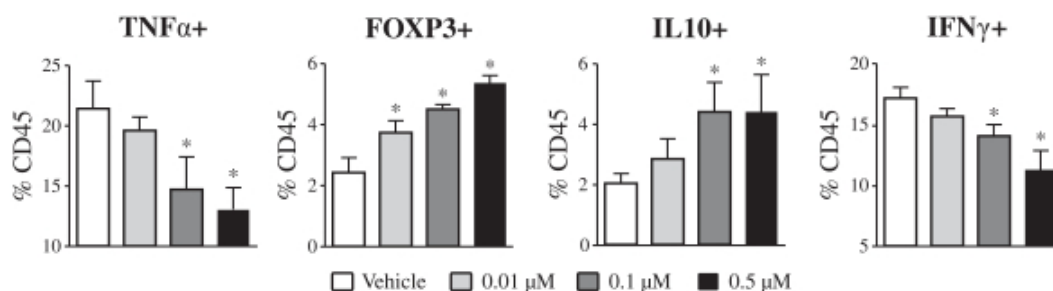
Each of the treatment arms will comprise 65 patients. The randomization will be stratified by prior exposure to biologic therapy for CD with exposed population limited to 50% and corticosteroid use at baseline. The trial will consist of a 28-day screening period, a 12-week induction period, an 18-week maintenance extension period and a 2-week post-treatment safety follow-up period. Patients that are in clinical response or remission at week 12 will be eligible to continue into the maintenance period. Patients entering the maintenance period will stay in the same blinded group assignment given in the induction phase.

Secondary endpoints will include clinical response, endoscopic remission, deep remission, mean change in CDAI and mucosal healing. Biopsies collected from endoscopies conducted at baseline, week 12 and week 30 will be used to evaluate histology, PK, target engagement and other mechanistic and translational outcomes. Blood and stool will be used to assess biomarkers throughout the study.

Preclinical results

Many of our preclinical models of BT-11 evaluated the product candidate in both CD and UC, as described above. The adoptive transfer and IL10^{-/-} models both develop ileitis in addition to colitis and would be considered the most relevant out of the five models of CD.

In human *lamina propria* mononuclear cells isolated from the colon of CD patients, BT-11 significantly reduced TNF α ⁺ and IFN γ ⁺ cells at concentrations of 0.1 and 0.5 μ M. BT-11 significantly increased IL10⁺ cells at the same concentrations and increases FOXP3⁺ cells at 0.01, 0.1 and 0.5 μ M.



Reduction of TNF⁺ and IFN γ ⁺, and increase in FOXP3⁺ and IL10⁺ cells in LPMC of CD patients treated ex vivo with BT-11 (0.01, 0.1, 0.5 μ M) (n = 6, P \leq 0.05). The results are expressed as % within CD45⁺ (hematopoietic immune cells) obtained from the colon.

Preclinical GLP toxicology results

Preclinically, pivotal repeat-dose studies in rats up to six months and dogs up to nine months have resulted in NOAEL ³ 1,000 mg/kg and no identified dose-limiting toxicities to date.

BT-11 for the treatment of eosinophilic esophagitis

Overview

BT-11 is an oral small molecule that is the first product candidate to target LANCL2 in the esophagus for EoE. In parallel to ongoing development in UC and CD, we are developing a modified formulation of BT-11 to treat EoE. EoE is categorized by inflammation of the esophagus due to an increased presence of eosinophils, a type of immune cell. The FDA has not approved any treatments of EoE. In addition, the FDA has granted orphan drug designation for product candidates designed to treat EoE, indicating that the FDA considers EoE to be an orphan disease. We intend to submit an IND for BT-11 for the treatment of EoE in the first half of 2021.

Background on EoE and current treatments

EoE results from a dysregulation of Th2-mediated immunity that drives recruitment of eosinophils to the esophagus. The inflamed esophagus can cause chronic pain, frequent hospitalization and emergency room visits, difficulty eating and swallowing, and formation of fibrotic strictures. With up to 160,000 patients in the United States, EoE is an orphan disease without a currently FDA-approved therapeutic.

Currently, management of EoE often consists of the use of proton pump inhibitors, corticosteroids or inhaled medications typically used for asthma. It is estimated that approximately one-third of EoE patients have no response to current medical practices in EoE. Therapeutics in development are primarily corticosteroids, including budesonide which is used for IBD and asthma, and biologics, including dupilumab, which targets the IL-4 receptor for the treatment of asthma and eczema.

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Our expectation is corticosteroid use and biologics will have similar limitations to those observed in IBD, including a presence of side effects and loss of response over time. Given the prevalence of EoE within both pediatric and adult populations, there is an unmet need for therapeutics with limited risk for side effects.

Our solution for the treatment of EoE

EoE stems from an excessive Th2 response in the esophagus that is thought to result from increased stimulation by epithelial cells and dendritic cells. In combination, regulatory functions of eosinophils, mediated through FOXP3, are suppressed in EoE patients. As such, there are multiple means to intercept the pathogenesis of disease.

Mechanistically, LANCL2 activation has the potential to impact the maintenance of the epithelial barrier, prevention of Th2 responses and improvement of suppressive capacity. We believe data generated from the evaluation of BT-11 efficacy in preclinical models of IBD and translational patient samples support that BT-11 may be used for the treatment of EoE. In mice, BT-11 was observed to decrease Th2 cells in the colonic mucosa, a mechanism important for both UC and EoE. In human LPMCs, BT-11 decreased the percentage of IL-4+ CD4+ T cells. IL-4 is one of the main cytokines produced by Th2 cells to recruit eosinophils.

As described previously, we believe that NT-11, if approved, has the potential to offer a differentiated profile to corticosteroids and biologics centering on tolerability, limited systemic exposure, oral dosing, and an innovative mechanism of action to restore tolerance.

Preclinical GLP toxicology

Oral BT-11 is supported by a robust GLP toxicology package potentially enabling chronic dosing through six-month rat and nine-month dog studies up to 1,000 mg/kg. No dose-limiting toxicities have been observed in safety pharmacology studies and no mutagenic potential has been suggested by genotoxicity studies.

Clinical development plan

We intend to submit an IND for BT-11 for the treatment of EoE in the first half of 2021, and to initiate a Phase 1b clinical trial in EoE in the second half of 2021. This trial will assess a modified formulation of BT-11-provided drug release in the oral cavity and esophagus. The primary objective of the trial will be to assess biomarkers of type 2 immune responses, analyze changes in esophageal eosinophil count and determine effects on the dysphagia symptom questionnaire, the primary patient-reported outcome measure in EoE. A secondary objective will be to assess PK of the modified formulation of BT-11 in humans.

BT-11 for the treatment of psoriasis and atopic dermatitis

Overview

BT-11 is a topical small molecule that is the first product candidate to target LANCL2 in the skin for psoriasis and atopic dermatitis. In parallel to ongoing development in intestinal disorders, we are developing a topical formulation of BT-11 for the treatment of skin inflammation. Psoriasis and atopic dermatitis are both disorders of the skin that cause itchiness, rashes, red patches, thickened skin and the formation of plaques or scales. We intend to submit an IND for BT-11 for the treatment of psoriasis in the second half of 2021.

Background on psoriasis and atopic dermatitis and current treatments

Psoriasis and atopic dermatitis are commonly linked to factors associated with both keratinocytes and immune cells resulting in inflammation of the skin with the formation of rashes and persistent itch. Psoriasis commonly

manifests as plaque psoriasis in which the skin thickens and takes on a scaly appearance due to over-proliferation of skin cells. This over-proliferation results from an increase activation and reactivity of Th17 cells. Similarly, in atopic dermatitis, over-active Th17 cells strongly contribute to the proliferation of skin cells. The activation of Th2-related responses are also often tied to the immunological changes during active disease in atopic dermatitis. Psoriasis was estimated to afflict 14.9 million patients, resulting in a global market of \$12.2 billion in 2017 and projected to be about \$19.2 billion by 2027. Atopic dermatitis was estimated to afflict 81.6 million patients, with over a three-fold greater prevalence in children and adolescents, resulting in a global market of \$6.4 billion in 2017.

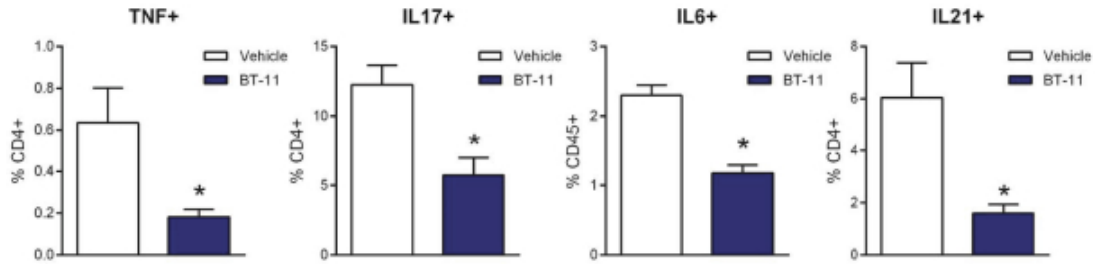
Currently, management of psoriasis often consists of the use of topical corticosteroids or immunosuppressants. For more severe cases or those presenting with psoriatic arthritis, use of systemic immunosuppressants (methotrexate, cyclosporine) or a biologic targeting TNF or the IL-12/23 pathway. In Phase 3 trials, ustekinumab had a 63.1% placebo adjusted response rate and adalimumab had a 64% placebo adjusted response rate, wherein the response was a 75% reduction in the psoriasis area and severity index. Atopic dermatitis has a similar treatment paradigm with the use of topical corticosteroids and calcineurin inhibitors as first-line drugs, followed by use of systemic immunosuppressants (methotrexate, cyclosporine) and biologics (dupilumab) targeting the IL-4 receptor. In pivotal trials, dupilumab had a 28% placebo-adjusted response rate, wherein the response was a score of 0 or 1 (clear or almost clear) on the Investigator's Global Assessment and a reduction of 2 points or more in that score from baseline.

Similar to their usage in other autoimmune disease, biologics and immunosuppressants require monitoring of liver functions and immunosuppression, as use of these agents has been linked to increased risks of infections and cancers.

Our solution for the treatment of psoriasis and atopic dermatitis

We believe topical BT-11, if approved, could function as an alternative front-line therapy to reduce the usage of corticosteroids and immunosuppressants. In addition to no dose limiting toxicities identified in completed nonclinical and clinical trials, we believe that BT-11 through its Treg-associated mechanism of action could offer a greater likelihood of maintained responses relative to other topical therapies. We believe further applications of topical BT-11 as an adjunctive therapy to systemic treatments in refractory cases could be possible.

In an imiquimod-induced mouse model of psoriasis, BT-11 significantly decreased the presence of TNF+, IL-17+, IL-6+, and IL-21+ cells in the spleen when administered directly to the skin daily. Importantly, TNF and IL-17 are critical elements of the pathogenesis of disease in both psoriasis and atopic dermatitis.



Immune cell changes induced by topical BT-11 in an imiquimod-induced model of psoriasis after one week of treatment (n = 9, * P<0.05).

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Preclinical GLP toxicology

Oral BT-11 is supported by a robust GLP toxicology package potentially enabling chronic dosing through six-month rat and nine-month dog studies up to 1,000 mg/kg. No dose-limiting toxicities have been observed in safety pharmacology studies and no mutagenic potential has been suggested by genotoxicity studies. The oral and general toxicity package will be supported by *in vitro* and *in vivo* skin corrosion and irritation assays.

Clinical development plan

We intend to submit an IND for BT-11 for the treatment of psoriasis in the second half of 2021, and to initiate a Phase 1b clinical trial in psoriasis in the second half of 2021. This trial will assess a topical formulation of BT-11 to be applied directly to the skin. The primary objective of the trial will be to assess cytokine biomarkers of immune responses, analyze changes in epidermal thickness and determine effects on the psoriasis area and severity index score, the common primary outcome measure in psoriasis. A secondary objective will be to assess PK of the topical formulation of BT-11 in humans.

BT-104 for the treatment of lupus

Overview

BT-104 is an orally-active, systemically bioavailable small molecule therapeutic candidate that targets LANCL2 that we are developing for the treatment of SLE. The pathogenesis of SLE is connected to defective apoptosis leading to stimulation of B cells by dendritic cells and CD4+ T cells to produce auto-antibodies. These antibodies activate the complement system and deposit in organs leading to inflammation and tissue damage. We believe the activation of LANCL2 can intercept these events upstream through skewing of CD4+ T cells to regulatory phenotypes and maintenance of the metabolic requirements for autophagy. SLE remains a poorly-managed disease with safety concerns, limited efficacy and lack of diversity in current treatment options. We believe that an oral molecule with a differentiated mechanism of action could address the limitations of current therapies. We intend to submit an IND for BT-104 for the treatment of SLE in the second half of 2021.

Background on SLE and current treatments

SLE involves a complex cascade of events that results in auto-antibody generation and immune complex formation. The deposition of these complexes manifests local inflammation in the tissues most commonly associated with lupus, kidney, cardiovascular system and skin, leading to damage and diminished function over time. SLE is an expanding public health threat that affects over 1.5 million patients in the United States and 5 million people worldwide, according to the Lupus Foundation of America. Direct health care costs amount to \$18 billion per year in the United States and up to \$12 billion in lost productivity as a result of the disease. Sales of the top 10 therapeutics for lupus amount to over \$4 billion annually.

Nearly 60% of SLE patients experience more than one flare per year or present with persistently active disease. Mortality rates and progression to end stage renal disease, or ESRD, have plateaued in recent years with currently available treatment options, indicating an unmet clinical need for safer and more effective therapeutics. SLE is commonly treated with corticosteroids, with 87% of patients being placed on a steroid-based regimen. Other therapeutic options fall into four classes:

- **Antimalarials** (hydroxychloroquine) have been used in the treatment of SLE due to an ability to lower the IFN α response. Up to 70% of SLE patients are estimated to be on antimalarials. Due in part to approval in 1956 for SLE, robust knowledge on the efficacy of antimalarials in SLE through placebo-controlled clinical trials is limited in regards to currently relevant endpoints.

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- **Biologics** (belimumab, rituximab) used in the treatment of SLE primarily target B cells. Belimumab is the only new FDA-approved treatment for SLE in the past 60 years and inhibits BAFF to block B cell maturation. In Phase 3 testing, the high dose of belimumab had an effect size less than 10% relative to placebo in the primary endpoint of SLE responder index response rate.
- **Immunosuppressants** (mycophenolate mofetil (MMF), methotrexate) are often used in the treatment of SLE and function by broadly blocking the proliferation of B and T cells. While used in a large portion of patients with lupus in combination with other therapies, the main clinical trials for immunosuppressants in lupus have failed to demonstrate effects in approvable endpoints by the FDA.
- **NSAIDs** are used to manage fever, arthritis and headaches coupled with SLE. Due to an association with renal side effects, the use of NSAIDs in the treatment of SLE is closely monitored. Cutaneous reactions and hepatotoxicity are also observed with higher frequency in SLE patients.

SLE remains a poorly managed disease with a lack of diversity in therapeutic options. Aside from limited efficacy, current medications are required to be taken multiple times daily in high doses and complex combinations. Limitations of current therapeutics include:

- **Safety concerns.** The use of corticosteroids for the treatment of SLE is associated with numerous side effects including cataracts, osteoporosis, and cardiovascular damage. With common doses of steroids ranging from 7.5 to 100 mg, it has been noted that a 1 mg/day increase in steroid exposure results in a 2.8% increase in risk for new organ damage in SLE. In clinical trials of belimumab, more death was observed in the treated groups relative to placebo, including due to septic shock, pneumonia and suicide. Antimalarials and immunosuppressants both increase risk of cardiovascular complications and infections.
- **Disease progression.** In as little as 10 years post-diagnosis, SLE patients accrue neuropsychiatric, renal, cardiovascular and musculoskeletal damage that cause chronic pain in two-thirds of patients. This damage accrual leads to lower quality of life and increased health care burden. Development of lupus nephritis occurs in 50% to 70% of patients and ESRD, necessitating kidney transplants, occurs in 15% to 30% of patients due to poor disease management with current therapeutics.
- **Lack of new therapeutic options.** Only one new drug for SLE has been approved in the last 60 years, with many clinicians instead choosing the off-label use of sub-optimal drugs. Current mechanisms of action target broad immunosuppression, interferon production, activation of B cells or the production of antibodies. With all current therapies targeting similar pathways, it is likely that subpopulations of SLE are continually non-responsive even with switches in medication.

Our solution for treatment of SLE

The common investigational therapeutic targets in SLE are B cells and plasma cells, interferon responses and production of antibodies, which ignore the cascade of upstream events that lead to their activation. LANCL2 has the potential to intercept the complex cascade of upstream events that result in auto antibody generation and immune complex formation at two levels. First, as previously described in the context of BT-11, LANCL2 is an important receptor in regulatory CD4⁺ T cells and is differentially expressed by over 7-fold in Tregs relative to non-Treg CD4⁺ T cells. Activation of LANCL2 boosts oxidative phosphorylation and synergizes with IL-2/CD25 signaling to support and enhance FOXP3 stability and the suppressive function of Tregs. In human SLE and the NZB/W mouse model of lupus, CD25⁺ FOXP3⁺ CD127^{low} Tregs are decreased in number and exist with a less suppressive phenotype. IL-2 levels are also suppressed in SLE, leading to CD25⁻ Tregs that fail to enact regulatory functions. Preclinically in animal models, neutralization of CD25 has led to accelerated disease while the adoptive transfer of Tregs slows disease onset.

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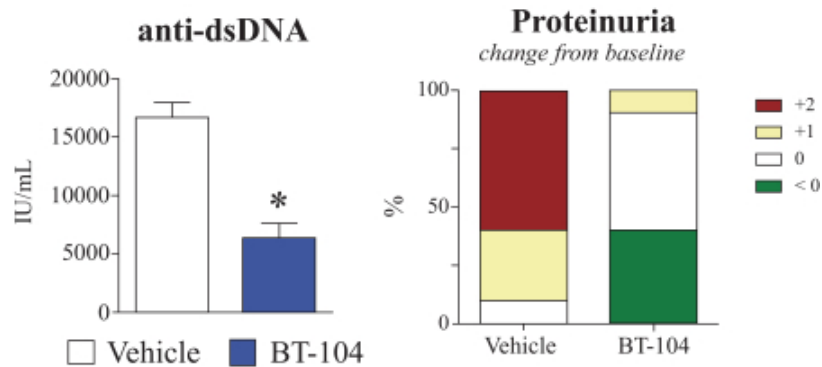
Second, LANCL2 supports the process of autophagy, the process that allows cells to eliminate defective cell material. In SLE, impaired autophagy results in the incomplete processing of apoptotic cells and accumulation of nuclear antigen that immune cells begin to react to over time. In SLE, impairment of LC3-associated phagocytosis proteins, such as Atg7 and Rubicon, results in lesser lysosomal fusion and the production of inflammatory cytokines during a process that typically produces IL-10. In the absence of LANCL2, macrophages and dendritic cells increase phagocytic uptake of cells but have lower expression of many autophagy-related genes. Critically, autophagy is a highly energy-intensive process, requiring mitochondrial metabolism to break down the material. The activation of LANCL2 can facilitate the generation of mitochondrial energy and enhance the production of IL-10 in phagocytes.

We believe that BT-104, if approved, may address the limitations of current therapeutics in the treatment of SLE based on the following characteristics below.

- **Enhanced tolerability.** There have been no dose-limiting toxicities to date in clinical development of BT-11. As a regulatory receptor, its activation does not result in the suppression of white blood cells or greater susceptibility to infection or malignancies. Preliminary dose-range finding studies with BT-104, at doses of 125 mg/kg, 250 mg/kg and 500 mg/kg, has resulted in no adverse effects in rats at up to seven days of dosing.
- **Halt of disease progression.** No currently available therapy aims to restore homeostasis or address the continued presentation of nuclear antigens. Therefore, compensatory mechanisms may develop over time, resulting in loss of efficacy. The activation of LANCL2 may aid in reversing the original break in immune tolerance. Preclinically, LANCL2 activation has been observed in mice to prevent the worsening of proteinuria with interventional dosing of BT-104.
- **Differentiated mechanism of action.** Current therapeutics for the treatment of SLE are all immunosuppressive in their mechanism of action, making LANCL2 clearly differentiated. LANCL2 induces regulatory CD4+ T cells and ameliorates metabolic dysfunction in immune cells. While differentiated, LANCL2 has reduced the production of anti-dsDNA antibodies and expression of IFN α , in mouse models and human primary cells.

Preclinical results

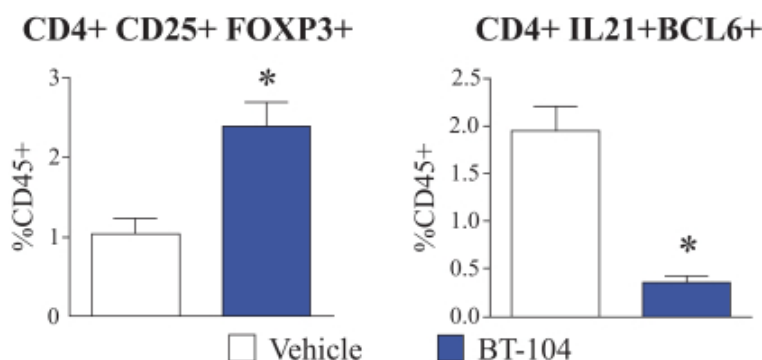
In a NZB/W F1 mouse model of lupus, BT-104 reduced serum anti-dsDNA antibodies and prevented worsening of proteinuria grade from baseline. Mice were treated with BT-104 daily for 12 weeks between the ages of 24 and 36 weeks. Ninety percent of mice treated with BT-104 experienced an improvement or no change in proteinuria grade from baseline, in comparison to 90% of vehicle treated controls that experienced a worsening in grade. Grade 2 or lower proteinuria is well correlated with the prevention of ESRD clinically.



Reduction of serum anti-dsDNA antibodies and prevention of proteinuria worsening after oral treatment of NZB/W F1 with BT-104 (20 mg/kg) for 12 weeks between the ages of 24 and 36 weeks (n = 10, $P \leq 0.05$).

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Oral BT-104 treatment has resulted in immunological changes systemically. In the spleen, 20 mg/kg of BT-104 increased CD25+ FOXP3+ Tregs and decreased IL21+ T follicular helper (Tfh) cells. Tfh cells assist in B cell maturation and amplify humoral responses.



Oral treatment of NZB/W F1 mice with BT-104 (20 mg/kg) for 12 weeks, between the ages of 24 and 36 weeks, increased the percentage of CD4+ Treg cells and suppressed T follicular helper cells in the spleen (n = 10, P £ 0.05).

The efficacy of LANCL2 activation was evaluated in cells obtained from blood (PBMCs) of SLE patients with active disease. BT-104 was observed to have a dose-dependent response, with maximum efficacy observed between 100 nM and 200 nM when PBMCs were treated with agents that activate inflammation, namely PMA + ionomycin (general activation), TLR7 (gardiquimod) and ODN2395 (type C CpG). BT-104 prevented IFN α secretion in human primary cells stimulated with potent IFN α inducers.

Ex vivo efficacy of BT-104 in human PBMCs

Stimuli	IFN α , % reduction from vehicle		
	50 nM BT-104	100 nM BT-104	200 nM BT-104
PMA (5 ng/mL) + Ionomycin (500 ng/mL)	51*	54*	70*
Gardiquimod (2 µg/mL)	42*	90*	92*
ODN2395 (2.5 µg/mL)	33	46*	59*

* P £ 0.05

Preclinical GLP toxicology results

Preliminary dose-range finding studies have been conducted with oral BT-104 at doses of 125 mg/kg, 250 mg/kg and 500 mg/kg in rats over seven days. These studies revealed a NOAEL ³ 500 mg/kg with no changes in hematology, biochemistry, organ weights, macroscopic or microscopic lesions. PK studies of BT-104 in rats show a bioavailability greater than 70% within the therapeutic dose range of 1 mg/kg to 20 mg/kg.

In preparation for IND submission, BT-104 will be assessed in 28-day repeat dose toxicity studies in rats and dogs at doses of 250 mg/kg, 500 mg/kg and 1,000 mg/kg.

Clinical development plan

We intend to submit an IND for BT-104 for the treatment of SLE in the second half of 2021 and initiate a Phase 1 clinical trial in normal healthy volunteers in the second half of 2021. This study will feature a standard single

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ascending dose/multiple ascending dose design (five cohorts of single ascending dose and three cohorts of multiple ascending dose) testing a dose range 5-fold to 10-fold greater than the projected clinical therapeutic dose. The primary objective of the study will be to assess the safety and tolerability of BT-104 by frequency and severity of AEs, standard safety laboratory results, ECG and vital signs. A secondary objective will be to assess the PK of BT-104 in humans.

BT-104 for the treatment of rheumatoid arthritis

Overview

BT-104 is a systemically bioavailable small molecule product candidate that targets LANCL2 that we are developing for the treatment of rheumatoid arthritis. The pathogenesis of rheumatoid arthritis is linked to dysfunction of CD4+ T cells leading to over-activation of cells within the joint synovium. LANCL2 is an anti-inflammatory receptor that controls CD4+ T cell subsets towards regulatory phenotypes. The activation of LANCL2 results in a net decrease of inflammatory cell infiltration. Rheumatoid arthritis is a chronic autoimmune disease with therapeutic gaps resulting from safety concerns and limited efficacy of current treatment options. We believe that an oral molecule with a differentiated mechanism of action could address the limitations of current therapies for the treatment of rheumatoid arthritis. We intend to submit an IND for BT-104 the treatment of rheumatoid arthritis in the second half of 2021.

Background on rheumatoid arthritis and current treatments

Rheumatoid arthritis is an autoimmune disease that results in chronic pain and loss of mobility in joints due to excessive inflammation that swells the joints and erodes bone and cartilage. Rheumatoid arthritis affects 1.3 million patients in the United States and has a global market estimated to be approximately \$25 billion annually. With age as a risk factor, the number of new cases of arthritis is expected to increase as the elderly population expands. The therapeutic market is projected to have a compound annual growth rate of over 4% from 2018 to 2025.

Rheumatoid arthritis requires chronic treatment to maintain remission and treatment escalation or add-ons to address flares. Approximately 10% of patients will be in remission for a full year. Current treatments for rheumatoid arthritis are categorized into five classes:

- **NSAIDs** (ibuprofen, naproxen) are used in mild cases of rheumatoid arthritis to provide slight anti-inflammatory effects in addition to pain and symptom relief. Safety risks for NSAIDs are minor in comparison to other classes of drugs but possess limited efficacy in moderate to severe cases.
- **Corticosteroids** (prednisone) are used to broadly suppress inflammation in the presence of a flare. Corticosteroid use in the treatment of rheumatoid arthritis is associated with weight gain, muscle loss, decrease in bone density and cardiovascular issues.
- **Disease-modifying antirheumatic drugs (DMARDs)** are a broad class of drugs including methotrexate, leflunomide, sulfasalazine, and hydroxychloroquine.
- **Biologics** (anti-TNF, anti-CD20, anti-IL6R, fusion protein) for the treatment of rheumatoid arthritis are diverse with targets of cytokine signaling, B cell depletion, and Th17 differentiation. Biologics can result in increased risk of cancers and infections.
- **JAK inhibitors** (tofacitinib, baricitinib) function by blocking the signals that promote activation of CD4+ T cells and other immune cells. The side effects of JAK inhibitors are numerous, including drop in white blood cell counts, anemia, blood clotting and death.

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The limitations of current therapies in rheumatoid arthritis are tied to safety and efficacy. There is a high risk of severe side effects with all current treatments, aside from NSAIDs. Medical practice lacks an option for moderate to severe patients that does not present with significant risk of co-morbidities. Given "black box" safety warnings on both biologics and JAK inhibitors, we believe new therapies that are safer and equally effective would have a clear market advantage. About 40% to 50% of rheumatoid arthritis patients experience a 50% drop in severity when switching to a new therapy with 30% to 35% entering remission. The high non-response rates and loss of response rates in rheumatoid arthritis continues to offer ample market opportunity for novel mechanisms of action.

Our solution for the treatment of rheumatoid arthritis

We believe BT-104, if approved, may offer a competitive advantage relative to current therapies given its novel mechanism of action and the lack of dose-limiting toxicities we have observed to date preclinically. LANCL2 is a key receptor in the plasticity between Treg and Th17 cells and accumulation of Th17 cells in the synovium is a shared characteristic of most individuals with rheumatoid arthritis, which drive the production of TNF and the recruitment of neutrophils and fibroblast like synoviocytes. Interactions between these three cells types are central to joint swelling, pannus formation and osteoclast differentiation.

Due to an ability to inhibit *de novo* Th17 differentiation and to prevent adoption of effector phenotype in Tregs, the activation of LANCL2 shifts the balance of this plasticity towards Tregs. Clinically, in the context of BT-104, LANCL2 activation has reduced calprotectin levels, a marker of neutrophil infiltration comprised of S100A8 and S100A9 subunits that are greatly increased in rheumatoid arthritis. Preclinically, LANCL2 activation significantly decreases calprotectin levels relative to tofacitinib, a marketed therapy for arthritis, in a separate model of autoimmune disease. These combined immunological changes can decrease ICAM1 and CD109 overexpression that leads to excessive fibroblast like synoviocyte infiltration.

In preliminary clinical development and preclinical studies, LANCL2 activation posed significantly less risk for toxicities than biologics, JAK inhibitors and other DMARDs. LANCL2 activation is novel in comparison to other treatments in rheumatoid arthritis by initiating an immunometabolic signaling cascade to enhance regulatory and tolerogenic pathways. This could offer an additional treatment option to the high refractory and relapsing population in rheumatoid arthritis.

Preclinical GLP toxicology results

BT-104 has been tested in a seven-day dose range finding study in rats up to doses of 500 mg/kg with no adverse effects observed. We expect to initiate GLP 28-day repeat dose toxicity studies in rats and dogs in the first half of 2021.

Clinical development plan

Subject to receiving authorization to proceed under an IND, we expect to initiate a safety and tolerability Phase 1 study in normal healthy volunteers of BT-104 in the second half of 2021.

BT-111 for the treatment of nonalcoholic steatohepatitis (NASH)

Overview

BT-111 is a small molecule product candidate that targets LANCL2 that we are developing for the treatment of NASH. NASH results from activation and proliferation of fibroblasts in response to chronic inflammation caused by obesity, lipid accumulation and insulin resistance. LANCL2 activation may ameliorate autoimmune disease and has shown benefit in restoring insulin sensitivity in obesity. We intend to submit an IND for BT-111 in the second half of 2021.

Background on NASH and current treatments

NASH affects over 8 million patients in the United States and greater than 16 million patients globally. With current NASH-related health care costs exceeding \$15 billion in the United States, NASH represents a large public health problem. With expected yearly growth of nearly 45%, NASH may become one of the most pressing health concerns worldwide. NASH increases risk for liver failure, hepatocellular carcinoma and cardiac death.

There is no currently FDA-approved treatment for NASH. As such, the projected annual market opportunity by 2025 is estimated to be up to \$30 billion. Current treatment options for NASH are diet and exercise, which have poor patient adherence in both the short- and long-term. Further, these approaches are more effective in non-alcoholic fatty liver disease, or NAFLD, whereas reversal of the fibrosis occurring in NASH may require pharmacological intervention.

A primary challenge in the development of NASH therapeutics has been the identification and selection of quantitative clinical trial endpoints and lack of information on representative disease-related biomarkers to use in early-stage clinical trials. Current therapeutics under development have effect sizes ranging between 8% and 15% relative to placebo fibrosis improvement with no worsening of NASH, suggesting sufficient room for improvement. We believe the ideal NASH therapeutic would be an oral medication capable of inducing immunological and metabolic effects.

Our solution for the treatment of NASH

NASH is a reversible fibrotic disorder of the liver resulting from chronic inflammation and metabolic dysfunction. Obesity and type 2 diabetes are major risk factors causing lipid accumulation and local macrophage activation that stimulates myofibroblasts to overproduce collagen and other extracellular matrix proteins. LANCL2, in addition to immune cells, is expressed within hepatocytes and muscle cells. In the context of type 2 diabetes, the natural ligand of LANCL2 improves glycemic control, increases glycogen metabolism and lessens adipose tissue inflammation.

Within the liver, the loss of LANCL2 increases liver size, triglyceride content and fibrosis. Mechanistically, LANCL2 activation increases expression of Pgc1a in metabolic tissues resulting in increased mitochondrial biogenesis and synergizes with insulin to activate glycogen synthase enzymes. Combined, these effects can reverse metabolic dysfunction and restore lipid homeostasis. The potential efficacy of LANCL2 in NASH is additionally supported by the anti-inflammatory effects, including downregulation of TNF and IL-6, that can reduce the proliferation and activation of myofibroblasts in the liver.

There are currently no FDA-approved therapies for the treatment of NASH. We believe BT-111, if approved, has the potential to address the unmet clinical need in NASH by providing:

- **Well-tolerated with convenient dosing.** The activation of LANCL2 has not been associated with any dose-limiting toxicities in preclinical or clinical development in NASH or other indications. LANCL2 activation does not block lymphocyte trafficking or proliferation directly, making it unlikely to be associated with drops in white blood cell count or increased risk for bacterial or viral infections. BT-111 would be administered as a once-daily oral tablet that is generally accepted to result in high patient compliance.
- **Dual impact on immunity and metabolism.** The anti-inflammatory actions of LANCL2 are well established, with an ability to decrease TNF expression and differentiation of Th1 and Th17 cells in multiple disease models. Within adipose tissue, LANCL2 decreases the presence of TNF producing macrophages. The activation of LANCL2 also increases glucose uptake and utilization in muscle and maintains insulin sensitivity. BT-111 may therefore address the inflammation-associated fibrosis and the underlying metabolic dysfunction in NASH.

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Preclinical results

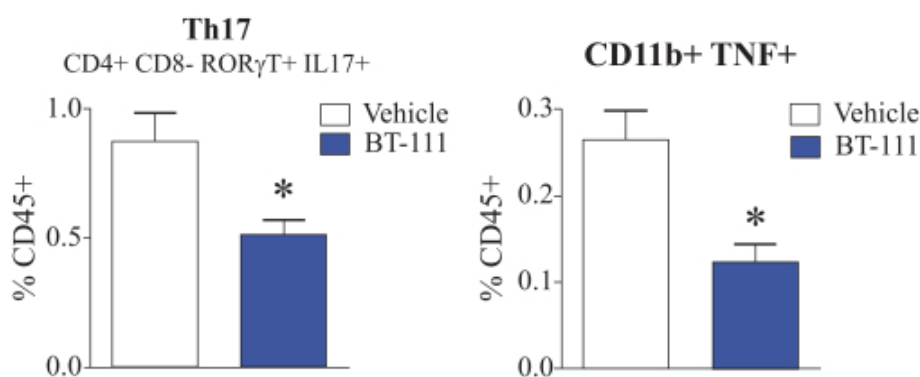
Therapeutic dosing of BT-111 (10 mg/kg) for six weeks between weeks six and 12 of CDAA diet, reduced lipid accumulation and liver fibrosis (n = 10, $P \leq 0.05$). Liver fibrosis, assessed by percent positive area in liver histology by Masson's trichrome staining, was approximately normalized to standard diet controls.

Efficacy of BT-111 in CDAA diet-induced model of NASH

	Vehicle, percent change from standard diet control	BT-111 (20 mg/kg), percent change from standard diet control
Liver triglycerides	+81%	+34%*
Masson's trichrome	+106%	+9%*

* $P \leq 0.05$

In the same model and treatment paradigm, BT-111 reduced markers of inflammation, including Th17 cells and TNF-producing myeloid cells (n = 10, $P \leq 0.05$). Both IL-17 and TNF have been linked to the progression of NAFLD to NASH due to their ability to induce hepatic stellate cell proliferation and activation, even in the presence of low TGF- β .



Reduction of Th17 and CD11b+ TNF+ cells after oral treatment of BT-111 (10 mg/kg) for 6 weeks in a 12-week CDAA-diet model of NASH (n = 10, $P \leq 0.05$).

Preclinical GLP toxicology

We plan to test BT-111 in a seven-day dose range finding study in rats up to doses of 1,000 mg/kg in the fourth quarter of 2020. We expect to conduct PK studies testing the bioavailability and profile of BT-111 in rats in the therapeutic window (1-20 mg/kg) in the second half of 2020. We intend to initiate GLP 28-day repeat dose toxicity studies in rats and dogs in the second quarter of 2021.

Clinical development plan

Following an expected IND submission in the second half of 2021, we intend to initiate a Phase 1 study in normal healthy volunteers in the second half of 2021. This study will feature a standard single ascending dose/multiple ascending dose design testing a dose range 5-fold to 10-fold greater than projected therapeutic dose. The primary objective of the study will be to assess the safety and tolerability of BT-111 by frequency and severity of AEs, standard safety laboratory results, ECG and vital signs. A secondary objective will be to assess the PK of BT-111 in humans and metabolic biomarkers including cytokine and lipid profiles.

BT-111 for the treatment of type 1 diabetes

Overview

BT-111 is a small molecule product candidate that targets LANCL2 that we are developing for the treatment of type 1 diabetes. Type 1 diabetes is an autoimmune disease in which insulin-producing pancreatic beta cells are destroyed, requiring life-long insulin replacement therapy. No treatment exists to maintain or restore beta cell mass. LANCL2 is a receptor that induces anti-inflammatory and regulatory effects that may help to restore self-tolerance and that promotes glycemic control. We intend to submit an IND for BT-111 in the second half of 2021.

Background on type 1 diabetes and current treatments

Type 1 diabetes is a devastating autoimmune disease that results in the destruction of cells within the pancreas that produce insulin leading to elevated blood sugar and damage to other organs. Type 1 diabetes afflicts about 1.5 million patients in the United States and 3.3 million globally. Its incidence is estimated to increase by 3.9% annually worldwide between 2016 and 2026. Direct medical expenses related to the management of type 1 diabetes, including insulin, syringes, pumps and monitoring supplies, and annual lost income totaled \$16 billion in the most recent estimate according to the Juvenile Diabetes Research Foundation. Total type 1 diabetes-related health care costs commonly exceed \$100,000 per patient over his or her lifetime.

The current treatment of type 1 diabetes is management with insulin therapy. Use of combination therapies to improve glycemic control are rare. No treatment is currently available to prevent or delay progression of beta cell loss upon diagnosis. Due to the difficulty of managing glycemia and complications from the disease, the average patient lifespan is reduced by over 17 years. The limitations of standalone insulin therapy are:

- **Variability.** Highly individualized glycemic responses to meals, responsiveness to the type of insulin and variation in physical activity confound proper control over blood glucose management. Current approaches place a high responsibility on the patient to accurately estimate insulin need.
- **Failure to address all β cell functions.** Insulin therapy does not address additional missing functions of β cells, such as the production of C-peptide or amylin, the auto-reactivity of the immune system, or the complications that arise.
- **Long-term complications.** The current recommended HbA1c goal for type 1 diabetes patients is 7.0. However, the average HbA1c is 8.4 in type 1 diabetes. This deviation from the target range has severe long-term consequences and confirms the need for additional glycemic control measures to combine with insulin therapy. Prolonged dysregulated blood glucose can lead to obesity and insulin resistance with age, worsening management and contributing to the deterioration of health.

Our solution for the treatment of type 1 diabetes

At diagnosis, type 1 diabetes patients typically still have between 20% and 40% of their original β cell mass and function. Following the beginning of insulin therapy, endogenous insulin production is observed to be increased in a 12-month window post-diagnosis, suggesting the ability to regenerate or maintain pancreatic function. The combination of β cell loss remission and the need for precipitating events suggest that the immunological destruction of pancreatic islets is capable of being stalled or even reversed.

We believe the activation of LANCL2 has a potential 3-fold benefit in type 1 diabetes through promotion of anti-inflammatory responses, maintenance of beta cell health and support of glycemic control. LANCL2 down-regulates the production of TNF, IFN γ and IL-21, the main cytokines associated with islet destruction. In type 1 diabetes, β cells undergo Bax and caspase 3 induced cell death. LANCL2 activation increases calcium signaling

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and reduces mitochondrial stress, reducing the activation and expression of Bax and caspase 3. LANCL2 assists in glucose uptake in muscle and other metabolic tissues, promoting translocation of GLUT4 and glycogen synthetase activity, which can aid in glucose homeostasis in situations of low insulin production.

Plasma concentration of the natural LANCL2 ligand, ABA, is decreased in diabetes, removing an endogenous compound that contributes to insulin sensitivity and glucose uptake. ABA can be produced in the central nervous system and pancreas, among other locations. Metabolic benefits of the LANCL2 signaling axis are observed in hepatocytes, adipocytes and myocytes through uptake and oxidation of glucose to improve the systemic glucose homeostasis. LANCL2 activation may alleviate pancreatic stress in early disease and assist with glucose control in late disease. We believe BT-111 may be used in type 1 diabetes to:

- **Provide anti-inflammatory effects.** Increased number of IL-10-producing cells during the short window post-diagnosis is associated with better blood glucose control. Similarly, type 1 diabetes patients with lower IFN γ production were more likely to exhibit an extended post-diagnosis remission in β cell loss. LANCL2 activation has been shown to increase the ratio of IL-10 CD4 $^+$ T cells to IFN γ CD4 $^+$ T cells.
- **Preserve β cell functions.** BT-111 maintains β cell mass in a NOD mouse model and reduces apoptosis of human islet cells in response to oxidative and inflammatory stress *in vitro*.
- **Normalize post-prandial spikes in blood glucose.** Type 1 diabetes patients experience prolonged elevations in blood glucose after meals and overall non-physiological trends. The activation of LANCL2 may assist in insulin-independent glucose uptake and energy storage that would provide greater control of blood glucose regulation.

Preclinical GLP toxicology

We intend to initiate GLP IND-enabling studies for BT-111 in the first half of 2021.

Clinical development plan

We intend to initiate a safety and tolerability study of BT-111 in normal healthy volunteers in the second half of 2021.

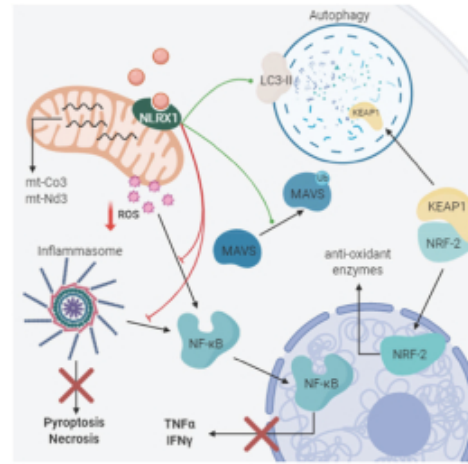
Our NLRX1 pathway product candidates

The NLRX1 pathway

The NLRX1 pathway addresses the immunometabolic interface from a different angle than the LANCL2 pathway. As a mitochondrial associated receptor, NLRX1 is favorably positioned to induce both metabolic and immunological effects. NLRX1 is unique among its family of receptors as one of three out of 23 NLRs to primarily induce regulatory and anti-inflammatory effects. The most commonly studied NLRs are those associated with the inflammasome, a complex whose activation results in high levels of cytokine production and cell death that increases inflammation. An overactive inflammasome and polymorphisms in inflammasome associated NLRs, such as NLRP1 and NLRP3, are commonly identified in autoimmune and chronic inflammatory diseases. NLRX1 is the natural counterbalance to this process, serving to control and negatively regulate many of the processes induced by inflammasome activation. NLRX1 serves as a key regulatory molecule permitting oxidative metabolism without the generation of inflammatory responses to the resultant by-products. Through effects on c-Abl and Nrf2, NLRX1 activates expression of enzymes to increase intracellular antioxidant capacity. The downregulation of intracellular reactive oxygen species and lactate production decreases NF- κ B activity, a main signaling element upstream of many inflammatory cytokines. As a result, NLRX1 activation decreases a wide range of cytokines, including ones of CD4 $^+$ T cell origin as well as ones of myeloid origin.

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- **NX-13 multi-modal mechanism of action by activating the NLRX1 pathway**
 - Decrease cellular reactive oxygen species
 - Antagonism of NF- κ B activation resulting in downregulation of myeloid cell and T cell derived cytokines like TNF and IFN γ
 - Decreased inflammasome formation (NLRP1 and NLRP3)
 - Decreased differentiation of effector CD4+ T cells.
- **NLRX1 activation in intestinal epithelial cells increases mitochondrial metabolism and prevent oxidative stress.**
 - Favors cell survival, the maintenance of barrier integrity and the expression of tight junction proteins.



At the cellular level, NLRX1 activation results in shifts in the balance in CD4+ T cell subsets, decreased activation of macrophages and decreased stress-induced cell death for epithelial and other specialized cells. The decrease in lactate production and NF- κ B activity results in proportionally higher Treg cells relative to Th17 cells with NLRX1 activation. Similarly, NF- κ B is a main molecule that signals the polarization of macrophages into inflammatory subsets as opposed to those associated with tissue repair and homeostasis. In macrophages, NLRX1-associated ubiquitination of mitochondrial antiviral-signaling protein (MAVS) is thought to contribute to decreased activation. In intestinal epithelial cells, airway epithelial cells and neurons, NLRX1 activation increases mitochondrial metabolism and prevents oxidative stress. These effects are beneficial to functions of these cell types, including cell survival, the maintenance of barrier integrity and expression of tight junction proteins. In addition, the added metabolic support decreases the likelihood that a cell will exacerbate inflammation during cell death. By favoring apoptosis, a relatively silent form of cell death, NLRX1 can aid in the tissue homeostasis and repair process to prevent chronic tissue damage and fibrosis.

Our development pipeline of NLRX1-targeting product candidates has a preliminary focus on autoimmune and inflammatory diseases most closely associated with altered inflammasome activation. We are currently developing three product candidates targeting the NLRX1 pathway: NX-13, NX-66 and NX-73. Further, we believe the development of NLRX1 ligands for IBD, CNS disorders, including MS, and respiratory disorders including asthma is supported by specific preclinical and translational target validation.

NX-13, an oral NLRX1 agonist for the treatment of UC and CD

Overview

NX-13 is an orally active small molecule product candidate that targets NLRX1, a negative regulatory NOD-like receptor. NX-13 is the first product candidate to target NLRX1. We have completed a Phase 1 clinical trial for NX-13 in normal healthy volunteers.

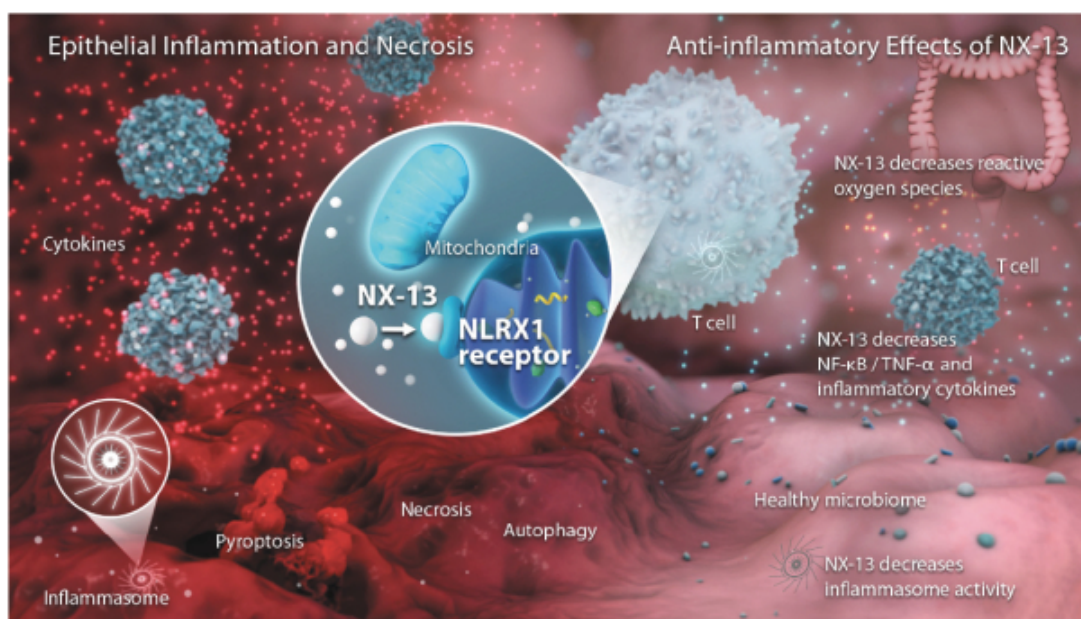
Our solution for treatment of UC

Due to the involvement of microbial and dietary factors in the onset and progression of UC, many pattern-recognition receptors, which are part of the environmental surveillance system by detecting bacterial and food

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components, have been implicated in the pathogenesis of UC. Unlike many of its family members, NLRX1 has neither well-characterized and prominent genetic mutations nor inflammatory effects. Out of 23 human NLRs, three are categorized as regulatory NLRs, of which NLRX1 is one. While NLRX1 interacts with many of the same downstream signaling elements as other NLRs, NLRX1 serves to control and mitigate these responses rather than activate them. This includes control of reactive oxygen species (ROS) and NF- κ B signaling, leading to a downstream decrease in TNF- α , IL-6, and IFN- γ production and a lessening of mucosal inflammation. Mechanistically, the activation of NLRX1 could have a 3-fold benefit in UC with the ability to modulate epithelial integrity, host-microbiome interactions, and mucosal immune responses. As such, we believe NX-13 could provide significant benefits compared to current therapeutics for UC.

NX-13 is designed to target NLRX1 and provide therapeutic efficacy by inducing anti-inflammatory effects in CD4+ T cells and other immune cells of the gastrointestinal (GI) tract. NLRX1 was identified as an immunometabolic therapeutic target based on loss of function characterization in animal models of IBD in which the loss of NLRX1 increased disease severity and histological lesions, altered CD4+ T cell differentiation, disrupted epithelial barrier integrity, and influenced gut microbial populations. Through the immunometabolic actions of NLRX1 leading to increased oxidative phosphorylation and decreased NF- κ B activity in CD4+ T helper (Th) cells, NX-13 inhibits the differentiation of Th1 and Th17 subsets and overall immune activation. NX-13 is a gut-restricted compound with minimal systemic absorption observed in preliminary pharmacokinetic studies in rats. This allows for oral activity in the gastrointestinal tract.

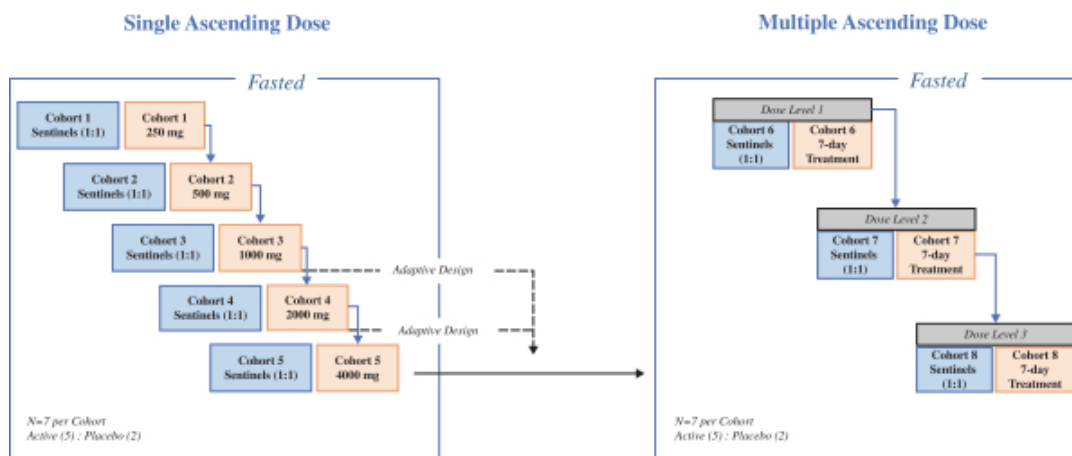


As a once-daily, oral, gut-restricted molecule, we believe NX-13 has a promising target product profile for the treatment of UC. Early nonclinical and clinical studies of NX-13 have not revealed any dose-limiting toxicities. In preclinical comparative efficacy studies to 5-ASA, anti-TNF, and tofacitinib, we have observed significantly greater changes in disease activity, biomarkers and histological parameters with NX-13. We believe that through NLRX1 activation, NX-13, if approved, may offer the potential for an independent or complementary approach to address the limited efficacy observed in UC with current options.

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Clinical development plan

In July 2020, we initiated dosing in a Phase 1 clinical trial of NX-13 in normal healthy volunteers. This study is a randomized, double-blind, placebo-controlled single and multiple ascending dose study to evaluate the safety, tolerability and PK of oral NX-13. The primary objective of the study is to assess the safety and tolerability of single and seven-day repeat oral doses of NX-13. Safety and tolerability endpoints will include changes from baseline in biochemistry, hematology, urinalysis, and ECG parameters, vital signs and frequency and severity of AEs. The secondary objective of the study is to assess the PK of NX-13 following administration of single and seven-day repeat oral doses. Plasma PK will be obtained to assess systemic exposure. Stool concentrations of NX-13 will be measured for local PK to inform doses carried forward into future UC patient studies. The graphic below depicts the design of the Phase 1 clinical trial.



The single ascending dose arm will consist of 35 healthy volunteers in a total of five cohorts (250 to 4,000 mg). Each cohort will enroll seven participants with five participants randomized to receive NX-13 and two participants randomized to receive placebo. The multiple ascending dose arm will consist of 21 healthy volunteers enrolled in a total of three cohorts. Each cohort will have seven participants with five participants randomized to receive NX-13 and two participants randomized to receive placebo. NX-13 will be administered by oral tablet.

Preclinical results

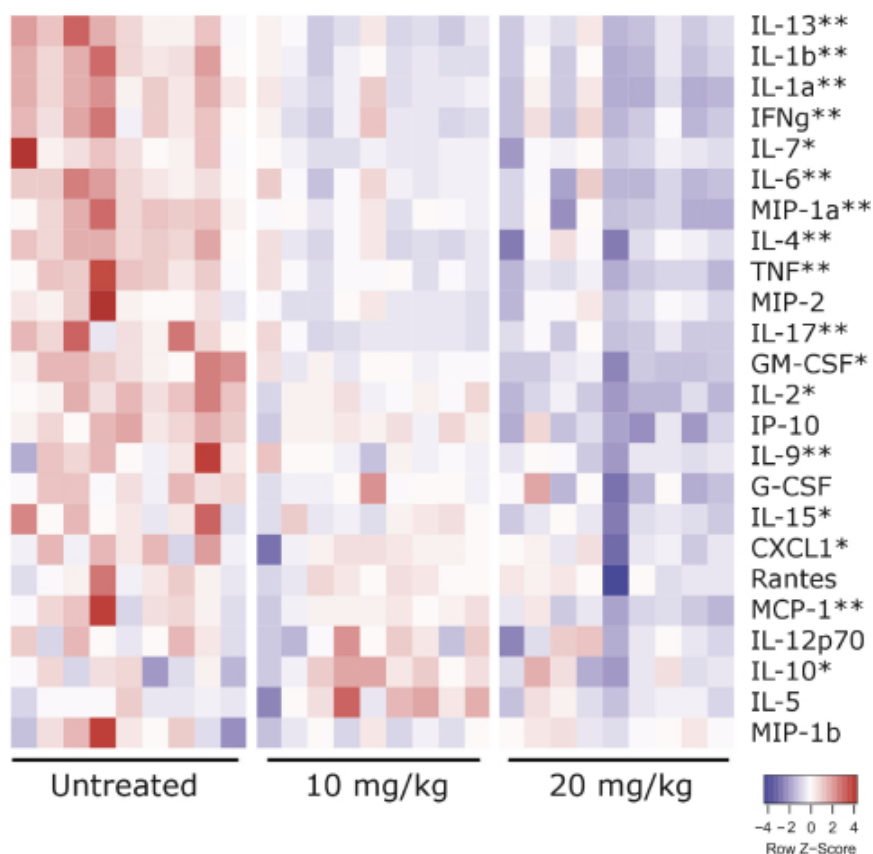
NX-13 was evaluated in three mouse models of IBD to represent chemical, cellular and genetic methods of disease induction. NX-13 was administered orally at doses of 20 mg/kg in DSS and Mdr1a^{-/-} and 10 mg/kg in adoptive transfer. Disease activity index, colonic leukocytic infiltration, lamina propria neutrophils and colonic TNF expression were used as endpoints.

Efficacy of NX-13 in three mouse models

Model	Reduction in final DAI relative to vehicle	Reduction in leukocytic infiltration relative to vehicle	Reduction in neutrophils relative to vehicle	Reduction in <i>Tnf</i> expression relative to vehicle
DSS (n = 9)	55%*	76%*	70%*	59%*
Adoptive transfer (n = 9)	72%*	52%*	60%*	79%*
Mdr1a^{-/-} (n = 9)	68%*	73%*	60%*	85%*

* $P \leq 0.05$

In the Mdr1a^{-/-} model, concentrations of 24 cytokines were tested after six weeks of treatment with NX-13 at 10 or 20 mg/kg and compared to vehicle, NX-13 untreated, mice. Numerous inflammatory cytokines were observed to be significantly reduced including those tied to CD4⁺ T cell responses (IFN γ , IL-17, TNF α , IL-4) as well as ones of myeloid origin (IL-6, IL-1 β , TNF α , MIP1a, MCP1).



Normalized concentrations of cytokines in the colon of Mdr1a^{-/-} mice after six weeks of NX-13 treatment (0, 10, 20 mg/kg) (n = 9, * $P \leq 0.05$ for high dose only, ** $P \leq 0.05$ for low and high dose relative to vehicle).

The efficacy of NX-13 (10 mg/kg, oral) was compared to anti-TNF (2 mg/kg, iv), 5-ASA (oral, 25 mg/kg), and tofacitinib (oral, 30 mg/kg) in DSS and Mdr1a^{-/-} mice. NX-13 treatment resulted in an 86% reduction in fecal

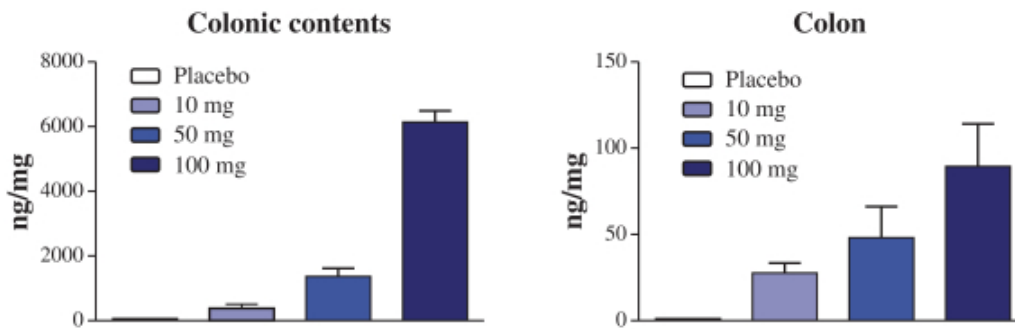
calprotectin, a 64% reduction in Th1 cells, and a 64% reduction in leukocytic infiltration. The reductions observed with NX-13 were 1.5-fold to 2.5-fold greater than those observed with anti-TNF and tofacitinib.

Comparative efficacy of NX-13 to current IBD therapeutics

Treatment	Change in calprotectin relative to vehicle	Change in lamina propria Th1 cells relative to vehicle	Change in leukocytic infiltration relative to vehicle	Treatment	Change in calprotectin relative to vehicle
NX-13	-86%*	-64%*	-64%*	NX-13	-86%*
anti-TNF	-32%*	-13%	-26%	anti-TNF	-32%*
tofacitinib	-26%*	-39%*	-45%*	tofacitinib	-26%*
mesalamine	+9%	-5%	-5%	mesalamine	+9%

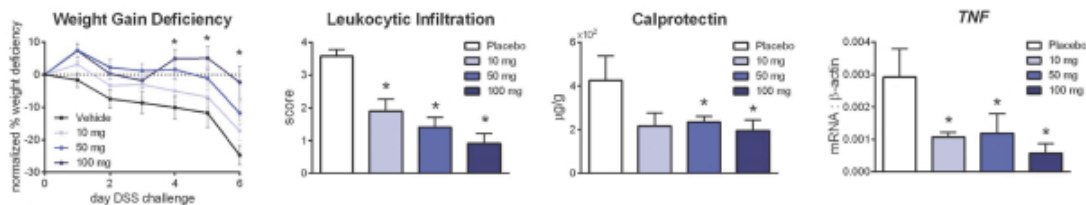
* P ≤ 0.05

We have tested the ability of NX-13 to reach the distal colon in high quantities after oral dosing in mice, rats and pigs. In pigs, which have a highly similar gastrointestinal tract to humans and an approximate 1:1 equivalent dosing ratio, NX-13 was observed at a concentration of over 6,000 ng/mg in colonic stool at 24 hours after oral dosing with 100 mg tablets. In our preclinical studies, one-seventieth of the colonic content NX-13 penetrated through the epithelial barrier. Dose-dependent concentrations are observed in both stool and tissue.



Colonic content (stool) and colonic tissue concentrations of NX-13 24 hours after oral dosing of pigs with immediate release tablets (10, 50, 100 mg) (n = 4).

The efficacy of NX-13 in pigs with DSS colitis was evaluated to colonic concentrations of NX-13 with efficacy markers. Oral NX-13 tablets protected against weight gain deficiency in a dose-dependent manner. The 100 mg dose of NX-13 resulted in a 74% reduction in leukocytic infiltration, a 54% reduction in fecal calprotectin and an 80% reduction in TNF expression relative to placebo. We also observed significant reductions in all three parameters at a 50 mg dose. Leukocytic infiltration and TNF expression were significantly reduced at a 10 mg dose. When compared to the local GI PK concentrations of NX-13, colonic concentrations greater than 45 ng/mg appear sufficient to induce response in all parameters. Additional magnitude of response can be achieved with concentrations greater than 85 ng/mg.

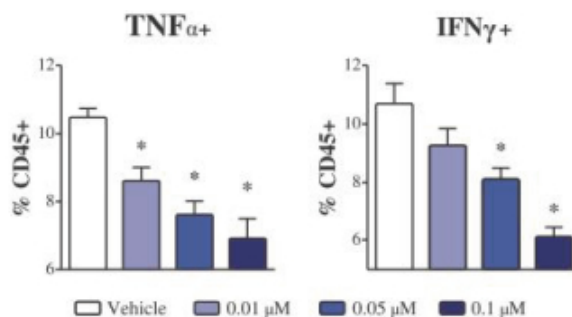


Reduction of weight gain deficiency, leukocytic infiltration, fecal calprotectin, and colonic TNF expression in pigs challenged with DSS for 7 days and treated with oral NX-

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13 tablets (10, 50, 100 mg) daily (n = 6, P £ 0.05).

In PBMCs from moderate to severe UC patients (n = 6), NX-13 significantly reduces TNF α + cells down with a 0.01 μ M dose and IFN γ + cells down with a 0.05 μ M dose.



Reduction of TNF α + and IFN γ + in peripheral blood mononuclear cells from UC patients with ex vivo treatment of NX-13 (0.01, 0.05, 0.1 μ M) after stimulation with PMA/ionomycin for 6 hours (n = 6, P £ 0.05).

Preclinical GLP toxicology results

NX-13 has completed IND-enabling studies and cleared 2 INDs plus initiated Phase 1 testing.

In rats, we evaluated doses of 250, 500, and 1,000 mg/kg/day in a 28-day GLP repeat-dose toxicity study. The NOAEL of NX-13 in rats was 1,000 mg/kg with no treatment-related AEs or clinical observations at any of the tested dose levels. No mortality or noteworthy findings were recorded. No differences in food consumption, ophthalmology, gross pathology, hematology, serum chemistry or histopathology were observed at the 1,000 mg/kg dose level compared to the control, and this dose level was the NOAEL.

In the 28-day repeat dose GLP toxicity study in dogs at 125, 250 and 500 mg/kg, no treatment-related ocular abnormalities, cardiovascular effects, clinical chemistry, hematology, coagulation, urinalysis, gross or microscopic findings were seen in either sex during the week 4 examinations and necropsy. No clinical signs were considered evidence of systemic toxicity. The NOAEL of NX-13 in dogs was 500 mg/kg.

Oral NX-13 displayed no signs of disruption of organ system function in *in vivo* evaluation of respiratory, cardiovascular and central nervous system function in GLP safety pharmacology studies up to tested limit doses. NX-13 did not show mutagenic potential in Ames, chromosomal aberration or micronucleus tests up to non-precipitating dose levels *in vitro* and 2,000 mg/kg *in vivo*.

Our solution for treatment of CD

NX-13 is an oral small molecule therapeutic targeting the NLRX1 pathway, a novel mechanism of action. The activation of NLRX1 is effective at inducing responses in CD4+ T cells, intestinal epithelial cells and myeloid cells. These responses are designed to result in a downregulation of multiple CD-associated cytokines (TNF, IL-1 β , Th1 cytokines), improved tolerance to the microbiome and reduced levels of oxidative stress. We believe NX-13, if approved, may address the unmet need for additional therapies in the treatment of CD based on the following observed characteristics:

- **Well-tolerated**, with no dose-limiting toxicities identified to-date.
- **Oral**, once-daily tablet.
- **Greater preclinical efficacy** than current therapeutics with robust validation in multiple models.

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In addition to the robust immunological changes induced by NLRX1 activation, NX-13 may also improve fibrosis, a key therapeutic gap in CD. Central to the fibrosis onset is the elevation of reactive oxygen species, which increases TGF- β signaling, increases myofibroblast proliferation and induces epithelial-to-mesenchymal transition. NX-13 reduces ROS through an induction of antioxidant enzymes including glutathione peroxidase and thioredoxin reductase. The loss of NLRX1 has been shown to reduce markers of autophagy, including LC3-II and ATG16L1, in models of IBD. A SNP ATG16L1, well-correlated to an increased risk of CD, results in an active protein that is more susceptible to mitochondrial stress-induced degradation. Therefore, increased NLRX1 activity, which decreases mitochondrial and oxidative stress, could increase autophagy in CD by enabling stabilization of ATG16L1. Through this autophagy mechanism, NLRX1 further supports intestinal redox balance to promote tissue repair over fibrosis.

Clinical development plan

We are currently conducting a Phase 1 clinical trial of NX-13 in normal healthy volunteers. Following completion of this trial, we expect to initiate a Phase 2 proof-of-concept trial evaluating NX-13 in CD in the second half of 2022.

Preclinical results

Many of the preclinical models of CD are shared with that of UC. Data on three mouse models and a pig model of IBD are presented above. The adoptive transfer model develops ileitis in addition to colitis and would be considered to be the most relevant of the three models to CD.

Preclinical GLP toxicology results

Preclinically, pivotal repeat-dose studies in rats up to tested dose limits (1,000 mg/kg) for 28 days and dogs up to tested dose limits (500 mg/kg) for 28 days have resulted in no identified dose-limiting toxicities to date.

NX-66 for the treatment of multiple sclerosis

Overview

NX-66 is an oral, small molecule agonist of the NLRX1 pathway that we are developing for the treatment of MS. NLRX1 is a non-inflammasome-forming mitochondrial-associated NLR, expressed by immune cells systemically and in the CNS, that down-regulates inflammation in injury and autoimmune diseases, including models of experimental autoimmune encephalomyelitis, or EAE, colitis, and brain injury. Progressive MS presents with cortical lesions comprised of activated microglia and an overall increase in microglia in the brain. These microglia, as well as IL-12- and TNF-producing dendritic cells, contribute to direct neuronal damage as well as the ongoing demyelination that disrupts axonal architecture. In active EAE (direct immunization), passive EAE (adoptive transfer), and spontaneous EAE (2D2 mice), the loss of NLRX1 results in worsening of disease, greater microglial activation, and increased prevalence of spinal cord lesions. We intend to submit an IND for NX-66 in the second half of 2021.

Background on multiple sclerosis and current treatments

Multiple sclerosis is a chronic inflammatory, demyelinating and neurodegenerative disorder of the central nervous system. The initial diagnosis of multiple sclerosis is frequently characterized by episodes of neurological disturbances followed with residual deficits or full recovery (relapsing-remitting multiple sclerosis) and in a minority by a slow accumulation of disability from the onset (primary progressive multiple sclerosis).

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Multiple sclerosis affects over 700,000 patients in the United States and over 2 million people worldwide. Multiple sclerosis results in decreased quality of life, with cognitive deficiencies reported in over 70% of patients and 42% of patients requiring informal caregiving from their families, according to the National Multiple Sclerosis Society. The global market for multiple sclerosis is currently over \$20 billion per year and is expected to grow at a compound annual growth rate of 2.8% per year through 2022.

Relapsing-remitting multiple sclerosis is a fragmented market with all classes of therapies clustered around the similar efficacy profiles with 20% to 37% no evidence of disease activity rates, and patients with average age over 40 experience on average 25% or less inhibition of disability progression. In contrast, very few treatment options for progressive multiple sclerosis exist. The most recent approval for progressive multiple sclerosis, ocrelizumab, reported less than a 7% effect size relative to placebo in Phase 3 studies. Current therapeutics for MS are clustered into six main classes:

- **Interferon betas** were the first class of disease modifying therapeutics in multiple sclerosis and are believed to function through reduction of antigen presentation and CD4+ T cell proliferation. Clinical trials of interferon beta have shown no evidence of disease activity rate of approximately 20% of treated patients and have inhibited disability progression by 5% to 40%.
- **Biologics** (alemtuzumab, natalizumab, ocrelizumab) for multiple sclerosis function through diverse mechanisms of action and are generally used in individuals who did not respond to other treatments. Mechanisms include lymphocyte maturation, lymphocyte trafficking and B cell depletion.
- **Immuno-modulators** (DMF, teriflunomide) comprise a large portion of the multiple sclerosis market, including DMF, which had the highest sales among multiple sclerosis therapeutics in the United States in 2019. The two main drug within this class, DMF and teriflunomide, are weakly immunometabolic by mechanism of action. DMF increases Nrf2 while teriflunomide reduces T cell proliferation by targeting a mitochondrial enzyme.
- **Glatiramer acetate** is a synthetic analogue of a main antigen in multiple sclerosis that functions through an inhibition of myelin-reactive T cells. While Copaxone, a glatiramer acetate, was the market-leading multiple sclerosis therapy in 2016, as of 2019 it sits outside of the top five brands for relapsing-remitting multiple sclerosis, with an approximate 7% market share.
- **Anti-trafficking agents** (fingolimod) are among the newest therapies in multiple sclerosis and generally target S1P receptors to block the migration of lymphocytes.
- **Corticosteroids** (methylprednisolone, dexamethasone) are commonly administered in multiple sclerosis intravenously in high doses over the period of three to five days in response to a disease flare. Efficacy in shortening disease flare is generally recognized.

Limitations of these disease-modifying therapies include:

- **Safety concerns.** The profile of adverse effects of current therapeutics in multiple sclerosis is similar to those experienced in other autoimmune indications. Biologics used for multiple sclerosis increased the risk of infections and progressive multifocal leukoencephalopathy. Steroids and immuno-modulators result in liver toxicities and suppressed white and red blood cell counts. Anti-trafficking agents have been associated with cardiovascular complications and macular edema. With therapeutics that require chronic use, significant room for improvement is present in regards to safety.
- **Limited efficacy and loss of response.** Across clinical trials of current therapeutics in relapsing-remitting multiple sclerosis, the rate of no evidence of disease activity has been observed to be 20% to 37% and patients with average age over 40 have experienced on average 25% or less inhibition of disability

progression. The most recent approval for progressive multiple sclerosis was ocrelizumab, which offers less than a 7% effect size relative to placebo in 12-week disability progression.

- **Disability progression.** Current therapeutics range from 10% to 45% of inhibition of disability progression. As the majority of therapeutics are focused entirely on changing the immune response, limited effects on the underlying pathways of neurodegeneration are addressed. Progressive forms of MS have an altered immunological profile relative to relapse-remitting multiple sclerosis, with innate immune responses predominating. Most multiple sclerosis therapeutics target the adaptive immune system to suppress flares.
- **Corticosteroid dependence.** High-dose corticosteroids have short-term benefit in the resolution of disease flares. Chronic dependence on high-dose corticosteroids, even in pulses has been associated with cognitive deficiencies, depression, and remyelination and repair. Use in multiple sclerosis may be detrimental to long-term health. In neurological injuries and animal models of EAE, high-dose corticosteroids were associated with exacerbation of neuronal damage.

Our solution for the treatment of multiple sclerosis

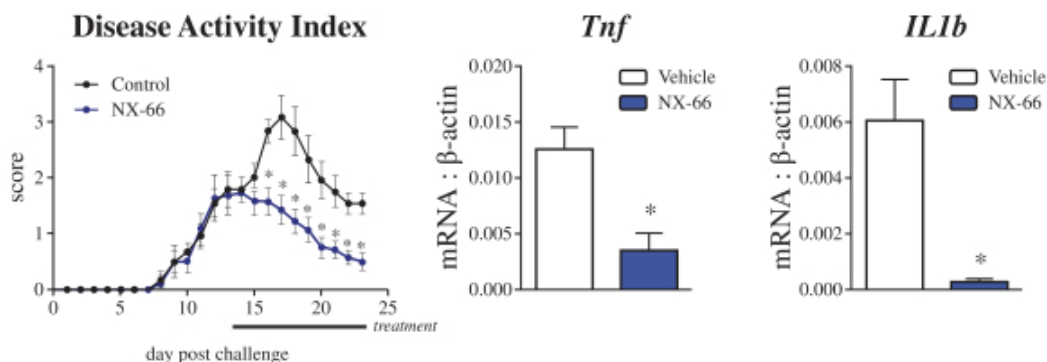
We believe the NX-66, through a differentiated NLRX1 pathway, if approved, may offer a competitive advantage relative to current therapies given its potential to address neurodegeneration and disease progression. NLRX1 is one of three regulatory NOD-like receptors (NLRs), in an overall family of 23 NLRs. Genetic abnormalities in NLR genes are linked to MS pathology, such as the Q705K polymorphism resulting in an overactive NLRP3 inflammasome and multiple mutations in NLRP1. NLRX1 is uniquely positioned as the natural counterbalance to these inflammatory NLRs that are overactive in multiple sclerosis. Preclinically, there is abundant evidence for the potency of NLRX1 in EAE through loss of function studies. In active (MOG immunization), passive (adoptive transfer) and spontaneous (2D2) models of EAE, the loss of NLRX1 leads to greater disease activity scores, increased number and severity of spinal cord lesions, and greater microglia activation. Additionally, NLRX1 contributes to the prevention of neurodegeneration through promoting controlled apoptosis over necrosis and pyroptosis, and regulating oxidative stress. Thus, we believe NLRX1 may aid in progressive forms of multiple sclerosis and address the therapeutic in multiple sclerosis based on the following observed characteristics:

- **Tolerability.** Preclinically, NLRX1 activation has not resulted in any dose-limiting toxicities in the study of NX-13 or NX-66. Mechanistically, NX-66 profiles most similarly to DMF out of current therapeutics. Importantly, DMF is often the choice of therapy when lack of side effects is a main point of concern by clinicians and patients.
- **Efficacy and loss of response.** NLRX1 bridges innate and adaptive immune pathways, unlike other therapeutics. Progressive forms of MS have a notably different immune profile in the CNS, with an increased importance for microglia over CD4+ T cells in comparison to relapsing-remitting forms. NLRX1 is able to modulate both arms with effects directly on CD4+ T cells, through a down-regulation of Th1 and Th17 phenotypes, and microglia, through a promotion of repair pathways. We believe the ability to modulate both aspects of the disease course in multiple sclerosis may alleviate damage accrual.
- **Disability progression.** We believe NLRX1 has the potential to directly prevent neuronal damage through control of oxidative stress and mitochondrial dysfunction in neurons, as well as promote apoptosis over necrosis. Disability progression results from an inability to remyelinate neurons and an imbalance in neuronal maintenance toward cell death. Limited therapies exist to address neuronal stress outside of immunomodulation.
- **Corticosteroid dependence.** Providing an orally-active therapeutic for multiple sclerosis with limited side effects may enable greater patient adherence, earlier treatment with potent therapy, and an alternative

mechanism for non-responders to current therapies. Combined, we believe these three items could decrease the use of corticosteroids.

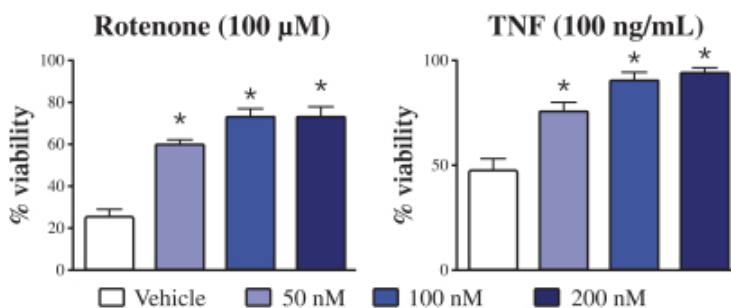
Preclinical results

Therapeutic dosing of oral NX-66 (20 mg/kg), between days 14 and 23 post-challenge, ameliorated disease severity in a MOG-induced model of EAE. NX-66 provided a greater than 50% reduction in disease activity four days after the initiation of treatment (n = 10, P £ 0.05). NX-66 treatment decreased Tnf and IL1b expression in the spinal cords of EAE mice.



Disease activity index in a MOG35-55 induced EAE model. Treatment with NX-66 (20 mg/kg, oral) was initiated at day 14 post-challenge and continued until day 23. TNF and IL-1b expression in the spinal cords of mice on day 23 (n = 10, P £ 0.05).

NX-66 exerts neuroprotective effects in N2A cells. In an MTT assay of viability, NX-66 treatment prevents loss of viability and cell damage in response to rotenone, an inducer of reactive oxygen species, and TNF.



Prevention of cell death in N2A cells stimulated with rotenone (100 µM) or TNF (100 ng/mL) by NX-66 (50, 100, 200 nM). Asterisks mark significance relative to vehicle (n = 9, P £ 0.05).

Preclinical GLP toxicology

NX-66 will be tested in a seven-day dose range-finding study in rats up to doses of 1,000 mg/kg in the second half of 2020. PK studies testing the bioavailability and profile of NX-66 in rats in the therapeutic window (1-20 mg/kg) will be conducted in the first half of 2021. GLP 28-day repeat dose toxicity studies in rats and dogs will be initiated in the second quarter of 2021.

Clinical development plan

Following an expected submission of an IND in the second half of 2021, we intend to initiate a Phase 1 clinical trial in normal healthy volunteers thereafter in the second half of 2021. This study will feature a standard single

ascending dose/multiple ascending dose design testing a dose range 5-fold to 10-fold greater than projected therapeutic dose. The primary objective of the study will be to assess the safety and tolerability of NX-66 by frequency and severity of AEs, standard safety laboratory results, ECG and vital signs. The secondary objective will be to assess the PK of NX-66 in humans within blood and the CSF.

NX-66 for the treatment of Alzheimer's disease

Overview

We are also developing NX-66, a small molecule product candidate targeting the NLRX1 pathway, for the treatment of Alzheimer's disease. NLRX1 activation can protect neurons from oxidative stress and ameliorate CNS inflammation. We believe NX-66 may represent a novel approach to addressing an unmet clinical need in Alzheimer's disease, for which no current therapy slows the progression of cognitive decline and neurological damage. The primary driver of NX-66's development in Alzheimer's disease is this unmet need, promising preclinical data and mechanistic alignment with the immunometabolic dysfunction present in disease. We intend to submit an IND for NX-66 in the second half of 2021.

Background on Alzheimer's disease and current treatments

Alzheimer's disease is an inflammatory and neurodegenerative disease that causes dementia. Alzheimer's disease is a progressive disorder beginning with mild cognitive impairment and slight memory loss progressing into difficulty with everyday tasks and further into requirement of 24-hour care. Alzheimer's disease affects up to 7 million patients in the United States with an estimated half million new cases diagnosed each year. With an expanding elderly population, the global therapeutics market for Alzheimer's disease is estimated to be \$12.9 billion by 2028 and is projected to have a compound annual growth rate of 19.3% between 2018 and 2028. With decreased quality of life and high home and hospice care costs, the total health care cost related to Alzheimer's disease is estimated to be over \$300 billion.

No current treatment for Alzheimer's disease has been proven to slow the damage of neurons that is associated with cognitive decline. Four drugs are currently approved for the treatment of Alzheimer's disease:

- **Galantamine** is an acetylcholinesterase inhibitor that targets amelioration of cholinergic deficiency. Galantamine can be isolated as a natural product and is generally used in the treatment of mild to moderate cases with reported effects on slight improvements in cognitive function and memory.
- **Donepezil** is a cholinesterase inhibitor with primary mechanism of action tied to reversing the cholinergic deficiency present in Alzheimer's disease. Donepezil provides a slight improvement in cognitive function without an effect on progression of disease.
- **Rivastigmine** is an additional cholinesterase inhibitor that is used in the treatment of mild to moderate Alzheimer's disease. As with other members of this drug class, its efficacy in the treatment of Alzheimer's disease is primarily tied to symptomatic relief.
- **Memantine** is a NMDA receptor antagonist that blocks excessive stimulation of neurons. Clinical trials of memantine resulted in no behavioral or neurological improvement, but a significant functional improvement, particularly in Severe Impairment Battery. Memantine and donepezil are also approved for use in combination.

All four approved drugs provide symptomatic relief by targeting neurological signaling. Recent failures in clinical development in Alzheimer's disease have largely focused on the plaques and tangles associated with disease. Mechanistically, limited late-stage clinical development of anti-inflammatory therapies has been

conducted. Microglial activation has been linked to amyloid and tau pathologies and can contribute to neuronal cell death. Inflammation is also highly linked to metabolism with dysregulation of lipids and glucose resulting from chronic activation. Defects in cholesterol biosynthetic pathways are main genetic risk factors for Alzheimer's disease. The brain during Alzheimer's disease experiences many of the same deficiencies in glycemic control present in type 1 diabetes. The combined inflammatory, metabolic and oxidative stress results in a poor environment for restoring cognitive function.

Our solution for the treatment of Alzheimer's disease

We believe NX-66, through a differentiated NLRX1 pathway, if approved, may offer a competitive advantage relative to current therapies given its immunometabolic pathway and potential to address neurodegeneration and disease progression. The immunopathology of Alzheimer's disease shares common elements with progressive forms of multiple sclerosis, including overactivation of the inflammasome and the central nature of immunometabolism in the interaction between neurons and immune cells. The inflammasome contributes to the overproduction of IL-1 β and other inflammatory cytokines in response to the amyloids and fatty acids that accumulate in the central nervous system with age. Meanwhile, loss of NLRP3 protects against dementia in the APP/PS1 model and other models of Alzheimer's disease. Aside from proteins directly linked to amyloid deposition, APP and PSEN1, many of the recently identified genetic variants associated with Alzheimer's disease are rare receptors, such as ABCA7 or TREM2, which contribute to ATP levels and lipid homeostasis. NLRX1 activation can counteract both inflammasome activation and diminished cellular ATP.

In models of brain injury, loss of NLRX1 worsens disease pathology, increasing oxidative stress and promoting metabolic dysfunction. Activation of NLRX1 in vitro protects against cell death in the context of inflammatory and oxidative injury.

Preclinical GLP toxicology

We intend to initiate GLP IND-enabling studies for NX-66 in the first half of 2021.

Clinical development plan

We intend to initiate a safety and tolerability study for NX-66 in normal healthy volunteers in the second half of 2021.

NX-73 for the treatment of asthma

Overview

NX-73 is a small molecule product candidate that targets NLRX1 that we are developing for the treatment of Asthma. NLRX1 is a mitochondria-associated receptor involved in down-regulating inflammation during bacterial and viral exposure, colitis, multiple sclerosis and chronic pulmonary disease. Asthma encompasses a wide range of allergic and inflammatory diseases. Severe sub-types of asthma, including both neutrophilic and eosinophilic manifestations, lack effective treatment methods. We believe that NX-73, if approved, has the potential to improve on the current treatment options through the potential to resolve neutrophil inflammation, improve pulmonary function and reverse underlying fibrosis. We intend to submit an IND for NX-73 in the second half of 2023.

Background on asthma and current treatments

Over 25 million patients in the United States have asthma, representing a \$14 billion annual therapeutic market that is expected to grow at a compound annual growth rate of 4% from 2019 to 2022. Multiple subtypes of

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asthma exist. Immunologically, these subtypes are dominated by a classification into type 2 and non-type 2. While most individuals with type 2 asthma will experience moderate response to standard treatments including corticosteroids, non-type 2 asthma, dominated by neutrophilic disease, is often refractory to these medications and results in severe, untreated disease in 10% to 15% of patients. The disease results in self-perpetuating disease in which airway epithelial cells are damaged and recruit neutrophils that chronically infiltrate the lung and contribute to epithelial cell damage. Limitations of current therapies for the treatment of asthma include:

- **Failure to resolve neutrophilic inflammation.** Corticosteroids, the main treatment for asthma, have been shown to promote the survival of neutrophils. Recent biologics and other treatments in development for severe eosinophilic asthma are focused on modulating Th2 and eosinophilic responses that leave Th17 and neutrophil inflammation unaffected.
- **Incompletely reversible airway obstruction.** Neutrophilic asthma is associated with chronic airway obstruction requiring frequent intervention and severe health complications. This suggests that structural or fibrotic changes may be present that are not addressed with current therapies.
- **Refractory patients.** Neutrophilic disease results in a greater likelihood that a patient will be refractory to current treatment. Refractory asthma patients tend to present with higher neutrophil counts. The noneosinophilic, or neutrophilic, asthma population is roughly half of the overall asthma population.

Our solution for the treatment of asthma

Neutrophilic asthma is commonly associated with occupational and environmental molecules and is likely caused by unresolving neutrophil infiltration resulting from deregulated repair of the epithelium. NLRX1 is a receptor expressed both within pulmonary immune cells and airway epithelial cells. NLRX1 is responsible for maintaining mitochondrial metabolism in airway epithelial cells and preventing oxidative stress-induced cell death. In the absence of NLRX1, airway epithelial cells produce higher levels of neutrophil chemoattractants, such as IL-8, and Th17 polarizing cytokines, such as IL-6, in response to DAMPs and PAMPs. Immunologically, NLRX1 has been associated with altered responses to viral and fungal diseases of the lung. In both cases, NLRX1 was observed to be beneficial, lessening the severity of disease through the innate immune system. We believe NX-73, if approved, may address an unmet clinical need in refractory neutrophilic asthma by:

- **Resolving neutrophil inflammation.** NLRX1 activation reduces IL-8 and other neutrophil chemoattractants in airway epithelial cells. NLRX1 is a potent controller of CD4+ T cell differentiation through the downregulation of Th17 cells by inhibition of LDH. Both factors can decrease the recruitment of neutrophils to the lungs.
- **Improving epithelial cell health.** Neutrophils can contribute to the death of epithelial cells through oxidative stress and metabolic dysfunction. NLRX1 activation increases the expression of antioxidant enzymes and also maintains mitochondrial metabolism. The restoration of the epithelial barrier integrity will improve pulmonary function.
- **Reversing underlying fibrosis.** Pulmonary fibrosis may contribute to the inability to completely reverse airway obstruction. By resolving the neutrophil inflammation and decreasing TNF production, the activation and proliferation of fibroblasts will decrease, which can contribute to the improvement of fibrosis.

Preclinical GLP toxicology

We intend to initiate a seven-day dose range finding study of NX-73 in rats up to doses of 1000 mg/kg, and PK studies testing the bioavailability and profile of NX-73 in rats in the therapeutic window (1-20 mg/kg) in the second half of 2021. We intend to initiate GLP 28-day repeat dose toxicity studies in rats and dogs in the second quarter of 2023.

Clinical development plan

Following an expected IND submission in the second half of 2023, we intend to initiate a Phase 1 study in normal healthy volunteers will be in the first half of 2024. The normal healthy volunteer study will feature a standard single ascending dose/multiple ascending dose design testing a dose range 5-fold to 10-fold greater than projected therapeutic dose. The primary objective of the study will be to assess the safety and tolerability of NX-73 by frequency and severity of AEs, standard safety laboratory results, ECG and vital signs. The secondary objective will be to assess the PK of NX-73 in humans.

NX-73 for the treatment of COPD

Overview

NX-73 is a small molecule product candidate that targets NLRX1 that we are developing for the treatment of COPD. NLRX1 is a mitochondria-associated receptor involved in down-regulating inflammation during bacterial and viral exposure, colitis, multiple sclerosis and chronic pulmonary disease. COPD is an inflammatory disease of the lung characterized by chronic bronchitis and emphysema and caused primarily by environmental exposures and cigarette smoke. The current treatments for COPD primarily provide symptomatic relief and slightly reduce severe flares and do not reduce the rate of progressive obstruction. We believe that NX-73 has the potential to improve on the current treatment options through the potential to address both epithelial and immune functions. We intend to submit an IND for NX-73 in the second half of 2023.

Background on COPD and current treatments

COPD is the third leading cause of death in the United States, may exist in up to 10% of adults over 40 and is estimated to be up to \$12 billion annual market growing with a compound annual growth rate of nearly 6% from 2018 to 2028.

The primary class of treatment in COPD is bronchodilators including both short- and long-acting beta2 agonists and muscarinic antagonists. Inhaled corticosteroids are also used in certain cases, often in combination with methylxanthines, which improve the response to corticosteroids. The most recent new class approval in COPD was a PDE4 inhibitor, for which 80% of patients experienced moderate-to-severe COPD exacerbations, representing a 13% drop relative to placebo. PDE4 inhibition has struggled to penetrate the market, estimated to comprise 2% to 5%, attributable in part to mixed results during clinical development. Cytokine-based biologics have failed to improve respiratory function in clinical trials. Limitations of current therapies for the treatment of COPD include:

- **Limiting effects on declining respiratory function.** Current therapeutics for COPD primarily provide symptomatic relief and slightly reduce severe flares. Bronchodilators do not reduce the rate of progressive obstruction, in which patients have a higher likelihood of becoming refractory to treatment. This results in a limited impact on the overall mortality rate.
- **Failure to treat neutrophilic and severe disease.** Bronchodilators provide little impact on the underlying inflammation present in COPD. While COPD patients with high eosinophil counts have partial response to corticosteroids, those without high eosinophils have limited response to any treatment.

Our solution for the treatment of COPD

Alveolar macrophages are a highly plastic phenotype capable of maintaining tissue homeostasis and inducing robust inflammation in the lung. They are central players in COPD and chronic pulmonary diseases. NLRX1 is

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suppressed in human COPD and its expression correlates with the degree of airflow limitation. In cigarette smoke induced animal models, lack of NLRX1 results in emphysematous destruction and high expression of IL-18. Mechanistically, NLRX1 inhibits the PAMP and DAMP mediated activation of MAVS, a key effector protein for the induction of IL-18 and IL-1 β , as well as decrease oxidative stress tied to the damage of the airway epithelium and activation of alveolar macrophages.

COPD has a large refractory population and a lack of therapies that prevent further decline in severe disease. We believe a significant market opportunity exists for therapeutics addressing both epithelial and immune functions. NLRX1 activation can ameliorate alveolar destruction.

We believe NX-73, if approved, has the potential to address the lack of immune-based therapies. With the exception of PDE4 inhibitors, COPD treatment primarily addresses the symptoms without modulating the underlying inflammation. Similar to asthma, corticosteroids fail to improve disease in patients with high neutrophil counts. NLRX1 activation may reduce the infiltration of neutrophils through decreased Th17 cells and decreased IL-8 production by airway epithelial cells.

Preclinical GLP toxicology

We intend to initiate GLP IND-enabling studies for NX-73 in the second half of 2023.

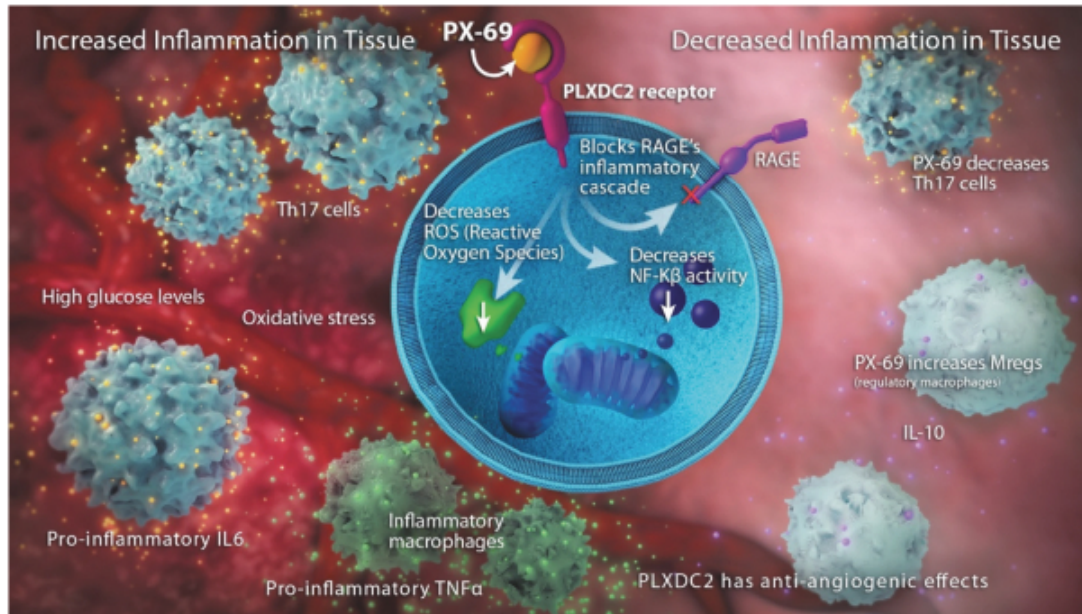
Clinical development plan

We intend to initiate a safety and tolerability study in normal healthy volunteers of NX-73 in the first half of 2024.

Our PLXDC2 pathway product candidate

The PLXDC2 pathway

PLXDC2 is a transmembrane receptor associated with immunoregulatory functions. Immunologically, PLXDC2 activation leads to the production of IL-10 and prevention of oxidative stress. PLXDC2 intercepts the receptor for advanced glycation end-products (RAGE) signaling pathway. This leads to downstream inhibition of NF- κ B and HIF-1 α signaling that is associated with TNF α , IL-6, MCP1 and other cytokines. Further supporting this anti-inflammatory cascade is an inhibition of the semaphorin 4A/plexin B1 axis that regulates MAPK activation. Through proteolysis of the VEGF receptor, activation of PLXDC2 can also induce anti-angiogenic effects that can limit immune cell infiltration and defects in tissue vascularization and anti-fibrotic effects that can reduce the production of fibronectin.

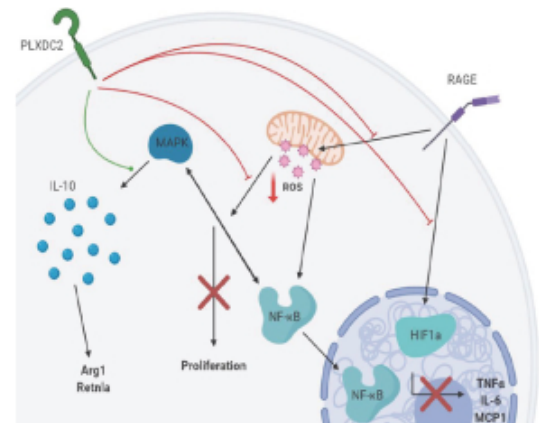


• PLXDC2 activation leads to immunoregulatory functions

- Production of IL-10
- Prevention of oxidative stress
- Inhibition of NF- κ B and HIF-1 α signaling that decrease production of TNF, IL-6 and MCP-1
- Intercepts RAGE signaling pathway

• Through proteolysis of the VEGF receptor activation of PLXDC2 can lead to:

- Anti-angiogenic effects that limit immune cell infiltration
- Anti-fibrotic effects that decrease fibronectin production



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The primary immune cell type affected by PLXDC2 activation is considered to be macrophages. When stimulated, PLXDC2 activated macrophages more closely associate with a non-inflammatory phenotype categorized by high expression of Retn1a and Arg1 and secretion of IL-10. While macrophages are central to the effects of PLXDC2 activation, effects are also observed in adaptive immunity. In animal models, PLXDC2 activation is associated with decreased B cell maturation and lower local Th17 activation due in part to the inhibition of MAPK signaling and glycolysis that lessens proliferation. In addition to effects on the growth factor microenvironment, PLXDC2 activation is also associated with growth arrest in fibroblasts leading to decreased proliferation. This could offer the potential to halt tissue fibrosis that leads to deterioration of organ function.

The development of PLXDC2 focuses on diseases with implication of oxidative stress, fibrosis and angiogenesis. PLXDC2 is a highly relevant target for diabetic complications, such as nephropathy and retinopathy, due to the high levels of advanced glycation end-products that result from hyperglycemia. These indications, in addition to rheumatoid arthritis, are implicated with defects in local growth factor production and innate immune cytokines that may be improved with PLXDC2 activation.

PX-69 for the treatment of diabetic nephropathy

Overview

PX-69 is a small molecule product candidate that targets PLXDC2 that we are developing for the treatment of diabetic nephropathy. Diabetic nephropathy is a main complication in both type 1 and type 2 diabetes and is the leading cause of ESRD. While current treatments are effective as a preventative measure, they are less efficacious when initiated at later stages of disease. We believe that PX-69 has the potential to improve on the current treatment options through the potential to improve kidney function and address late stage renal disease. We intend to submit an IND for PX-69 in the first half of 2022.

Background on diabetic nephropathy and current treatments

Forty percent of diabetic patients will develop diabetic nephropathy, affecting both type 1 and type 2 diabetics and resulting in up to 10 million patients in the United States. Diabetic nephropathy is the leading cause for long-term renal dialysis and ESRD. The estimated global market for diabetic nephropathy is up to \$3 billion annually with a compound annual growth rate of over 5% from 2014 to 2020.

Prolonged periods of hyperglycemia and dysregulated glucose metabolism increases the risk for many complications, from kidney failure to blindness to amputation of extremities. High blood glucose results in the build-up of multiple metabolites that can directly damage the kidney and cause oxidative stress. Patients often require high blood pressure- and cholesterol-lowering drugs and dialysis resulting from these complications.

Currently, pharmacological management of diabetic nephropathy is managed through glycemic control and blood pressure medications. The most commonly prescribed treatments for diabetic nephropathy are angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blocker (ARB). These treatments are believed to function through improvement of a hemodynamic imbalance, reducing stress on the kidneys and overall inflammation. While effective as a preventative measure when early detection is possible, diminished efficacy of these therapies is observed when initiated at later stages of disease. These therapies unreliably decrease serum creatinine indicating that further improvement on removal of waste products is possible.

Our solution for the treatment of diabetic nephropathy

The native protein ligand of PLXDC2 is locally expressed in both the retina and kidney and is notably suppressed when damage to either organ occurs. In the kidney, the presence of this protein is associated with suppression

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of advanced glycation end-product signaling and inhibition of fibrosis. Many diabetic complications result from advanced glycation end-products which are formed from the reaction of high glucose levels with proteins and other macromolecules. By intercepting RAGE signaling, PLXDC2 prevents myriad downstream effects that lead to kidney damage. Primary among these mechanisms is the prevention of oxidative stress and high-glucose induced activation of NF- κ B and HIF1 α . Activation of PLXDC2 results in the downregulation of TNF, MCP1 and other cytokines. Inhibition of fibrosis, including a downregulation of fibronectin, is caused by inhibition of RAGE combined with VEGF receptor proteolysis. The second of these effects also serves to reduce angiogenesis, an additional process connected to diabetic nephropathy. Enhanced activation of PLXDC2 may therefore help return the tissue to homeostasis in the deficiency of the native ligand.

We believe PX-69, if approved, has the potential to improve on current therapies by:

- **Providing direct antioxidant effects.** PLXDC2 activation is associated with decreased NF- κ B activation and lower intracellular reactive oxygen species. Combined with reduction of local hypoxia, PLXDC2 can improve the health and homeostasis of renal epithelial cells and podocytes.
- **Addressing late-stage disease.** PLXDC2 has the potential to intercept the angiogenic and fibrogenic signals that are more prevalent during late-stage disease. In the absence of improved screening, patients with stage 4 or higher renal disease will continue to have a higher likelihood of requiring long-term dialysis or kidney transplant.
- **Improvement of overall kidney function.** The build-up of multiple waste products in the body can result in additional co-morbidities that contribute to the overall decline in health in diabetic individuals. Identification of novel treatment strategies in diabetic nephropathy may help to reduce these in a wider range of individuals.

Preclinical GLP toxicology

PX-69 will be tested in a seven-day dose range finding study in rats up to doses of 1,000 mg/kg in the second quarter of 2021. We intend to initiate PK studies testing the bioavailability and profile of PX-69 in rats in the therapeutic window (1-20 mg/kg) in the second quarter of 2021. We intend to initiate GLP 28-day repeat dose toxicity studies in rats and dogs in the fourth quarter of 2022.

Clinical development plan

Following an expected IND submission in the first half of 2022, we intend to initiate a Phase 1 study in normal healthy volunteers in the second half of 2022. The normal healthy volunteer study will feature a standard single ascending dose/multiple ascending dose design testing a dose range 5-fold to 10-fold greater than projected therapeutic dose. The primary objective of the study will be to assess the safety and tolerability of PX-69 by frequency and severity of AEs, standard safety laboratory results, ECG and vital signs. A secondary objective will be to assess the PK of PX-69 in humans.

PX-69 for the treatment of rheumatoid arthritis

Overview

PX-69 is a small molecule product candidate that targets PLXDC2 that we are developing for the treatment of rheumatoid arthritis. Rheumatoid arthritis is characterized by a swelling and loss of mobility in joints caused by excessive inflammation and infiltration into the joint synovium. There is no clear advantage in terms of safety and efficacy for the current approved treatments. We believe that PX-69 has potential to improve on the

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modest efficacy observed with current treatments in rheumatoid arthritis due to disease-specific and general immune functions. We intend to submit an IND for PX-69 in the first half of 2022.

Background on rheumatoid arthritis and current treatments

Rheumatoid arthritis is a global health concern and affects approximately 1.3 million patients in the United States and represents an approximate \$25 billion annual therapeutics market. The market is estimated to be the second largest specialty drug indication behind oncology.

Five classes of drugs (NSAIDs, corticosteroids, DMARDs, biologics and JAK inhibitors) are used to manage rheumatoid arthritis. The rheumatoid arthritis market is fragmented due to no clear advantage in terms of safety and efficacy among these classes of therapies. The result is a lack of a defined treatment paradigm or order of escalation between classes.

Our solution for the treatment of rheumatoid arthritis

Rheumatoid arthritis causes severe inflammation of joints leading to loss of mobility and intense pain. The underlying immunology of the synovial inflammation is complex involving the interplay of myeloid cells, T cells, fibroblasts and other structural cells of the synovium. High expression of TNF and IL-6 are central to the pathogenesis of rheumatoid arthritis, with additional contributions by IL-1 β , IL-12, IL-17, IL-21, IL-23, MCP1, and TGF- β . Together these cytokines can lead to leukocytic recruitment, bone remodeling, pannus formation, oxidative stress and hyperplasia of the joint lining. As a strong regulator of myeloid responses, including the production of TNF and IL-6 as well as overall infiltration and angiogenesis, PLXDC2 can serve as a novel target in rheumatoid arthritis.

Rheumatoid arthritis results from interactions between immune cells and synoviocytes that leads to joint swelling, pannus formation and bone loss. These interactions are exacerbated by increased angiogenesis driven by local hypoxia. PLXDC2 is a receptor for an anti-angiogenesis factor that limits angiogenesis through proteolysis of the VEGF receptor. The semaphorin 4A/plexin B1 axis is a major contributor to interactions between Th17 cells and synovial fibroblasts. The axis leads to downstream upregulation of MAPK and production of factors contributing to osteoclastogenesis. PLXDC2 is an inhibition of this pathway and MAPK activation.

We believe PX-69, if approved, has the potential to improve on the modest efficacy observed with current treatments in rheumatoid arthritis due to disease-specific and general immune functions. PLXDC2 has a greater potential to influence osteoclastogenesis and angiogenesis than current therapeutics from a mechanistic standpoint. If combined with high tolerability, we believe PX-69 could be a disruptive therapy in rheumatoid arthritis.

Preclinical GLP toxicology

We intend to initiate GLP IND-enabling studies for PX-69 in the second quarter of 2021.

Clinical development plan

We intend to initiate a safety and tolerability study for PX-69 in normal healthy volunteers in the second quarter of 2022.

Manufacturing

Our drug substance and drug product manufacturing are conducted at third-party contract manufacturing organizations, or CMOs, in India and Switzerland. All of our manufacturers hold applicable licenses,

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certifications and/or approvals for cGMP manufacturing, analytical testing, packaging, and release operations from multiple drug regulation entities, including the FDA. Each manufacturer has also been independently qualified through our own internal qualification processes.

Multiple batches of BT-11 drug substance and drug product candidate have been completed with completed two-year room temperature stability data. BT-11 drug product is an immediate release tablet at multiple strengths. Process optimization, scale-up, manufacturing and production of registration batches are expected in 2021. Manufacture of NX-13 drug substance and drug product has been completed for Phase 1 studies with indications of room temperature stability in all stability assessments as of August 2020. NX-13 drug product candidate is an immediate release tablet at multiple strengths. Process optimization and scale-up for Phase 2 clinical trial supply will occur in 2021. Phase 3 process optimization, scale-up and registration batch manufacture are projected for completion in 2023.

We have recently begun the process of expanding our manufacturing capacity by developing relationships with new, qualified CMOs in other parts of the world. Additional CMOs for the manufacture of BT-11 and NX-13 drug substance and drug products are currently being identified, with each required to comply with current good manufacturing practices, or cGMP, and have the relevant manufacturing expertise for the applicable product. We expect that the newly qualified CMOs will begin process transfer and scale-up activities by the end of 2020 with plans to begin cGMP clinical manufacture in 2021. Together with our current manufacturing capabilities, this added capacity and strategic placement is expected to satisfy the regulatory demands of each of the anticipated long-term commercial markets while also ensuring a continuance of supply.

Competition

The biotechnology and pharmaceutical industries, and particularly the market for the treatment of autoimmune diseases, are characterized by rapidly advancing technologies, intense competition and a strong emphasis on proprietary and novel products and product candidates. We face competition with respect to our current product candidates, and will face competition with respect to any product candidates that we may seek to develop or commercialize in the future, from many different sources, including major pharmaceutical and specialty pharmaceutical companies, compounding facilities, academic institutions and governmental agencies and public and private research institutions.

We are aware of several other products and product candidates as potential treatments for UC and Crohn's disease that would compete with BT-11 and NX-13, if approved. In particular, we expect to compete against companies that produce biologic drugs that currently dominate the UC and Crohn's disease market, as well as companies that produce the aminosalicylates, steroids and immunosuppressants that are currently used to treat patients with mild to moderate disease. If approved, BT-11 and NX-13 are expected to compete against companies that produce, or are developing, injectable biologic therapeutics such as AbbVie Inc., Eli Lilly and Co., Janssen Pharmaceuticals, Inc., Roche Holding Ltd., Takeda Pharmaceutical Company Ltd. and UCB S.A., as well as companies that produce, or are developing, oral products such as Applied Molecular Transport Inc., Arena Pharmaceuticals, Inc., Bristol-Myers Squibb Co., Galapagos N.V., Gilead Sciences, Inc., Gossamer Bio, Inc., Pfizer Inc., Protagonist Therapeutics, Inc. and Theravance Biopharma, Inc.

BT-11 and NX-13 are well differentiated orally active, gut-restricted, therapeutic candidates that are the first to target their respective pathways. We are not aware of any product candidate targeting the LANCL2, NLRX1, or PLXDC2 pathways in current clinical development.

Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer or more effective, have fewer or less severe side effects, are more convenient or are less expensive than BT-11, NX-13 or any other product that we may develop. Our competitors also may obtain

FDA or other regulatory approval for their products more rapidly than we may obtain approval for our product, which could result in our competitors establishing a strong market position before we are able to enter the market.

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 industries 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 that may be necessary for, our programs. We believe that our unique corporate culture, proprietary LANCE platform, and well-differentiated technology will help us effectively navigate the challenges associated with this competitive landscape targeting a large market of over \$153 billion by 2025.

Intellectual property

Patents and applications

Our success depends in part on our ability to obtain and maintain proprietary protection for our product candidates, technology, and know-how; to operate without infringing the proprietary rights of others; and to prevent others from infringing our proprietary rights. Our policy is to seek to protect our proprietary position by, among other methods, pursuing and obtaining patent protection in the United States and jurisdictions outside the United States. Our patent portfolio is intended to cover our product candidates, their methods of use, and any other inventions that are commercially important to our business. We also rely on trade secret protection of our confidential information and know-how relating to our proprietary technology, platforms, and product candidates.

BT-11 patent portfolio

We solely own a patent portfolio covering the BT-11 compound and its use in treating inflammatory bowel disease (*e.g.*, UC and CD) and other conditions.

The BT-11 patent portfolio includes four issued U.S. patents: U.S. Patent Nos. 9,556,146; 9,839,635; 10,028,950; and 10,682,349. These patents collectively cover the BT-11 compound from a variety of angles and degrees of breadth. These patents also collectively cover methods of using BT-11 for treating inflammatory bowel disease and other conditions.

The BT-11 portfolio also includes issued patents covering BT-11 in Australia (AU Patent No. 2015337091), China (CN Patent No. 107108573), Europe (EP Patent No. 3209655), Israel (IL Patent No. 252630), Japan (JP Patent No. 6499306), New Zealand (NZ Patent No. 732213), the Republic of Korea (KR Patent No. 10-2026342), and the Russian Federation (RU Patent No. 2688677). The granted European patent is in the process of being validated in Germany, France, the United Kingdom, and 30 other European countries. The issued Australian and Russian patents further cover methods of using BT-11 for treating inflammatory bowel disease and other conditions.

The BT-11 portfolio also includes pending applications in Brazil, Canada, Hong Kong (via China), India, and Turkey. The application in Hong Kong (via China) has been accepted and patent issuance (grant) is pending.

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The application lineages in all the aforementioned jurisdictions remain pending, which provides the opportunity to pursue protection of additional aspects of BT-11 and/or its uses.

The issued patents and any patents issuing from the pending applications in this portfolio are projected to expire in 2035, absent any surrendered term, adjustments, or extensions.

NX-13 patent portfolio

We solely own a patent portfolio covering the NX-13 compound and its use in treating inflammatory bowel disease and other conditions.

The NX-13 patent portfolio includes two issued U.S. patents: U.S. Patent Nos. 10,487,057 and 10,676,436. These patents collectively cover the NX-13 compound and the use of NX-13 in treating inflammatory bowel disease and other conditions. A continuation application to pursue additional coverage of NX-13 and its use is pending.

The NX-13 patent portfolio also includes a PCT application that is eligible for worldwide filing as well as an independent application in Argentina. We plan to file national phase patent applications stemming from the PCT application in jurisdictions such as Australia, Brazil, Canada, Chile, China, Eurasia, Europe, Georgia, India, Israel, Japan, Mexico, New Zealand, the Republic of Korea, Ukraine, and Uzbekistan.

The issued patents and any patents issuing from the pending applications in this portfolio are projected to expire in 2039, absent any surrendered term, adjustments, or extensions.

BT-11-conditioned T cells

We solely own a patent application portfolio pursuing coverage of BT-11-conditioned T cells, methods of making the T cells, and methods of using the T cells in treating inflammatory bowel disease and other conditions. This portfolio includes pending applications in the U.S., Australia, Brazil, Canada, Chile, China, Eurasia, Europe, Georgia, Hong Kong, India, Israel, Japan, Mexico, New Zealand, the Republic of Korea, Ukraine, and Uzbekistan. Any patents issuing from these applications are predicted to expire in 2038, absent any surrendered term, adjustments, or extensions.

Other LANCL2 targeting compound patent portfolio

We solely own a patent portfolio covering other LANCL2-targeting compounds and their use in treating inflammatory bowel disease and other conditions. This portfolio includes issued patents in the United States (U.S. Patent Nos. 10,201,538 and 10,493,072) and the Republic of Korea (KR Patent No. 10-2134171) and pending applications in Australia, China, Israel and New Zealand. The issued patents and any patents issuing from the pending applications in this portfolio are projected to expire in 2035, absent any surrendered term, adjustments, or extensions.

BT-104

We solely own two U.S. provisional patent applications directed to the BT-104 compound, related to BT-104, and uses of such compounds. We plan to file U.S. and PCT nonprovisional applications claiming priority to these provisional applications. If the nonprovisional applications are timely filed and granted, the granted patents would expire in 2040, absent any surrendered term, adjustments, or extensions.

PX-69

We solely own two U.S. provisional patent applications directed to the PX-69 compound, compounds related to PX-69, and uses of such compounds. We plan to file U.S. and PCT nonprovisional applications claiming priority

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to these provisional applications. If the nonprovisional applications are timely filed and granted, the granted patents would expire in 2041, absent any surrendered term, adjustments, or extensions.

NX-66

We solely own a U.S. provisional patent application directed to the NX-66 compound, compounds related to NX-66, and uses of such compounds. We plan to file U.S. and PCT nonprovisional applications claiming priority to this provisional application. If the nonprovisional applications are timely filed and granted, the granted patents would expire in 2041, absent any surrendered term, adjustments, or extensions.

BT-111

We solely own a U.S. provisional patent application directed to the BT-111 compound, compounds related to BT-111, and uses of such compounds. We plan to file U.S. and PCT nonprovisional applications claiming priority to this provisional application. If the nonprovisional applications are timely filed and granted, the granted patents would expire in 2041, absent any surrendered term, adjustments, or extensions.

BT-11 polymorphs

We solely own a U.S. provisional patent application directed to crystalline forms of BT-11 and uses of such crystalline forms. We plan to file U.S. and PCT nonprovisional applications claiming priority to this provisional application. If the nonprovisional applications are timely filed and granted, the granted patents would expire in 2041, absent any surrendered term, adjustments, or extensions.

Topical BT-11 therapies

We solely own a U.S. provisional patent application directed to the topical administration of BT-11 and related compounds for the therapeutic treatment of psoriasis and other conditions of the skin and mucosa. We plan to file U.S. and PCT nonprovisional applications claiming priority to these provisional applications. If the nonprovisional applications are timely filed and granted, the granted patents would expire in 2041, absent any surrendered term, adjustments, or extensions.

Additional patent applications

We plan to file U.S. provisional patent applications covering our NX-73 compound and its therapeutic uses within the next several months.

Intellectual Property Protection

We cannot predict whether the patent applications we pursue will issue as patents in any particular jurisdiction or whether the claims of any issued patents will provide any proprietary protection from competitors. Further, any issued patents may expire before the expected expiration dates disclosed above due to actions taken during patent prosecution, such as submission of a disclaimer surrendering the term of a patent beyond a certain date. Even if our pending patent applications are granted as issued patents, those patents, as well as any patents we license from third parties, may be challenged, circumvented, or invalidated by third parties. While there are currently no contested proceedings or third-party claims relating to any of the patents or patent applications described above, we cannot provide any assurances that we will not have such proceedings or third-party claims at a later date or once any patent is granted.

The term of a patent depends upon the legal term of patents in the particular country in which it is obtained. In most countries in which we file, including the United States, the patent term is 20 years from the earliest date of filing a non-provisional patent application.

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In the United States, the term of a patent that covers an FDA-approved drug may be eligible for patent term extension, which permits in some cases restoration of patent term as compensation for patent term lost during the FDA regulatory review process. In certain circumstances, the Hatch-Waxman Act permits a patent term extension of up to five years beyond the unextended expiration date of the U.S. patent. The length of the patent term extension is related to the length of time the approved drug is under regulatory review. Patent term extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval, and only one patent applicable to an approved drug may be extended. Provisions are available in Europe and other foreign jurisdictions to extend the term of a patent that covers an approved drug, or provide an additional period of protection for the approved pharmaceutical product following expiry of the patent. In the future, if our products receive FDA approval, we expect to apply for patent term extensions on patents covering those products. We plan to seek patent term extensions to any of our issued patents in any jurisdiction where these are available. There is no guarantee, however, that the applicable authorities, including the U.S. Patent and Trademark Office in the United States and the national patent offices in Europe or other jurisdictions, will agree with our assessment of whether such extensions should be granted, and, if granted, the length of such extensions.

In addition to our reliance on patent protection for our inventions, product candidates, and research programs, we also rely on trade secret protection for our confidential and proprietary information. Although we take steps to protect our proprietary information and trade secrets, including through contractual means with our employees and consultants, third parties may independently develop substantially equivalent proprietary information and techniques, or otherwise gain access to our trade secrets or disclose our technology. Thus, we may not be able to meaningfully protect our trade secrets. It is our policy to require our employees, consultants, outside scientific collaborators, sponsored researchers, and other advisors to execute confidentiality agreements upon the commencement of employment or consulting relationships with us. These agreements provide that all confidential information concerning our business or financial affairs developed or made known to the individual or entity during the course of the party's relationship with us is to be kept confidential, and not disclosed to third parties except in specific circumstances. In the case of employees, the agreements provide that all inventions conceived by the individual, and which are related to our current or planned business or research and development or made during normal working hours, on our premises or using our equipment or proprietary information, are our exclusive property. In addition, we take other appropriate precautions, such as physical and technological security measures, to guard against misappropriation of our proprietary technology by third parties. We have also adopted policies and conduct training that provides guidance on our expectations and practices to protect our trade secrets.

Freedom to Operate

We have obtained legal opinions on the freedom to operate with BT-11 and NX-13. The legal opinions have concluded that we have freedom to operate with BT-11, NX-13, and their uses in the treatment of inflammatory bowel diseases, such as UC and CD.

Government regulation

The FDA and comparable regulatory authorities in state and local jurisdictions and in other countries impose substantial and burdensome requirements upon companies involved in the clinical development, manufacture, marketing and distribution of drugs, such as those we are developing. These agencies and other federal, state and local entities regulate, among other things, the research and development, testing, manufacture, quality control, safety, effectiveness, labeling, storage, record keeping, approval, advertising and promotion, distribution, post-approval monitoring and reporting, sampling and export and import of our product candidates.

U.S. government regulation

In the United States, the FDA regulates drugs under the Federal Food, Drug, and Cosmetic Act, or the FDCA, and its implementing regulations. The process of obtaining regulatory approvals and the subsequent compliance with applicable federal, state, local and foreign statutes and regulations requires 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 subject an applicant to a variety of administrative or judicial sanctions, such as the FDA's refusal to approve pending NDAs, withdrawal of an approval, imposition of a clinical hold, issuance of warning letters, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, refusals of government contracts, restitution, disgorgement or civil or criminal penalties.

The process required by the FDA before a drug may be marketed in the United States generally involves the following:

- completion of pre-clinical laboratory tests, animal studies and formulation studies in compliance with the FDA's good laboratory practices, or GLP, regulations;
- submission to the FDA of an investigational new drug application, or IND, which must become effective before human clinical trials may begin;
- approval by an independent institutional review board, or IRB, at each clinical site before each trial may be initiated;
- performance of adequate and well-controlled human clinical trials in accordance with good clinical practice, or GCP, requirements to establish the safety and efficacy of the proposed drug product for each indication;
- submission to the FDA of a New Drug Application, or NDA;
- satisfactory completion of an FDA advisory committee review, if applicable;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities at which the product is produced to assess compliance with current good manufacturing practices, or cGMP, requirements and to assure that the facilities, methods and controls are adequate to preserve the drug's identity, strength, quality and purity; and
- FDA review and approval of the NDA.

Pre-clinical studies

Pre-clinical studies include laboratory evaluation of product chemistry, toxicity and formulation, as well as animal studies to assess potential safety and efficacy. An IND sponsor must submit the results of the pre-clinical tests, together with manufacturing information, analytical data and any available clinical data or literature, among other things, to the FDA as part of an IND. Some pre-clinical testing may continue even after the IND is submitted. An IND automatically becomes effective 30 days after receipt by the FDA, unless before that time the FDA raises concerns or questions related to one or more proposed clinical trials and places the clinical trial on a clinical hold. In such a case, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial can begin. As a result, submission of an IND may not result in the FDA allowing clinical trials to commence.

Clinical trials

Clinical trials involve the administration of the investigational new drug to human subjects under the supervision of qualified investigators in accordance with GCP requirements, which include the requirement that

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all research subjects provide their informed consent in writing for their participation in any clinical trial. Clinical trials are conducted under protocols detailing, among other things, the objectives of the trial, the parameters to be used in monitoring safety, and the effectiveness criteria to be evaluated. A protocol for each clinical trial and any subsequent protocol amendments must be submitted to the FDA as part of the IND (or equivalent submission ex-US). In addition, an IRB or ethics committee, or EC, at each institution participating in the clinical trial must review and approve the plan for any clinical trial before it commences at that institution. Information about certain clinical trials must be submitted within specific timeframes to the National Institutes of Health, or NIH, for public dissemination on their www.clinicaltrials.gov website.

Human clinical trials are typically conducted in three sequential phases, which may overlap or be combined:

- **Phase 1:** The drug is initially introduced into healthy human subjects or patients with the target disease or condition and tested for safety, dosage tolerance, absorption, metabolism, distribution, excretion and, if possible, to gain an early indication of its effectiveness.
- **Phase 2:** The drug is administered to a limited patient population to identify possible adverse effects and safety risks, to preliminarily evaluate the efficacy of the product for specific targeted diseases and to determine dosage tolerance and optimal dosage.
- **Phase 3:** The drug is administered to an expanded patient population, generally at geographically dispersed clinical trial sites, in well-controlled clinical trials to generate enough data to statistically evaluate the efficacy and safety of the product for approval, to establish the overall risk-benefit profile of the product, and to provide adequate information for the labeling of the product.

Progress reports detailing the results of the clinical trials must be submitted at least annually to the FDA and more frequently if serious adverse events occur. Phase 1, Phase 2 and Phase 3 clinical trials may not be completed successfully within any specified period, or at all. Furthermore, the FDA or the sponsor may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Similarly, an IRB or EC 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.

Marketing approval

Assuming successful completion of the required clinical testing, the results of the pre-clinical and clinical studies, together with detailed information relating to the product's chemistry, manufacture, controls and proposed labeling, among other things, are submitted to the FDA as part of an NDA requesting approval to market the product for one or more indications. In most cases, the submission of an NDA is subject to a substantial application user fee. Under the Prescription Drug User Fee Act, or PDUFA, guidelines that are currently in effect, the FDA has a goal of ten months from the date of "filing" of a standard NDA for a new molecular entity to review and act on the submission. This review typically takes twelve months from the date the NDA is submitted to FDA because the FDA has approximately two months to make a "filing" decision.

In addition, under the Pediatric Research Equity Act of 2003, or PREA, as amended and reauthorized, certain NDAs or supplements to an NDA must contain data that are adequate to assess the safety and effectiveness of the drug 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 FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults, or full or partial waivers from the pediatric data requirements.

The FDA also may require submission of a risk evaluation and mitigation strategy, or REMS, plan to ensure that the benefits of the drug outweigh its risks. The REMS plan could include medication guides, physician

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communication plans, assessment plans, and/or elements to assure safe use, such as restricted distribution methods, patient registries, or other risk minimization tools.

The FDA conducts a preliminary review of all NDAs within the first 60 days after submission, before accepting them for filing, to determine whether they are sufficiently complete to permit substantive review. The FDA may request additional information rather than accept an NDA for filing. In this event, the application must be resubmitted with the additional information. The resubmitted application is also subject to review before the FDA accepts it for filing. Once the submission is accepted for filing, the FDA begins an in-depth substantive review. The FDA reviews an NDA to determine, among other things, whether the drug is safe and effective and whether the facility in which it is manufactured, processed, packaged or held meets standards designed to assure the product's continued safety, quality and purity.

The FDA may refer an application for a novel drug to an advisory committee. An advisory committee is a panel of independent experts, including clinicians and other scientific experts, that reviews, evaluates and provides 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.

Before approving an NDA, the FDA typically will inspect the facility or facilities where the product is manufactured. The FDA will not approve an application 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. Additionally, before approving an NDA, the FDA may inspect one or more clinical trial sites to assure compliance with GCP requirements.

After evaluating the NDA and all related information, including the advisory committee recommendation, if any, and inspection reports regarding the manufacturing facilities and clinical trial sites, the FDA may issue an approval letter, or, in some cases, a complete response letter. A complete response letter generally contains a statement of specific conditions that must be met in order to secure final approval of the NDA and may require additional clinical or pre-clinical testing in order for FDA to reconsider the application. Even with submission of this additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval. If and when those conditions have been met to the FDA's satisfaction, the FDA will typically issue an approval letter. An approval letter authorizes commercial marketing of the drug with specific prescribing information for specific indications.

Even if the FDA approves a product, it may limit the approved indications for use of the product, require that contraindications, warnings or precautions be included in the product labeling, require that post-approval studies, including Phase 4 clinical trials, be conducted to further assess a drug's safety after approval, require testing and surveillance programs to monitor the product after commercialization, or impose other conditions, including distribution and use restrictions or other risk management mechanisms under a REMS, which can materially affect the potential market and profitability of the product. The FDA may prevent or limit further marketing of a product based on the results of post-marketing studies or surveillance programs. After approval, some types of changes to the approved product, such as adding new indications, manufacturing changes and additional labeling claims, are subject to further testing requirements and FDA review and approval.

Special FDA expedited review and approval programs

The FDA has various programs, including Fast Track designation, Breakthrough Therapy designation, Accelerated Approval, and Priority Review, which are intended to expedite or simplify the process for the development and FDA review of drugs that are intended for the treatment of serious or life-threatening diseases or conditions and demonstrate the potential to address unmet medical needs. The purpose of these programs is to provide important new drugs to patients earlier than under standard FDA review procedures.

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Under the fast track program, the sponsor of a new drug candidate may request that FDA designate the drug candidate for a specific indication as a fast track drug concurrent with, or after, the filing of the IND for the drug candidate. Fast track designation provides opportunities for frequent interactions with the FDA review team to expedite development and review of the product. FDA may initiate review of sections of a fast track drug's NDA before the application is complete. This rolling review is available if the applicant provides, and FDA approves, a schedule for the submission of the remaining information and the applicant pays applicable user fees. However, FDA's time period goal for reviewing an application does not begin until the last section of the NDA is submitted.

In addition, a sponsor can request breakthrough therapy designation for a drug if it is intended, alone or in combination with one or more other drugs, to treat a serious or life-threatening disease or condition, and preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. Drugs designated as breakthrough therapies are eligible for intensive guidance from FDA on an efficient drug development program, organizational commitment to the development and review of the product including involvement of senior managers, and, like fast track products, are also eligible for rolling review of the NDA. Both fast track and breakthrough therapy products are also eligible for accelerated approval and/or priority review, if relevant criteria are met.

Under the FDA's accelerated approval regulations, the FDA may approve a drug for a serious or life-threatening illness that provides meaningful therapeutic benefit to patients over existing treatments based upon 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, that is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the availability or lack of alternative treatments.

In clinical trials, a surrogate endpoint is a measurement of laboratory or clinical signs of a disease or condition that substitutes for a direct measurement of how a patient feels, functions, or survives. Surrogate endpoints can often be measured more easily or more rapidly than clinical endpoints. A drug candidate approved on this basis is subject to rigorous post-marketing compliance requirements, including the completion of Phase 4 or post-approval clinical trials to confirm the effect on the clinical endpoint. Failure to conduct required post-approval studies, or confirm a clinical benefit during post-marketing studies, will allow FDA to withdraw the drug from the market on an expedited basis. All promotional materials for drug candidates approved under accelerated approval regulations are subject to prior review by FDA.

Once an NDA is submitted for a product intended to treat a serious condition, the FDA may assign a priority review designation if FDA determines that the product, if approved, would provide a significant improvement in safety or effectiveness. A priority review means that the goal for the FDA to review an application is six months, rather than the standard review of ten months under current PDUFA guidelines. Under the current PDUFA agreement, these six- and ten- month review periods are measured from the 60-day filing date rather than the receipt date for NDAs for new molecular entities, which typically adds approximately two months to the timeline for review from the date of submission. Most products that are eligible for fast track breakthrough therapy designation are also likely to be considered appropriate to receive a priority review.

Even if a product qualifies for one or more of these programs, the FDA may later decide that the product no longer meets the conditions for qualification or decide that the time period for FDA review or approval will not be shortened. In addition, the manufacturer of an investigational drug for a serious or life-threatening disease is required to make available, such as by posting on its website, its policy on responding to requests for expanded access. Furthermore, fast track designation, breakthrough therapy designation, and priority review do not change the standards for approval and may not ultimately expedite the development or approval process.

Orphan designation

The FDA may grant orphan designation to drugs or biologics intended to treat a rare disease or condition that affects fewer than 200,000 individuals in the United States, or if it affects more than 200,000 individuals in the United States, and there is no reasonable expectation that the cost of developing and marketing the product for this type of disease or condition will be recovered from sales in the United States. Orphan designation must be requested before submitting a NDA or Biologics License Application, or a BLA. After the FDA grants orphan designation, the identity of the therapeutic agent and its potential orphan use are disclosed publicly by the FDA. Orphan designation does not convey any advantage in or shorten the duration of the regulatory review and approval process.

In the United States, orphan designation entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages and user-fee waivers. In addition, if a product receives the first FDA approval for the indication for which it has orphan designation, the product is entitled to orphan exclusivity, which means the FDA may not approve any other application to market the same product for the same indication for a period of seven years, except in limited circumstances, such as a showing of clinical superiority over the product with orphan exclusivity or where the manufacturer with orphan exclusivity is unable to assure sufficient quantities of the approved orphan designated product. Competitors, however, may receive approval of different products for the indication for which the orphan product has exclusivity or obtain approval for the same product but for a different indication for which the orphan product has exclusivity. Orphan product exclusivity also could block the approval of one of our products for seven years if a competitor obtains approval of the same product as defined by the FDA or if our product candidate is determined to be contained within the competitor's product for the same indication or disease. If a drug or biological product designated as an orphan product receives marketing approval for an indication broader than what is designated, it may not be entitled to orphan product exclusivity.

Post-approval requirements

Drugs manufactured or distributed pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product sampling and distribution, advertising and promotion and reporting of adverse experiences with the product. After approval, most changes to the approved product, such as adding new indications or other labeling claims are subject to prior FDA review and approval. There also are continuing, annual program user fee requirements for any marketed products, as well as application fees for supplemental applications with clinical data.

The FDA may impose a number of post-approval requirements as a condition of approval of an NDA. For example, the FDA may require post-marketing testing, including Phase 4 clinical trials, and surveillance to further assess and monitor the product's safety and effectiveness after commercialization.

In addition, drug manufacturers and other entities involved in the manufacture and distribution of approved drugs are required to register their establishments with the FDA and state agencies and are subject to periodic unannounced inspections by the FDA and these state agencies for compliance with cGMP requirements. Changes to the manufacturing process are strictly regulated and often require prior FDA approval before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP requirements and impose reporting and documentation requirements upon the sponsor and any third-party manufacturers that the sponsor may decide to use. Accordingly, manufacturers must continue to expend time, money, and effort in the area of production and quality control to maintain cGMP compliance.

Once an approval is granted, the FDA may withdraw the approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in mandatory

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revisions to the approved labeling to add new safety information; imposition of post-market studies or clinical trials to assess new safety risks; or imposition of distribution or other restrictions under a REMS program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- safety alerts, Dear Healthcare Provider letters, press releases or other communications containing warning or other safety information about the product;
- fines, warning letters or holds on post-approval clinical trials;
- refusal of the FDA to approve pending NDAs or supplements to approved NDAs, or suspension or revocation of product approvals;
- product seizure or detention, or refusal to permit the import or export of products; or
- injunctions or the imposition of civil or criminal penalties.

The FDA strictly regulates marketing, labeling, advertising and promotion of products that are placed on the market. Drugs may be promoted only for the approved indications and in accordance with the provisions of the approved label. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant liability.

In addition, the distribution of prescription pharmaceutical products is subject to the Prescription Drug Marketing Act, or PDMA, which regulates the distribution of drugs and drug samples at the federal level, and sets minimum standards for the registration and regulation of drug distributors by the states. Both the PDMA and state laws limit the distribution of prescription pharmaceutical product samples and impose requirements to ensure accountability in distribution.

Coverage and reimbursement

Sales of our product candidates, if approved, will depend, in part, on the extent to which the cost of such products will be covered and adequately reimbursed by third-party payors, such as government healthcare programs, commercial insurance and managed healthcare organizations. These third-party payors are increasingly limiting coverage and/or reducing reimbursements for medical products and services by challenging the prices and examining the medical necessity and cost-effectiveness of medical products and services, in addition to their safety and efficacy. If these third-party payors do not consider our products to be cost-effective compared to other therapies, they may not cover our products after approval as a benefit under their plans or, if they do, the level of payment may not be sufficient to allow us to sell our products on a profitable basis.

There is no uniform policy requirement for coverage and reimbursement for drug products among third-party payors in the United States. Therefore, coverage and reimbursement for drug products can differ significantly from payor to payor. The coverage determination process can be a time-consuming and costly process that may require us to provide scientific and clinical support for the use of our products to each payor separately, with no assurance that coverage and adequate reimbursement will be obtained or applied consistently. Even if reimbursement is provided, market acceptance of our products may be adversely affected if the amount of payment for our products proves to be unprofitable for healthcare providers or less profitable than alternative treatments, or if administrative burdens make our products less desirable to use.

In addition, the U.S. government, state legislatures and foreign governments have continued implementing cost-containment programs, including price controls, restrictions on reimbursement and requirements for

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substitution of generic products. 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 product candidates or a decision by a third-party payor to not cover our product candidates could reduce physician usage of our products candidates, once approved, and have a material adverse effect on our sales, results of operations and financial condition.

U.S. healthcare reform

There have been and continue to be proposals by the federal government, state governments, regulators and third-party payors to control or manage the increased costs of healthcare and, more generally, to reform the U.S. healthcare system. By way of example, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, collectively referred to as the ACA, enacted in March 2010, has had and is expected to continue to have a significant impact on the healthcare industry. The ACA, among other things, imposed a significant annual fee on certain companies that manufacture or import branded prescription drug products, and established a new Medicare Part D coverage gap discount program, in which manufacturers must now agree to offer 70% point-of-sale discounts off negotiated prices of applicable brand drugs and therapeutic biologics to eligible beneficiaries during their coverage gap period, as a condition for the manufacturer's outpatient drugs and therapeutic biologics to be covered under Medicare Part D. The ACA also increased the Medicaid rebate rate and expanded the rebate program to include Medicaid managed care organizations. It also contained substantial new provisions intended to broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against healthcare fraud and abuse, add new transparency requirements for the healthcare industry, impose new taxes and fees on pharmaceutical manufacturers, and impose additional health policy reforms, any or all of which may affect our business.

There remain judicial and Congressional challenges to certain aspects of the ACA, as well as efforts by the Trump administration to repeal or replace certain aspects of the ACA. For example, the Tax Cuts and Jobs Act of 2017, or the Tax Act, included 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, the 2020 federal spending package permanently eliminated, effective January 1, 2020, the ACA-mandated "Cadillac" tax on high-cost employer-sponsored health coverage and, effective January 1, 2021, also eliminated the health insurance tax. On December 14, 2018, a Texas U.S. District Court Judge ruled that the ACA is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Act. Additionally, on December 18, 2019, the U.S. Court of Appeals for the 5th Circuit upheld the District Court ruling that the individual mandate was unconstitutional and remanded the case back to the District Court to determine whether the remaining provisions of the ACA are invalid as well. On March 2, 2020, the United States Supreme Court granted the petitions for writs of certiorari, and the case is currently under review by the Supreme Court. It is unclear how such litigation, and other efforts to challenge, repeal or replace the ACA will impact the ACA and our business.

Other legislative changes have also been proposed and adopted since the ACA was enacted. For example, the Budget Control Act of 2011 resulted in aggregate reductions in Medicare payments to providers of 2% per fiscal year, which went into effect in 2013 and, following passage of subsequent legislation, will stay in effect through 2030, with the exception of a temporary suspension from May 1, 2020 through December 31, 2020 implemented under the Coronavirus Aid, Relief and Economic Security Act, or CARES Act, unless additional Congressional action is taken. Additionally, the American Taxpayer Relief Act of 2012, among other things, reduced Medicare payments to several types of providers and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. New laws may result in additional reductions in Medicare and other healthcare funding.

Further, there has been heightened governmental scrutiny over the manner in which manufacturers set prices for their marketed products. Such scrutiny has resulted in several recent Congressional inquiries and proposed and enacted federal and state legislation designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for products. At the federal level, the Trump administration's budget proposal for fiscal year 2021 includes a \$135 billion allowance to support legislative proposals seeking to reduce drug prices, increase competition, lower out-of-pocket drug costs for patients, and increase patient access to lower-cost generic and biosimilar drugs. Further, the Trump administration previously released a "Blueprint" to lower drug prices and reduce out of pocket costs of drugs that contained 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. The FDA also recently released a final rule, effective November 30, 2020, implementing a portion of President Trump's Executive Order announced on July 24, 2020 that directed HHS to finalize the Canadian drug importation proposed rule previously issued by HHS and make other changes allowing for personal importation of drugs from Canada. The FDA final rule provides guidance for states to build and submit importation plans for drugs from Canada. Further, on November 20, 2020, HHS finalized a regulation removing safe harbor protection for price reductions from pharmaceutical manufacturers to plan sponsors under Part D, either directly or through pharmacy benefit managers, unless the price reduction is required by law. The rule also creates a new safe harbor for price reductions reflected at the point-of-sale, as well as a safe harbor for fixed fees to pharmacy benefit managers for certain services rendered to manufacturers. The probability of success of the other recently announced policies under the Trump administration, which would require additional authorization to be effective, and their impact on our products, if approved, is uncertain, particularly in light of the new incoming Biden administration. At the state level, legislatures have become increasingly aggressive in passing legislation and implementing regulations designed to control pharmaceutical and biological 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. It is also possible that additional governmental action is taken in response to the COVID-19 pandemic.

It is uncertain whether and how future legislation, whether domestic or foreign, could affect prospects for our product candidates or what actions foreign, federal, state, or private payors for healthcare treatment and services may take in response to any such healthcare reform proposals or legislation, particularly in light of the recent U.S. presidential election. Adoption of price controls and other cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures reforms may prevent or limit our ability to generate revenue, attain profitability or commercialize our product candidates.

Other healthcare laws and compliance requirements

We will also be subject to healthcare regulation and enforcement by the federal, state and foreign governments in which we will conduct our business once our products are approved. These fraud and abuse and transparency laws may impact, among other things, our financial arrangements and proposed sales, marketing and education programs.

The federal Anti-Kickback Statute, prohibits, among other things, persons from knowingly and willfully soliciting, receiving, offering or paying remuneration, directly or indirectly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, order, or recommendation of, an item or service reimbursable under a federal healthcare program, such as the Medicare and Medicaid programs. 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.

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Moreover, the federal civil and criminal false claims laws, including the civil False Claims Act, which can be enforced through “qui tam” whistleblower actions, prohibit, among other things, individuals or entities from knowingly presenting, or causing to be presented, claims for payment from Medicare, Medicaid, or other third-party payors that are false or fraudulent, or making a false statement or record material to payment of a false claim or avoiding, decreasing, or concealing an obligation to pay money to the federal government. Additionally, the government may assert that a claim including items and services resulting from a violation of the U.S. federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the civil False Claims Act.

In addition, the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, created federal criminal statutes that prohibit executing a scheme to defraud any healthcare benefit program and making false statements relating to healthcare matters. Similar to 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 Physician Payments Sunshine Act requires applicable manufacturers of covered drugs to disclose payments and other transfers of value provided to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors) and teaching hospitals as well as physician ownership and investment interests. Beginning for payments made in 2021, applicable manufactures will also be required to report payments to physician assistants, nurse practitioners, clinical nurse specialists, certified nurse anesthetists and certified nurse-midwives as well.

The majority of states also have statutes or regulations similar to the aforementioned federal anti-kickback and false claims laws, which apply to items and services reimbursed under Medicaid and other state programs, or, in several states, apply regardless of the payor. In addition, we may be subject to reporting requirements under state transparency laws, as well as state laws that require pharmaceutical companies to comply with the industry’s voluntary compliance guidelines and the applicable compliance guidance promulgated by the federal government that otherwise restricts certain payments that may be made to health care providers and entities. In addition, certain states and local jurisdictions require the registration of pharmaceutical sales representatives.

Because of the breadth of these laws and the narrowness of available statutory and regulatory exceptions, it is possible that some of our business activities could be subject to challenge under one or more of such laws. If we or our operations are found to be in violation of any of the laws described above or any other governmental regulations that apply to us, we may be subject to penalties, including significant administrative, civil and criminal penalties, damages, fines, imprisonment, disgorgement, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, exclusion of products from reimbursement under U.S. federal or state healthcare programs, and the curtailment or restructuring of our operations.

Government regulation outside of the United States

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 studies and any commercial sales and distribution of our products.

Whether or not we obtain FDA approval for a product, we must obtain the requisite approvals from regulatory authorities in foreign countries prior to the commencement of clinical studies 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 study application much like the IND prior to the commencement of human clinical studies.

The requirements and process governing the conduct of clinical studies, product licensing, pricing and reimbursement vary from country to country. If we 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.

Data privacy and security

Numerous state, federal and foreign laws, including consumer protection laws and regulations, govern the collection, dissemination, processing, use, access to, confidentiality and security of personal information, including health-related information. In the United States, numerous federal and state laws and regulations, including state data breach notification laws, state health information privacy laws, and federal and state consumer protection laws and regulations (e.g., Section 5 of the FTC Act), govern the collection, use, disclosure, and protection of health-related and other personal information could apply to our operations or the operations of our partners. For example, HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, and their respective implementing regulations, imposes privacy, security and breach notification obligations on certain health care providers, health plans, and health care clearinghouses, known as covered entities, as well as their business associates that perform certain services involving creating, receiving, maintaining or transmitting individually identifiable health information for or on behalf of such covered entities. Entities that are found to be in violation of HIPAA as the result of a breach of unsecured protected health information, a complaint about privacy practices or an audit by HHS, may be subject to significant civil, criminal and administrative fines and penalties and/or additional reporting and oversight obligations if required to enter into a resolution agreement and corrective action plan with HHS to settle allegations of HIPAA non-compliance. Further, entities that knowingly obtain, use, or disclose individually identifiable health information maintained by a HIPAA covered entity in a manner that is not authorized or permitted by HIPAA may be subject to criminal penalties.

Even when HIPAA does not apply, according to the FTC, violating consumers' privacy rights or failing to take appropriate steps to keep consumers' personal information secure may constitute unfair acts or practices in or affecting commerce in violation of Section 5(a) of the FTC Act. The FTC expects a company's data security measures to be reasonable and appropriate in light of the sensitivity and volume of consumer information it holds, the size and complexity of its business, and the cost of available tools to improve security and reduce vulnerabilities. Individually identifiable health information is considered sensitive data that merits stronger safeguards.

In addition, certain state and non-U.S. laws, such as the GDPR 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/or criminal penalties and private litigation. For example, California recently enacted legislation, the California Consumer Privacy Act, or CCPA, which went into effect January 1, 2020. The CCPA, among other things, creates new data privacy obligations for covered companies and provides new privacy rights to California residents, including the right to opt out of certain disclosures of their information. The CCPA also creates a private right of action with statutory damages for certain data breaches, thereby potentially increasing risks associated with a data breach. In Europe, the GDPR went into effect in May 2018 and introduces strict requirements for processing the personal data of individuals within the EEA. In addition, the GDPR increases the scrutiny of transfers of personal data from clinical trial sites located in the EEA to the United States and other jurisdictions that the European Commission does not recognize as having "adequate" data protection laws. Recent legal developments in Europe have created complexity and compliance uncertainty regarding certain transfers of personal data from the EEA. For example, on July 16, 2020, the Court of Justice of the European Union ("CJEU")

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invalidated the EU-US Privacy Shield Framework (“Privacy Shield”) under which personal data could be transferred from the EEA to United States entities who had self-certified under the Privacy Shield scheme. While the CJEU upheld the adequacy of the standard contractual clauses (a standard form of contract approved by the European Commission as an adequate personal data transfer mechanism, and potential alternative to the Privacy Shield), it made clear that reliance on them alone may not necessarily be sufficient in all circumstances. Use of the standard contractual clauses must now be assessed on a case-by-case basis taking into account the legal regime applicable in the destination country, in particular applicable surveillance laws and rights of individuals. Companies that must comply with the GDPR face increased compliance obligations and risk, including more robust regulatory enforcement of data protection requirements and potential fines for noncompliance of up to €20 million or 4% of the annual global revenues of the noncompliant company, whichever is greater. In addition, following Brexit and the end of the Transition Period, companies will have to comply with the GDPR and the GDPR as incorporated into United Kingdom national law, the latter regime having the ability to separately fine up to the greater of £17.5 million or 4% of global turnover. The relationship between the United Kingdom and the European Union in relation to certain aspects of data protection law remains unclear, for example around how data can lawfully be transferred between each jurisdiction, which exposes us to further compliance risk.

Employees

As of September 30, 2020, we had 33 full-time employees in activities such as research and development, finance, clinical development, regulatory affairs, project management and administration. None of our employees is represented by a labor union or covered by a collective bargaining agreement. We consider our relationship with our employees to be good.

In order to successfully implement our development and commercialization plans and strategies, and as we transition into operating as a public company, we expect to need additional managerial, operational, sales, marketing, financial and other personnel. Future growth would impose 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, FDA, EMA and other comparable foreign regulatory agencies’ review process for BT-11, NX-13 and any other future product candidates, while complying with any contractual obligations to contractors and other third parties we may have; and
- improving our operational, financial and management controls, reporting systems and procedures.

Facilities

Our principal executive office is located at 1800 Kraft Drive, Suite 216, Blacksburg, Virginia, 24060, where we lease approximately 5,500 square feet of office and lab space under a lease that terminates on July 31, 2021. This space houses the internal research and development efforts with a fully functional wet lab equipped with lab benches, hoods, safety equipment and appropriate plumbing and ventilation to conduct hands-on scientific research; and a vivarium, featuring five animal rooms for internal studies. We also occupy approximately 700 square feet of office space in Ashburn, Virginia, which lease expires June 30, 2021. We believe that our facilities are sufficient to meet our current needs and that suitable additional space will be available as and when needed.

Legal proceedings

We are not subject to any material legal proceedings.

Management

Executive officers and directors

The following table provides information regarding our current executive officers and directors, including their ages as of November 1, 2020:

Name	Age	Position(s)
Executive officers		
Josep Bassaganya-Riera, Ph.D.	45	Chairman, President, Chief Executive Officer and Common Stock Director
Raquel Hontecillas, Ph.D.	49	Chief Scientific Officer
Jyoti Chauhan, MS, RAC	31	Executive Director, Global Clinical Operations and Regulatory Compliance
Non-employee directors		
Christopher Garabedian	54	Director
Konstantin Poukalov	37	Director
Roderick Wong, M.D.	43	Director

(1) Member of the audit committee.

(2) Member of the compensation committee.

(3) Member of the nominating and corporate governance committee.

Executive officers

Josep Bassaganya-Riera, Ph.D. has served as our Chairman, President and Chief Executive Officer since our founding in January 2017. Dr. Bassaganya-Riera has served as the Director of the Nutritional Immunology and Molecular Medicine Laboratory since July 2002 and the Chairman of the board of directors of Biotherapeutics Inc. since October 2008. He previously served as the Chief Executive Officer of Biotherapeutics from October 2008 to September 2017 and a Research Professor of Immunology at Virginia Tech from December 2002 to May 2020. Dr. Bassaganya-Riera holds a degree in Veterinary Medicine from Universitat Autònoma de Barcelona and a Ph.D. in Nutrition and Immunology from Iowa State University. Our board of directors believes that Dr. Bassaganya-Riera is qualified to serve as a director based on his role as the founder of our company, his service as our President and Chief Executive Officer and his extensive management and technical experience in the pharmaceutical industry.

Raquel Hontecillas, Ph.D. has served as our Chief Scientific Officer since our founding in January 2017. Dr. Hontecillas is the Co-Director of the Nutritional Immunology and Molecular Medicine Laboratory, a position she has held since July 2002, and the Chief Scientific Officer of Biotherapeutics, Inc., a position she has held since October 2008. She previously served as a Research Professor of Immunology at Virginia Tech from July 2008 to July 2020. Dr. Hontecillas holds a degree in Veterinary Medicine from Universidad Complutense University de Madrid, Spain and a Ph.D. in Immunology from Iowa State University.

Jyoti Chauhan, MS, RAC has served as our Executive Director of Global Clinical Operations and Regulatory Affairs since August 2019. She previously served as our Clinical Project Manager from February 2018 to July 2018 and our Program Director, Clinical Operations and Regulatory Affairs from July 2018 to August 2019. Ms. Chauhan previously served as the Manager of Regulatory Affairs at NexImmune, Inc. from March 2018 to August 2018, the Senior Regulatory Affairs Specialist at the International Partnership for Microbicides from September 2017 to March 2018 and the Regulatory Affairs Specialist at Technical Resources International, Inc. from March 2016

to September 2017, and currently serves as a Principal at Nova Technology Inc., a position she has held since October 2015. Ms. Chauhan holds a B.S. in Biotechnology with Chemistry, Botany and Zoology from Hemwati Nandan Bahuguna Garhwal University and a M.S. in Pharmaceutical Sciences from the Narsee Monjee Institute of Management Studies.

Non-employee directors

Christopher Garabedian has served as a director since September 2017. He founded Xontogeny in June 2016 and serves as its Chairman and Chief Executive Officer. Mr. Garabedian also serves as a Senior Advisor at the Boston Consulting Group, a position he has held since January 2016, and as a Portfolio Manager at Perceptive Advisors, a position he has held since May 2017. He previously served as the President and Chief Executive Officer of Sarpeta Therapeutics, Inc. from January 2011 to March 2015, as well as a member of the board of directors from June 2010 to March 2015. Mr. Garabedian earned a B.S. in Marketing from the University of Maryland. Our board of directors believes that Mr. Garabedian is qualified to serve as a director based on his extensive management experience in the biopharmaceutical industry.

Konstantin Poukalov has served as a director since August 2019. Mr. Poukalov has served a Managing Director at Perceptive Advisors since March 2019 and as the Chief Business Officer of ARYA Sciences Acquisition Corp II since June 2020. He previously served as the Chief Financial Officer of Kadmon Holdings, Inc. from July 2014 to October 2018. He has served on the board of directors of Lyra Therapeutics since January 2020. Mr. Poukalov holds a B.S. in Electrical Engineering from Stony Brook University. Our board of directors believes that Mr. Poukalov is qualified to serve as a director based on his extensive financial and industry experience.

Roderick Wong, M.D. has served as a director since August 2019. Dr. Wong has served as Managing Partner and Chief Investment Officer of RTW Investments, LP since 2010. Dr. Wong previously served as the President, Chief Executive Officer and Chairman of Health Sciences Acquisition Corporation from December 2018 to December 2019. He has served as Chairman of the board of directors of Rocket Pharmaceuticals, Inc. since July 2015 and as a member of the board of directors of Avidity Biosciences, Inc. since June 2020. Dr. Wong holds a B.S. in Economics from Duke University, an M.D. from the University of Pennsylvania Medical School and an M.B.A. from Harvard Business School. Our board of directors believes that Dr. Wong is qualified to serve as a director based on his experience as an investor and an executive in the biopharmaceutical industry.

Board composition

Our business and affairs are managed under the direction of our board of directors. Our board of directors currently consists of members. Each director is currently elected to the board for a one-year term, to serve until the election and qualification of successor directors at the annual meeting of stockholders, or until the director's earlier removal, resignation or death.

Our directors were elected to, and currently serve on, the board pursuant to a voting agreement among us and several of our largest stockholders. This agreement will terminate upon the closing of this offering, after which there will be no further contractual obligations regarding the election of our directors. Thereafter, each of our current directors will continue to serve until the election and qualification of his or her successor, or his or her earlier death, resignation or removal.

In accordance with our amended and restated certificate of incorporation, which will be in effect upon the closing of this offering, our board of directors will be divided into three classes, each of which will consist, as nearly as possible, of one-third of the total number of directors constituting our entire board and which will serve staggered three-year terms. At each annual meeting of stockholders, the successors to directors whose

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terms then expire will be elected to serve from the time of election and qualification until the third annual meeting following election. Our directors will be divided among the three classes as follows:

- Class I, which will consist of _____ and _____, and their term will expire at our first annual meeting of stockholders to be held after the closing of this offering;
- Class II, which will consist of _____ and _____, and their term will expire at our second annual meeting of stockholders to be held after the closing of this offering; and
- Class III, which will consist of _____ and _____, and their term will expire at our third annual meeting of stockholders to be held after the closing of this offering.

Our amended and restated bylaws, which will become effective upon the closing of this offering, will provide that the authorized number of directors may be changed only by resolution approved by a majority of our board of directors. Any additional directorships resulting from an increase in the number of directors will be distributed among the three classes so that, as nearly as possible, each class will consist of one-third of the directors.

The division of our board of directors into three classes with staggered three-year terms may delay or prevent a change of our management or a change of control.

Director independence

Applicable Nasdaq rules require a majority of a listed company's board of directors to be comprised of independent directors within one year of listing. In addition, Nasdaq rules require that, subject to specified exceptions, each member of a listed company's audit, compensation and nominating and corporate governance committees be independent and that audit committee members also satisfy independence criteria set forth in Rule 10A-3 under the Exchange Act of 1934, as amended, or the Exchange Act. The Nasdaq independence definition includes a series of objective tests, such as that the director is not, and has not been for at least three years, one of our employees, that neither the director nor any of his family members has engaged in various types of business dealings with us and that the director is not associated with the holders of more than 5% of our common stock. In addition, under applicable Nasdaq rules, a director will only qualify as an "independent director" if, in the opinion of the listed 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.

Our board of directors has determined that all of our directors, except for Dr. Bassaganya-Riera, are independent directors, as defined under applicable Nasdaq rules. In making such determination, our board of directors considered the current and prior relationships that each such director has with our company and all other facts and circumstances that our board of directors deemed relevant in determining his or her independence, including the beneficial ownership of our capital stock by each director and the transactions described in the section titled "Certain relationships and related party transactions."

There are no family relationships among any of our directors or executive officers, except between our Chairman, Chief Executive Officer and President Josep Bassaganya-Riera and our Chief Scientific Officer Raquel Hontecillas, who are married.

Role of the board in risk oversight

One of the key functions of our board of directors is informed oversight of our risk management process. Our board of directors does not have a standing risk management committee, but rather administers this oversight function directly through the board of directors as a whole, as well as through various standing committees of

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our board of directors that address risks inherent in their respective areas of oversight. In particular, our board of directors is responsible for monitoring and assessing strategic risk exposure and our audit committee has the responsibility to consider and discuss our major financial risk exposures and the steps our management has taken to monitor and control these exposures, including guidelines and policies to govern the process by which risk assessment and management is undertaken. The audit committee also monitors compliance with legal and regulatory requirements.

Board committees

Our board of directors has established an audit committee, compensation committee and a nominating and corporate governance committee, each of which operate pursuant to a committee charter. Our board of directors may establish other committees to facilitate the management of our business. The composition and functions of each committee are described below.

Audit committee

Upon completion of this offering, our audit committee will consist of _____, _____ and _____, with _____ serving as chair of the audit committee. Our board of directors has determined that each of these individuals meets the independence requirements of the Sarbanes-Oxley Act of 2002, as amended, or the Sarbanes-Oxley Act, Rule 10A-3 under the Securities Exchange Act of 1934, or the Exchange Act, and the applicable listing standards of Nasdaq. Each member of our audit committee can read and understand fundamental financial statements in accordance with Nasdaq audit committee requirements. In arriving at this determination, the board has examined each audit committee member's scope of experience and the nature of their prior and/or current employment.

Our board of directors has determined that _____ qualifies as an audit committee financial expert within the meaning of SEC regulations and meets the financial sophistication requirements of the Nasdaq listing standards. In making this determination, our board has considered _____ formal education and previous and current experience in financial and accounting roles. Both our independent registered public accounting firm and management periodically meet privately with our audit committee.

The functions of this committee include, among other things:

- evaluating the performance, independence and qualifications of our independent auditors and determining whether to retain our existing independent auditors or engage new independent auditors;
- reviewing and approving the engagement of our independent auditors to perform audit services and any permissible non-audit services;
- monitoring the rotation of partners of our independent auditors on our engagement team as required by law;
- prior to engagement of any independent auditor, and at least annually thereafter, reviewing relationships that may reasonably be thought to bear on their independence, and assessing and otherwise taking the appropriate action to oversee the independence of our independent auditor;
- reviewing our annual and quarterly financial statements and reports, including the disclosures contained under the caption "Management's discussion and analysis of financial condition and results of operations," and discussing the statements and reports with our independent auditors and management;
- reviewing with our independent auditors and management significant issues that arise regarding accounting principles and financial statement presentation and matters concerning the scope, adequacy and effectiveness of our financial controls;

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- reviewing with management and our auditors any earnings announcements and other public announcements regarding material developments;
- establishing procedures for the receipt, retention and treatment of complaints received by us regarding financial controls, accounting or auditing matters and other matters;
- preparing the report that the SEC requires in our annual proxy statement;
- reviewing and providing oversight of any related-person transactions in accordance with our related person transaction policy and reviewing and monitoring compliance with legal and regulatory responsibilities, including our code of business conduct and ethics;
- reviewing our major financial risk exposures, including the guidelines and policies to govern the process by which risk assessment and risk management is implemented;
- reviewing on a periodic basis our investment policy; and
- reviewing and evaluating on an annual basis the performance of the audit committee and the audit committee charter.

We believe that the composition and functioning of our audit committee complies with all applicable requirements of the Sarbanes-Oxley Act, and all applicable SEC and Nasdaq rules and regulations. We intend to comply with future requirements to the extent they become applicable to us.

Compensation committee

Upon completion of this offering, our compensation committee will consist of _____, _____ and _____, with _____ serving as chair of the compensation committee. Each of these individuals is a non-employee director, as defined in Rule 16b-3 promulgated under the Exchange Act and is an "outside director," as defined pursuant to Section 162(m) of the Internal Revenue Code of 1986, as amended, or the Code. Our board of directors has determined that each of these individuals is "independent" as defined under the applicable listing standards of Nasdaq, including the standards specific to members of a compensation committee. The functions of this committee include, among other things:

- reviewing, modifying and approving (or if it deems appropriate, making recommendations to the full board of directors regarding) our overall compensation strategy and policies;
- making recommendations to the full board of directors regarding the compensation and other terms of employment of our executive officers;
- reviewing and making recommendations to the full board of directors regarding performance goals and objectives relevant to the compensation of our executive officers and assessing their performance against these goals and objectives;
- reviewing and approving (or if it deems appropriate, making recommendations to the full board of directors regarding) the equity incentive plans, compensation plans and similar programs advisable for us, as well as modifying, amending or terminating existing plans and programs;
- evaluating risks associated with our compensation policies and practices and assessing whether risks arising from our compensation policies and practices for our employees are reasonably likely to have a material adverse effect on us;
- reviewing and making recommendations to the full board of directors regarding the type and amount of compensation to be paid or awarded to our non-employee board members;

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- establishing policies with respect to votes by our stockholders to approve executive compensation to the extent required by Section 14A of the Exchange Act and, if applicable, determining our recommendations regarding the frequency of advisory votes on executive compensation;
- reviewing and assessing the independence of compensation consultants, legal counsel and other advisors as required by Section 10C of the Exchange Act;
- administering our equity incentive plans;
- establishing policies with respect to equity compensation arrangements;
- reviewing the competitiveness of our executive compensation programs and evaluating the effectiveness of our compensation policy and strategy in achieving expected benefits to us;
- reviewing and making recommendations to the full board of directors regarding the terms of any employment agreements, severance arrangements, change in control protections and any other compensatory arrangements for our executive officers;
- reviewing with management and approving our disclosures under the caption “Compensation Discussion and Analysis” in our periodic reports or proxy statements to be filed with the SEC, to the extent such caption is included in any such report or proxy statement;
- preparing the report that the SEC requires in our annual proxy statement; and
- reviewing and evaluating on an annual basis the performance of the compensation committee and the compensation committee charter.

We believe that the composition and functioning of our compensation committee complies with all applicable requirements of the Sarbanes-Oxley Act, and all applicable SEC and Nasdaq rules and regulations. We intend to comply with future requirements to the extent they become applicable to us.

Nominating and corporate governance committee

Upon completion of this offering, our nominating and corporate governance committee will consist of _____, _____ and _____, with _____ serving as chair of the nominating and corporate governance committee. Our board of directors has determined that each of these individuals is “independent” as defined under the applicable listing standards of Nasdaq and SEC rules and regulations. The functions of this committee include, among other things:

- identifying, reviewing and evaluating candidates to serve on our board of directors;
- determining the minimum qualifications for service on our board of directors;
- evaluating director performance on the board and applicable committees of the board and determining whether continued service on our board is appropriate;
- evaluating, nominating and recommending individuals for membership on our board of directors;
- evaluating nominations by stockholders of candidates for election to our board of directors;
- considering and assessing the independence of members of our board of directors;
- developing a set of corporate governance policies and principles and recommending to our board of directors any changes to such policies and principles;

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- reviewing and making recommendations to the board of directors with respect to management succession planning;
- considering questions of possible conflicts of interest of directors as such questions arise; and
- reviewing and evaluating on an annual basis the performance of the nominating and corporate governance committee and the nominating and corporate governance committee charter.

We believe that the composition and functioning of our nominating and corporate governance committee complies with all applicable requirements of the Sarbanes-Oxley Act, and all applicable SEC and Nasdaq rules and regulations. We intend to comply with future requirements to the extent they become applicable to us.

Compensation committee interlocks and insider participation

None of our directors who serve as a member of our compensation committee is, or has at any time during the past year been, one of our officers or employees. None of our executive officers currently serves, or in the past year has served, as a member of the board of directors or compensation committee of any other entity that has one or more executive officers serving on our board of directors or compensation committee.

Code of business conduct and ethics

Effective upon the closing of this offering, we will adopt a Code of Business Conduct and Ethics, or the Code of Conduct, applicable to all of our employees, executive officers and directors. This includes our principal executive officer, principal financial officer and principal accounting officer or controller, or persons performing similar functions. Following the closing of this offering, the full text of the Code of Conduct will be available on our website at www.landosbiopharma.com. We intend to post on our website all disclosures that are required by law or the listing standards of the Nasdaq Stock Market concerning any amendments to, or waivers from, any provision of the Code of Conduct. Information contained on, or that can be accessed through, our website is not incorporated by reference into this prospectus, and you should not consider information on our website to be part of this prospectus.

Non-employee director compensation

During the year ended December 31, 2019, we did not pay any fees to, make any equity awards or non-equity awards to, or pay any other compensation to the non-employee members of our board of directors for their services as directors. Our non-employee directors only received reimbursement of their actual out-of-pocket costs and expenses incurred in connection with attending board meetings. Dr. Bassaganya-Riera, our President and Chief Executive Officer, is also the Chairman of our board of directors and the Common Stock Director, but did not receive any additional compensation for his service as a director.

We intend to adopt a non-employee director compensation policy, pursuant to which our non-employee directors will be eligible to receive compensation for service on our board of directors and committees of our board of directors, following the completion of this offering.

Executive compensation

This section provides a summary of the compensation of our “named executive officers,” who are the three executive officers listed in the “Summary Compensation Table” below. In addition to presenting quantitative compensation information in the tables below, this section also provides a qualitative description of the material factors helpful to an understanding of such data.

Summary compensation table

The following table sets forth information regarding compensation awarded to, earned by and paid to our named executive officers with respect to the year ended December 31, 2019.

Name and principal position	Salary (\$) (1)	Bonus (\$) (2)	Total (\$)
Josep Bassaganya-Riera, Ph.D.(3) <i>Chairman, President, Chief Executive Officer and Common Stock Director</i>	382,083	—	382,083
Raquel Hontecillas, Ph.D. <i>Chief Scientific Officer</i>	89,583	30,000	119,583
Jyoti Chauhan, MS, RAC <i>Executive Director, Global Clinical Operations and Regulatory Compliance</i>	170,833	50,000	220,833

- (1) Each named executive officer’s base salary is a fixed component of annual compensation for performing specific duties and functions, and has been established taking into account each individual’s roles, responsibilities, skills and expertise. In 2019, we paid annual base salaries of \$350,000, \$75,000 and \$150,000 to each of Drs. Bassaganya-Riera and Hontecillas and Ms. Chauhan, respectively, which were subsequently increased to \$385,000, \$100,000 and \$200,000, respectively.
- (2) Represents discretionary bonuses awarded to Dr. Hontecillas and Ms. Chauhan in 2019 pursuant to their terms of their offer letter agreements. See “—Agreements with our named executive officers and potential payments upon termination of employment.”
- (3) Dr. Bassaganya-Riera is also our Chairman and Common Stock Director, but he did not receive any additional compensation in his capacity as a director in 2019.

Outstanding equity awards at December 31, 2019

As of December 31, 2019, our named executive officers did not hold any outstanding equity awards, nor did we grant, cancel or modify any equity awards during 2019.

Agreements with our named executive officers and potential payments upon termination of employment

We have entered into an employment agreement, effective January 1, 2020, or the Agreement, with Dr. Josep Bassaganya-Riera, that provides for an annual base salary of \$502,500, which is subject to increase during the term of the Agreement at the discretion of our board of directors, and an annual discretionary bonus with a target equal to 45% of Dr. Bassaganya-Riera’s annual base salary based upon the achievement of individual and company performance goals and conditions at our company as determined by our board of directors. The initial term of the employment agreement, or the Initial Term, is two years from the effective date of the employment agreement, and following the Initial Term, Dr. Bassaganya-Riera’s employment period will be automatically renewed for successive one-year periods unless either we or Dr. Bassaganya-Riera terminates it or elects not to renew it.

The Agreement further provides for the grant of an option to purchase 300,000 shares of common stock to Dr. Bassaganya-Riera, which was granted on October 2, 2020, at an exercise price of \$3.40 per share. The option vests and becomes exercisable over a three-year period commencing on January 1, 2020, with 25% of the option vesting immediately, 25% vesting on January 1, 2021 and the remaining 50% vesting in equal

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monthly installments over the twenty-four months thereafter. Pursuant to the Agreement, Dr. Bassaganya-Riera is eligible to receive a further option to purchase 150,000 shares of common stock granted in the event this initial public offering is priced at a “pre-money” valuation of \$1,000,000,000 or greater, not including the proceeds of this offering priced at the initial public offering price, or the fair market value as determined by the board, if greater. If, subsequent to this offering and prior to September 1, 2022, our company’s market capitalization, as determined by multiplying our daily volume weighted-average stock price by the number of shares of common stock then outstanding, exceeds \$2,000,000,000 over a consecutive 10-calendar day period, or over 15 calendar days within a 30-day calendar period, Dr. Bassaganya-Riera is entitled to receive a further option to purchase 150,000 shares of common stock.

Pursuant to the Agreement, if we terminate Dr. Bassaganya-Riera’s employment without “Cause,” or if Dr. Bassaganya-Riera terminates his employment for “Good Reason” (each, as defined in the Agreement), in exchange for execution and making effective and irrevocable, a general release in a form acceptable to us, compliance with certain non-competition and non-solicitation obligations, resignation from all positions with our company and return of all company property, he will be eligible for payment of his base salary for 12 months, or if during the Initial Term, payment of his base salary for the longer of the remainder of the Initial Term or 12 months, and any then-outstanding equity awards that would have become vested during the 12 months following the termination date will become fully vested and exercisable. Dr. Bassaganya-Riera will also be eligible for COBRA premiums, with the cost of the regular premium for such benefits shared in the same relative proportion by Dr. Bassaganya-Riera and us as in effect on his termination date until the earlier of 12 months or the date Dr. Bassaganya-Riera becomes eligible for health benefits through another employer or otherwise becomes ineligible for COBRA. Such severance and acceleration benefits are conditioned upon Dr. Bassaganya-Riera’s execution of and compliance with an effective and irrevocable general release, compliance with certain non-competition and non-solicitation obligations, resignation from all positions with us and return of all our property.

We intend to enter into employment agreements with Dr. Hontecillas and Ms. Chauhan prior to the completion of this offering. We have engaged Dr. Hontecillas and Ms. Chauhan with an offer letter that provides for an initial base salary, discretionary bonus opportunity and equity compensation, as described in “—Summary compensation table.” Neither of our current offer letter agreements with Dr. Hontecillas and Ms. Chauhan, nor our current employment arrangement with Dr. Bassaganya-Riera, includes any severance entitlements or other potential payments in the event of any change in control, termination, or other defined triggering events.

We do not maintain any other offer letters or employment agreements with any other named executive officers.

Retirement benefits and other compensation

Our named executive officers did not participate in, or otherwise receive any benefits under, any pension, retirement or deferred compensation plan sponsored by us during 2019. Our named executive officers were eligible to participate in our employee benefits, including health insurance and group life insurance benefits, on the same basis as our other employees. We generally do not provide perquisites or personal benefits except in limited circumstances, and we did not provide any perquisites or personal benefits to our named executive officers in 2019.

Equity incentive plans

2019 Equity incentive plan

In December 2019, our board of directors adopted the 2019 Equity Incentive Plan, or the 2019 Plan. The purpose of the 2019 Plan is to provide share-based and cash incentives that will assist in attracting, retaining, and motivating employees, including officers, directors and consultants. The material terms of the 2019 Plan are summarized below:

Share Reserve. A total of 2,003,956 shares of our common stock have been initially authorized and reserved for issuance under the 2019 Plan. As of December 31, 2019, we had not granted any awards under the 2019 Plan. In

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addition, the number of shares of our common stock reserved for issuance under our 2019 Plan is subject to an automatic increase on January 1 of each calendar year through January 1, 2029, in an amount equal to the lesser of 5.0% of the total number of shares of our common stock outstanding on the last day of the calendar month before the date of each automatic increase, 1,000,000 or a lesser number of shares as determined by the board of directors.

Shares subject to stock awards granted under our 2019 Plan that are forfeited, canceled, reacquired by us prior to vesting, expired (whether voluntarily or involuntarily), satisfied without the issuance of shares or withheld upon the exercise of a stock option or settlement of an award to cover the exercise price or tax withholding or otherwise terminated (other than by exercise) will be deemed not to have been issued for purposes of determining the maximum number of shares to be issued under the 2019 Plan. If any shares of common stock issued pursuant to a stock award are forfeited back to or repurchased or reacquired by us for any reason, the shares that are forfeited or repurchased will revert to and again become available for issuance under the 2019 Plan for all purposes other than the grant of incentive stock options.

Administration. Our 2019 Plan is administered by our board of directors or a committee appointed by our board of directors. Subject to the terms of the 2019 Plan, our board of directors has the authority to, among other things, select the persons to whom awards will be granted, construe and interpret our 2019 Plan as well as to prescribe, amend and rescind rules and regulations relating to the 2019 Plan and awards granted thereunder. Our board of directors may also delegate to one or more of our officers the authority to (1) designate employees (other than themselves) to receive specified stock awards and (2) determine the number of shares subject to such stock awards, subject to any limitations set by our board of directors. Under our 2019 Plan, our board of directors has the authority to determine award recipients, grant dates, the numbers and types of stock awards to be granted, the applicable fair market value and the provisions of each stock award, including the period of exercisability and the vesting schedule applicable to a stock award.

Under the 2019 Plan, the board of directors also generally has the authority to effect, with the consent of any adversely affected participant as required by the 2019 Plan, the amendment, modification or termination of any outstanding award.

Eligibility. Pursuant to the 2019 Plan, we may grant incentive stock options only to our employees (including officers and directors who are also employees). We may grant non-statutory stock options and other awards to our employees, directors and consultants.

Options and SARs. The 2019 Plan provides for the grant of (1) incentive stock options, which are intended to qualify for tax treatment as set forth under Section 422 of the Internal Revenue Code, as amended, or the Code, (2) non-statutory stock options to purchase shares of our common stock and (3) SARs, each at a stated exercise price and with other terms to be set forth in an award agreement. The exercise price of each stock option or SAR must be at least equal to the fair market value of our common stock on the date of grant. However, the exercise price of any incentive stock option granted to an individual who owns more than ten percent of the total combined voting power of all classes of our capital stock must be at least equal to 110% of the fair market value of our common stock on the date of grant.

The plan administrator determines the term of stock options granted under the 2019 Plan, up to a maximum of 10 years. Acceptable consideration for the purchase of common stock issued upon the exercise of a stock option will be determined by the plan administrator and may include (1) cash, check or wire transfer, (2) a broker-assisted cashless exercise, (3) the tender of shares of our common stock previously owned by the option holder or (4) other legal consideration approved by the plan administrator.

The aggregate fair market value, determined at the time of grant, of our common stock with respect to incentive stock options that are exercisable for the first time by an award holder during any calendar year

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under all of our stock plans may not exceed \$100,000. Options or portions thereof that exceed such limit will generally be treated as non-statutory stock options. No incentive stock options may be granted to any person who, at the time of the grant, owns or is deemed to own stock possessing more than 10% of our total combined voting power or that of any of our affiliates unless (1) the option exercise price is at least 110% of the fair market value of the stock subject to the option on the date of grant, and (2) the term of the ISO does not exceed five years from the date of grant.

Restricted stock, restricted stock units and unrestricted stock. The 2019 Plan allows for the grant of restricted stock awards, restricted stock units and unrestricted stock, with terms as generally determined by the administrator (in accordance with the 2019 Plan) and to be set forth in an award agreement. Dividends and other distributions may be credited in respect of shares covered by such awards.

Performance awards. The 2019 Plan allows for the grant of performance, other stock-based, or cash incentive awards, with terms as generally determined by the administrator (in accordance with the 2019 Plan) and to be set forth in an award agreement. Performance awards may be granted subject to vesting or payment based on the achievement of performance goals established in connection with the grant of the award. The terms of such awards will be determined by the administrator (in accordance with the 2019 Plan) and to be set forth in an award agreement.

Other stock awards. The administrator may grant other awards based in whole or in part by reference to our common stock. The plan administrator will set the number of shares under the stock award and all other terms and conditions of such awards.

Limited transferability. Unless otherwise determined by our board of directors, awards under the 2019 Plan generally may not be transferred or assigned in any manner other than by will or the laws of descent and distribution, or as permitted by Rule 701 promulgated under the Securities Act.

Corporate transaction. In the event that we are subject to a corporate transaction (as defined in the 2019 Plan and generally meaning, collectively, a merger, a sale or transfer of more than 50% of the voting power of all of our outstanding securities, or a sale of all or substantially all of our assets), the 2019 Plan provides that the administrator may provide, in its discretion, for the treatment of outstanding awards, including the continuation of outstanding awards, the assumption or substitution of awards, the acceleration of vesting of awards, the settlement of awards (whether or not vested) in cash, securities or other consideration, the cancellation of such awards for no consideration or a combination of the foregoing. The administrator need not treat all awards in a similar manner.

Adjustments. In the event of a stock split, reverse stock split, stock dividend, reorganization, recapitalization, combination or exchange of shares, reclassification, spin-off or other similar change in capitalization, or any dividend or distribution to holders of shares other than an ordinary cash dividend, each outstanding award will (to the extent appropriate) be appropriately adjusted (subject to required action by the board), in order to prevent diminution or enlargement of benefits or potential benefits intended to be made available under the 2019 Plan or otherwise as required by applicable law.

Amendment and termination. The board of directors may amend, suspend or terminate the 2019 Plan, in whole or in part, at any time. However, any rights under outstanding awards granted under the 2019 Plan at the time of amendment or termination will not be materially or adversely affected.

Limitations on liability and indemnification matters

Upon the closing of this offering, our amended and restated certificate of incorporation will contain provisions that limit the liability of our current and former directors for monetary damages to the fullest extent permitted

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by Delaware law. Delaware law provides that directors of a corporation will not be personally liable for monetary damages for any breach of fiduciary duties as directors, except liability for:

- any breach of the director's duty of loyalty to the corporation or its stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- unlawful payments of dividends or unlawful stock repurchases or redemptions as provided in Section 174 of the Delaware General Corporation Law; or
- any transaction from which the director derived an improper personal benefit.

This limitation of liability does not apply to liabilities arising under federal securities laws and does not affect the availability of equitable remedies such as injunctive relief or rescission.

Our amended and restated certificate of incorporation and our amended and restated bylaws will provide that we are required to indemnify our directors to the fullest extent permitted by Delaware law. Our amended and restated bylaws will also provide that, upon satisfaction of certain conditions, we are required to advance expenses incurred by a director in advance of the final disposition of any action or proceeding, and 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 that capacity regardless of whether we would otherwise be permitted to indemnify him or her under the provisions of Delaware law. Our amended and restated bylaws will also provide our board of directors with discretion to indemnify our officers and employees when determined appropriate by the board.

We have entered into indemnification agreements with each of our directors and expect to enter into indemnification agreements with each of our executive officers prior to the closing of this offering. With certain exceptions, these agreements provide for indemnification for related expenses including, among other things, attorneys' fees, judgments, fines and settlement amounts incurred by any of these individuals in any action or proceeding. We believe that these bylaw provisions and indemnification agreements are necessary to attract and retain qualified persons as directors and executive officers. We also maintain customary directors' and officers' liability insurance.

The limitation of liability and indemnification provisions in our amended and restated certificate of incorporation and amended and restated bylaws may discourage stockholders from bringing a lawsuit against our directors for breach of their fiduciary duty. They may also reduce the likelihood of derivative litigation against our directors and officers, even though an action, if successful, might benefit us and other stockholders. Further, a stockholder's investment may be adversely affected to the extent that we pay the costs of settlement and damage awards against directors and officers as required by these indemnification provisions. At present, there is no pending litigation or proceeding involving any of our directors, officers or employees for which indemnification is sought and we are not aware of any threatened litigation that may result in claims for indemnification.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted for our directors, executive officers or persons controlling us, we have been informed that, in the opinion of the SEC, such indemnification is against public policy as expressed in the Securities Act and is therefore unenforceable.

Rule 10b5-1 sales plans

Our directors and executive officers may adopt written plans, known as Rule 10b5-1 plans, in which they will contract with a broker to buy or sell shares of our common stock on a periodic basis. Under a Rule 10b5-1 plan, a broker executes trades pursuant to parameters established by the director or officer when entering into the

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plan, without further direction from them. The director or officer may amend a Rule 10b5-1 plan in some circumstances and may terminate a plan at any time. Our directors and executive officers also may buy or sell additional shares outside of a Rule 10b5-1 plan when they are not in possession of material nonpublic information subject to compliance with the terms of our insider trading policy. Prior to 180 days after the date of this offering, subject to early termination, the sale of any shares under such plan would be prohibited by the lock-up agreement that the director or officer has entered into with the underwriters.

Certain relationships and related party transactions

The following is a description of transactions since our inception in January 2017 to which we have been a participant in which the amount involved exceeded or will exceed \$120,000, and in which any of our directors, executive officers or holders of more than 5% of our voting securities, or affiliate or any members of their immediate family, had or will have a direct or indirect material interest, other than compensation arrangements which are described under "Executive compensation."

Private placements of our securities

Transactions with Perceptive

Series A preferred stock financing

In September 2017, we entered into a preferred stock purchase agreement with Perceptive Life Sciences Master Fund, Ltd. and Perceptive Xontogeny Venture Fund, LP, pursuant to which we issued and sold to Perceptive an aggregate of 1,612,017 shares of Series A convertible preferred stock at a purchase price of \$3.10 per share for an aggregate purchase price of \$5.0 million. In June 2018, we issued and sold to Perceptive Life Sciences Master Fund, Ltd. and Perceptive Xontogeny Venture Fund, LP, upon our achievement of certain milestones, an aggregate of 1,612,017 additional shares of Series A convertible preferred stock at a purchase price of \$3.10 per share for an aggregate purchase price of \$5.0 million. We refer to Perceptive Life Sciences Master Fund, Ltd. and Perceptive Xontogeny Venture Fund, LP together as Perceptive. Perceptive is a beneficial owner of greater than 5% of our capital stock and is affiliated with our director Konstantin Poukalov.

Convertible promissory notes and issuance of Series B preferred stock

In January 2019, we entered into a note purchase agreement with Perceptive Life Sciences Master Fund, Ltd. and Perceptive Xontogeny Venture Fund, LP, pursuant to which we issued convertible promissory notes in an aggregate principal amount of \$8.0 million, net of issuance costs of \$20,000. The maturity date of the notes was January 24, 2020 and the notes bore interest at a rate of 6%. In August 2019, the holders elected to convert their outstanding convertible promissory notes in the aggregate principal amount of \$8.3 million into an aggregate of 1,101,488 shares of Series B redeemable convertible preferred stock.

Series B preferred stock financing

In August 2019, we entered into a preferred stock purchase agreement with certain investors, including beneficial owners of greater than 5% of our capital stock, pursuant to which we issued and sold to such investors an aggregate of 8,036,574 shares of Series B convertible preferred stock at a purchase price of \$7.4981 per share for an aggregate purchase price of \$51.7 million.

The following table sets forth the aggregate number of shares of Series B convertible preferred stock issued to our related parties in this financing:

Participants	Shares of Series B preferred stock	Aggregate purchase price (\$)
Entities affiliated with Perceptive(1)	4,102,247	30,759,058
Entities affiliated with RTW(2)	2,000,506	14,999,994
Osage University Partners III, LP(3)	1,066,936	7,999,992

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- (1) Affiliates of Perceptive whose securities are aggregated for purposes of reporting share ownership information are Perceptive Life Sciences Master Fund, Ltd., Perceptive Xontogeny Venture Fund, LP and PX Venture (A), LLC. Perceptive is a beneficial owner of greater than 5% of our capital stock and is affiliated with our director Konstantin Poukalov.
- (2) Affiliates of RTW whose securities are aggregated for purposes of reporting share ownership information are RTW Master Fund, Ltd., RTW Innovation Master Fund, Ltd. and RTW Special Purpose Fund I, LLC. RTW is a beneficial owner of greater than 5% of our capital stock and is affiliated with our director Dr. Roderick Wong.
- (3) Osage University Partners III, LP is a beneficial owner of greater than 5% of our capital stock.

Our relationship with Biotherapeutics

In March 2017, we issued an aggregate of 101,625 shares of our common stock to Biotherapeutics, Inc. in exchange for Biotherapeutics assigning us certain patents related to our product candidates. Dr. Josep Bassaganya-Riera, our Chairman, President, Chief Executive Officer and Common Stock Director, is also Chairman of Biotherapeutics, and Dr. Raquel Hontecillas, our Chief Scientific Officer, is also Chief Scientific Officer of Biotherapeutics.

Advisory agreement with Xontogeny

In April 2017, we entered into a strategy and business advisory agreement with Xontogeny LLC. Xontogeny is a beneficial owner of greater than 5% of our capital stock and is affiliated with our director Christopher Garabedian. Pursuant to the agreement, we issued 1,693,750 shares of common stock to Xontogeny, 25% of which vested on the closing date of the Series A preferred stock financing, 25% of which vested on the first anniversary of the closing date of the Series A preferred stock financing and the remaining 50% of which vested monthly over two years commencing on such first anniversary.

Investors' rights agreement and voting agreement

In connection with the sales of convertible preferred stock described above, we entered into an investors' rights agreement, a voting agreement and a right of first refusal and co-sale agreement with the holders of preferred stock, including each of the persons and entities listed in the table above.

The investors' rights agreement, among other things:

- grants our preferred stockholders specified registration rights with respect to shares of our common stock, including shares of common stock issued or issuable upon conversion of the shares of convertible preferred stock held by them;
- obligates us to deliver periodic financial statements to some of the stockholders who are parties to the investors' rights agreement; and
- grants a right of first refusal with respect to sales of our shares by us, subject to specified exclusions, which exclusions include the sale of the shares pursuant to this prospectus, to the stockholders who are parties to the investors' rights agreement.

Following the consummation of this offering, the holders of 11,260,608 shares of our common stock, including the shares of common stock issuable upon the conversion of our convertible preferred stock, will be entitled to rights with respect to the registration of their shares under the Securities Act. For more information regarding the registration rights provided in the investors' rights agreement, please refer to the section titled "Description of capital stock—Registration rights."

In addition, as described in "Management—Board composition," the voting agreement entitles certain holders of our capital stock to designate directors to our board.

The provisions of these agreements other than those relating to registration rights will terminate upon the closing of this offering.

Indemnification agreements

Our amended and restated certificate of incorporation will contain provisions limiting the liability of directors, and our amended and restated bylaws will provide that we will indemnify each of our directors to the fullest extent permitted under Delaware law. Our amended and restated certificate of incorporation and amended and restated bylaws will also provide our board of directors with discretion to indemnify our officers and employees when determined appropriate by the board.

In addition, we have entered into indemnification agreements with each of our directors, and we expect to enter into indemnification agreements with each of our executive officers prior to the closing of this offering. For more information regarding these agreements, see “Executive compensation—Limitations on liability and indemnification matters.”

Public offering participation rights

We entered into letter agreements in August 2019 with Perceptive, RTW and Osage University Partners III LP, or Osage, each a beneficial owner of more than 5% of our capital stock. The letter agreements grant each of Perceptive, RTW and Osage a participation right to purchase a specified percentage of shares of common stock in this offering at the initial public offering price, subject to compliance with applicable securities laws. The letter agreements further provide that, under certain circumstances in which Perceptive, RTW or Osage are unable to participate in this offering, we are required to offer Perceptive, RTW and Osage shares of our common stock through a separate private placement to be consummated concurrently with this offering.

Related person transaction policy

Prior to this offering, we have not had a formal policy regarding approval of transactions with related parties. We have adopted a related person transaction policy that sets forth our procedures for the identification, review, consideration and approval or ratification of related person transactions, which policy will become effective immediately upon the execution of the underwriting agreement for this offering. For purposes of our policy only, a related person transaction will be a transaction, arrangement or relationship, or any series of similar transactions, arrangements or relationships, in which we and any related person are, were or will be participants in which the amount involved exceeds \$120,000. Transactions involving compensation for services provided to us as an employee or director will not be covered by this policy. A related person will be any executive officer, director or beneficial owner of more than 5% of any class of our voting securities, including any of their immediate family members and any entity owned or controlled by such persons.

Under the policy, if a transaction has been identified as a related person transaction, including any transaction that was not a related person transaction when originally consummated or any transaction that was not initially identified as a related person transaction prior to consummation, our management must present information regarding the related person transaction to our audit committee, or, if audit committee approval would be inappropriate, to another independent body of our board of directors, for review, consideration and approval or ratification. The presentation must include a description of, among other things, the material facts, the interests, direct and indirect, of the related persons, the benefits to us of the transaction and whether the transaction is on terms that are comparable to the terms available to or from, as the case may be, an unrelated third party or to or from employees generally. Under the policy, we will collect information that we deem reasonably necessary from each director, executive officer and, to the extent feasible, significant stockholder to enable us to identify any existing or potential related-person transactions and to effectuate the terms of the

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policy. In addition, under our Code of Conduct that we expect to adopt prior to the closing of this offering, our employees and directors will have an affirmative responsibility to disclose any transaction or relationship that reasonably could be expected to give rise to a conflict of interest. In considering related person transactions, our audit committee, or other independent body of our board of directors, will take into account the relevant available facts and circumstances including:

- the risks, costs and benefits to us;
- the impact on a director's independence in the event that the related person is a director, immediate family member of a director or an entity with which a director is affiliated;
- the availability of other sources for comparable services or products; and
- the terms available to or from, as the case may be, unrelated third parties or to or from employees generally.

The policy will require that, in determining whether to approve, ratify or reject a related person transaction, our audit committee, or other independent body of our board of directors, must consider, in light of known circumstances, whether the transaction is in, or is not inconsistent with, our best interests and those of our stockholders, as our audit committee, or other independent body of our board of directors, determines in the good faith exercise of its discretion.

Principal stockholders

The following table sets forth information regarding beneficial ownership of our capital stock as of November 5, 2020 by:

- each person, or group of affiliated persons, known by us to beneficially own more than 5% of our common stock;
- each of our directors;
- each of our named executive officers; and
- all of our current executive officers and directors as a group.

We have determined beneficial ownership in accordance with the rules of the SEC. Under these rules, beneficial ownership includes any shares of common stock as to which the individual or entity has sole or shared voting power or investment power. Applicable percentage ownership prior to this offering is based on 18,035,608 shares of common stock outstanding as of July 1, 2020, after giving effect to the conversion of all of our preferred stock. In computing the number of shares beneficially owned by an individual or entity and the percentage ownership of that person, shares of common stock subject to options held by such person that are currently exercisable or will become exercisable within 60 days of July 1, 2020 are considered outstanding, although these shares are not considered outstanding for purposes of computing the percentage ownership of any other person.

Unless noted otherwise, the address of all listed stockholders is c/o Landos Biopharma, Inc., 1800 Kraft Drive, Suite 216, Blacksburg, Virginia 24060.

Except as indicated by the footnotes below, we believe, based on information furnished to us, that each of the stockholders listed has sole voting and investment power with respect to the shares beneficially owned by the stockholder unless noted otherwise, subject to community property laws where applicable.

NAME AND ADDRESS OF BENEFICIAL OWNER	NUMBER OF SHARES BENEFICIALLY OWNED	PERCENTAGE OF SHARES BENEFICIALLY OWNED	
		BEFORE OFFERING	AFTER OFFERING
Greater than 5% stockholders			
Entities affiliated with Perceptive(1)	7,326,281	40.1%	%
Josep Bassaganya-Riera, Ph.D.(2)	5,156,250	28.2	
Entities affiliated with RTW(3)	2,000,506	11.0	
Xontogeny LLC(4)	1,693,750	9.3	
Osage University Partners III, LP	1,066,936	5.8	
Directors and named executive officers			
Josep Bassaganya-Riera, Ph.D.(2)	5,156,250	28.2	
Raquel Hontecillas, Ph.D.(5)	50,000	*	
Jyoti Chauhan, MS, RAC(6)	50,000	*	
Christopher Garabedian(7)	1,693,750	9.3	
Konstantin Poukalov(8)	7,326,281	40.1	
Roderick Wong, M.D.(9)	2,000,506	11.0	
All current executive officers and directors as a group (6 persons)	16,101,787	89.2%	

* Represents ownership of less than one percent.

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- (1) Includes (a) 3,178,018 shares of common stock held by Perceptive Life Sciences Master Fund, Ltd. (b) 3,178,018 shares of common stock held by Perceptive Xontogeny Venture Fund, LP and (c) 970,245 shares of common stock held by PX Venture (A), LLC. Perceptive Life Sciences Master Fund Ltd., Perceptive Advisors LLC and Joseph Edelman have shared voting and dispositive power with respect to the shares held by Perceptive Life Sciences Master Fund Ltd. Perceptive Advisors LLC serves as the investment manager to Perceptive Life Sciences Master Fund Ltd. and may be deemed to beneficially own the securities directly held by Perceptive Life Sciences Master Fund Ltd. Mr. Edelman is the managing member of Perceptive Advisors LLC and may be deemed to beneficially own the securities directly held by Perceptive Life Sciences Master Fund Ltd. The principal address of Perceptive Advisors LLC is 51 Astor Place, 10th Floor New York, NY 10003.
- (2) Includes (a) 4,284,771 shares of common stock held by Dr. Bassaganya-Riera, as Trustee of the Josep Bassaganya-Riera Revocable Trust Agreement dated April 9, 2018, as amended, (b) 419,971 shares of common stock held by Dr. Bassaganya-Riera, as Trustee of the Josep Bassaganya-Riera Grantor Retained Annuity Trust No. 1 dated June 28, 2018 and (c) 451,508 shares of common stock held by Dr. Bassaganya-Riera, as Trustee of the Josep Bassaganya-Riera Grantor Retained Annuity Trust No. 2 dated March 26, 2019.
- (3) Includes (a) 1,028,481 shares of common stock held by RTW Master Fund, Ltd. (b) 305,190 shares of common stock held by RTW Innovation Master Fund, Ltd. and (c) 666,835 shares of common stock held by RTW Special Purpose Fund I, LLC. RTW Investments, LP is the investment manager of each funds and has the power to vote and the power to direct the disposition of all such shares. Roderick Wong is the Managing Partner of RTW Investments, LP. The address of RTW Investments, LP and Roderick Wong is 412 West 15th Street, Floor 9, New York, New York 10011. The address of RTW Master Fund, Ltd. is c/o Intertrust Corporate Services (Cayman) Limited, 190 Elgin Avenue, George Town, Grand Cayman KY1-9001, Cayman Islands.
- (4) Includes 1,693,750 shares of common stock held by Xontogeny LLC. Christopher Garabedian, Joseph Edelman and Adam Stone have shared voting and dispositive power with respect to the shares held by Xontogeny LLC. The principal address of Xontogeny LLC is 240 Newbury Street, Suite 201, Boston, MA 02116.
- (5) Consists of 50,000 shares of common stock held by Dr. Hontecillas, as Trustee of the Raquel Hontecillas-Magarzo Revocable Trust Agreement dated April 9, 2018, as amended.
- (6) Consists of 50,000 shares of common stock held by Ms. Chauhan.
- (7) Consists of 1,693,750 shares of common stock held by Xontogeny LLC. Mr. Garabedian is the Chairman and Chief Executive Officer of Xontogeny and may be deemed to beneficially own these shares.
- (8) Consists of (a) 3,178,018 shares of common stock held by Perceptive Life Sciences Master Fund, Ltd. (b) 3,178,018 shares of common stock held by Perceptive Xontogeny Venture Fund, LP and (c) 970,245 shares of common stock held by PX Venture (A), LLC. Perceptive Life Sciences Master Fund Ltd., Perceptive Advisors LLC and Joseph Edelman have shared voting and dispositive power with respect to the shares held by Perceptive Life Sciences Master Fund Ltd. Mr. Poukalov is a Managing Director of Perceptive Advisors and may be deemed to beneficially own these shares.
- (9) Consists of (a) 1,028,481 shares of common stock held by RTW Master Fund, Ltd. (b) 305,190 shares of common stock held by RTW Innovation Master Fund, Ltd. and (c) 666,835 shares of common stock held by RTW Special Purpose Fund I, LLC. RTW Investments, LP is the investment manager of each funds and has the power to vote and the power to direct the disposition of all such shares. Dr. Wong is the Managing Partner of RTW Investments, LP.

Description of capital stock

The following description of our capital stock and provisions of our amended and restated certificate of incorporation and amended and restated bylaws to be effective following the completion of this offering, as well as certain provisions of our investors' rights agreement and Delaware law, are summaries. You should also refer to the amended and restated certificate of incorporation and the amended and restated bylaws, which are filed as exhibits to the registration statement of which this prospectus is part.

General

Upon the completion of this offering, our amended and restated certificate of incorporation will authorize us to issue up to _____ shares of common stock, \$0.01 par value per share, and _____ shares of preferred stock, \$0.01 par value per share, all of which shares of preferred stock will be undesignated. Our board of directors may establish the rights and preferences of the preferred stock from time to time. As of December 31, 2019, we had outstanding 6,457,421 shares of common stock, held by five stockholders of record. As of December 31, 2019, after giving effect to the conversion of all of the outstanding shares of our convertible preferred stock into 11,260,608 shares of common stock, there would have been 17,718,029 shares of common stock issued and outstanding, held by 15 stockholders of record.

Common stock

Voting rights

Each holder of our common stock is entitled to one vote for each share on all matters submitted to a vote of the stockholders, including the election of directors. The affirmative vote of holders of at least 66²/₃% of the voting power of all of the then-outstanding shares of capital stock, voting as a single class, will be required to amend certain provisions of our amended and restated certificate of incorporation, including provisions relating to amending our amended and restated bylaws, the classified board, the size of our board, removal of directors, director liability, vacancies on our board, special meetings, stockholder notices, actions by written consent and exclusive forum.

Dividends

Subject to preferences that may be applicable to any then-outstanding preferred stock, holders of common stock are entitled to receive ratably those dividends, if any, as may be declared from time to time by the board of directors out of legally available funds.

Liquidation

In the event of our liquidation, dissolution or winding up, holders of common stock will be entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of our debts and other liabilities and the satisfaction of any liquidation preference granted to the holders of any then-outstanding shares of preferred stock.

Rights and preferences

Holders of common stock have no preemptive, conversion or subscription rights and there are no redemption or sinking fund provisions applicable to the common stock. The rights, preferences and privileges of the holders of common stock are subject to, and may be adversely affected by, the right of the holders of shares of any series of preferred stock that we may designate in the future.

Preferred stock

As of December 31, 2019, there were outstanding 11,260,608 shares of convertible preferred stock, consisting of 3,224,034 shares of Series A convertible preferred stock and 8,036,574 shares of Series B convertible preferred stock. All currently outstanding shares of convertible preferred stock will be converted into an aggregate of 11,260,608 shares of common stock upon the closing of this offering.

Following the closing of this offering, our board of directors will have the authority under our amended and restated certificate of incorporation, without further action by our stockholders, to issue up to _____ shares of preferred stock in one or more series, to establish from time to time the number of shares to be included in each such series, to fix the rights, preferences and privileges of the shares of each wholly unissued series and any qualifications, limitations or restrictions thereon, and to increase or decrease the number of shares of any such series, but not below the number of shares of such series then outstanding.

Our board of directors may authorize the issuance of preferred stock with voting or conversion rights that could adversely affect the voting power or other rights of the holders of our common stock. The purpose of authorizing our board of directors to issue preferred stock and determine its rights and preferences is to eliminate delays associated with a stockholder vote on specific issuances. The issuance of preferred stock, while providing flexibility in connection with possible acquisitions and other corporate purposes, could, among other things, have the effect of delaying, deferring or preventing a change in control of us and may adversely affect the market price of our common stock and the voting and other rights of the holders of our common stock. It is not possible to state the actual effect of the issuance of any shares of preferred stock on the rights of holders of common stock until the board of directors determines the specific rights attached to that preferred stock.

We have no present plans to issue any shares of preferred stock following completion of this offering.

Options

As of December 31, 2019, there were no options to purchase shares of common stock outstanding. For additional information regarding the terms of our 2019 Equity Incentive Plan, see “Executive compensation—Equity incentive plans.”

Registration rights

We, the holders of our existing convertible preferred stock and certain holders of our existing common stock have entered into an investors’ rights agreement. The registration rights provisions of this agreement provide those holders with demand, piggyback and Form S-3 registration rights with respect to the shares of common stock currently held by them and issuable to them upon conversion of our convertible preferred stock in connection with this offering.

Demand registration rights

At any time beginning six months and ending five years following the effective date of the registration statement of which this prospectus is a part, the holders of at least 20% of the registrable securities then outstanding have the right to demand that we file a registration statement with respect to such registrable securities outstanding for which the anticipated aggregate offering price, net of selling expenses, would exceed \$10 million. These registration rights are subject to specified conditions and limitations, including the right of the underwriters, if any, to limit the number of shares included in any such registration under specified circumstances. Upon such a request, we are required to effect the registration as soon as practicable, but in any event no later than 60 days after the receipt of such request. An aggregate of 11,260,608 shares of common stock will be entitled to these demand registration rights.

Piggyback registration rights

If we propose to register any of our securities under the Securities Act either for our own account or for the account of other stockholders, the holders of registrable securities will each be entitled to notice of the registration and will be entitled to include their shares of common stock in the registration statement. These piggyback registration rights are subject to specified conditions and limitations, including the right of the underwriters to limit the number of shares included in any such registration under specified circumstances. An aggregate of 11,260,608 shares of common stock will be entitled to these piggyback registration rights.

Registration on Form S-3

At any time after we become eligible to file a registration statement on Form S-3, the holders of at least 10% of the registrable securities then outstanding will be entitled to request to have such shares registered by us on a Form S-3 registration statement. These Form S-3 registration rights are subject to other specified conditions and limitations, including the condition that the anticipated aggregate offering price, net of selling expenses, exceeds \$1 million. Upon receipt of this request, the holders of registrable securities will each be entitled to participate in this registration. An aggregate of 11,260,608 shares of common stock will be entitled to these Form S-3 registration rights.

Expenses of registration

We are required to pay all expenses, including fees and expenses of one counsel to represent the selling stockholders (up to \$35,000 total), relating to any demand, piggyback or Form S-3 registration, other than underwriting discounts and commissions, stock transfer taxes and any additional fees of counsel for the selling stockholders, subject to specified conditions and limitations. We are not required to pay registration expenses if a demand registration request is withdrawn at the request of a majority of holders of registrable securities to be registered, unless holders of a majority of the registrable securities agree to forfeit their right to one demand registration.

The investors' rights agreement contains customary cross-indemnification provisions, pursuant to which we are obligated to indemnify the selling stockholders in the event of material misstatements or omissions in the applicable registration statement attributable to us, and the selling stockholders are obligated to indemnify us for material misstatements or omissions in the registration statement attributable to them, subject to certain limitations.

Termination of registration rights

The registration rights granted under the investors' rights agreement will terminate with respect to any particular stockholder upon the earlier of the date that such stockholder is able to sell all of its registrable securities pursuant to Rule 144 under the Securities Act during a three-month period or the fifth anniversary of this offering.

Anti-takeover provisions

Section 203 of the Delaware General Corporation Law

We are subject to Section 203 of the Delaware General Corporation Law, which prohibits a Delaware corporation from engaging in any business combination with any interested stockholder for a period of three years after the date that such stockholder became an interested stockholder, with the following exceptions:

- before such date, the board of directors of the corporation approved either the business combination or the transaction that resulted in the stockholder becoming an interested stockholder;

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- upon completion of the transaction that 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 began, excluding for purposes of determining the voting stock outstanding, but not the outstanding voting stock owned by the interested stockholder, those shares owned (i) by persons who are directors and also officers and (ii) employee stock plans in which employee participants do not have the right to determine confidentially whether shares held subject to the plan will be tendered in a tender or exchange offer; or
- on or after such date, the business combination is approved by the board of directors and authorized at an annual or special meeting of the stockholders, and not by written consent, by the affirmative vote of at least 66²/3% of the outstanding voting stock that is not owned by the interested stockholder.

In general, Section 203 defines a “business combination” to include the following:

- any merger or consolidation involving the corporation or any direct or indirect majority-owned subsidiary of the corporation and the interested stockholder;
- any sale, transfer, pledge or other disposition of 10% or more of the assets of the corporation involving the interested stockholder (in one transaction or a series of transactions);
- subject to certain exceptions, any transaction that results in the issuance or transfer by the corporation or by any direct or indirect majority-owned subsidiary of the corporation of any stock of the corporation or of such subsidiary to the interested stockholder;
- any transaction involving the corporation or any direct or indirect majority-owned subsidiary of the corporation that has the effect of increasing the proportionate share of the stock or any class or series of the corporation beneficially owned by the interested stockholder; or
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits by or through the corporation.

In general, Section 203 defines an “interested stockholder” as an entity or person who, together with the person’s affiliates and associates, beneficially owns, or within three years prior to the time of determination of interested stockholder status did own, 15% or more of the outstanding voting stock of the corporation.

Certificate of incorporation and bylaws to be in effect upon the closing of this offering

Our amended and restated certificate of incorporation to be in effect upon the completion of this offering, or our restated certificate, will provide for our board of directors to be divided into three classes with staggered three-year terms. Only one class of directors will be elected at each annual meeting of our stockholders, with the other classes continuing for the remainder of their respective three-year terms. Because our stockholders do not have cumulative voting rights, stockholders holding a majority of the shares of common stock outstanding will be able to elect all of our directors. Our restated certificate and our amended and restated bylaws to be effective upon the completion of this offering, or our restated bylaws, will also provide that directors may be removed by the stockholders only for cause upon the vote of 66²/3% or more of our outstanding common stock. Furthermore, the authorized number of directors may be changed only by resolution of the board of directors, and vacancies and newly created directorships on the board of directors may, except as otherwise required by law or determined by the board, only be filled by a majority vote of the directors then serving on the board, even though less than a quorum.

Under our restated certificate and restated bylaws our stockholders will not have cumulative voting rights. Because of this, the holders of a majority of the shares of common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they should so choose.

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Our restated certificate and restated bylaws will also provide that all stockholder actions must be effected at a duly called meeting of stockholders and will eliminate the right of stockholders to act by written consent without a meeting. Our restated bylaws will also provide that only our Chairman of the board, Chief Executive Officer or the board of directors pursuant to a resolution adopted by a majority of the total number of authorized directors may call a special meeting of stockholders.

Our restated bylaws will also provide that stockholders seeking to present proposals before a meeting of stockholders to nominate candidates for election as directors at a meeting of stockholders must provide timely advance notice in writing, and will specify requirements as to the form and content of a stockholder's notice.

Our restated certificate and restated bylaws will provide that the stockholders cannot amend many of the provisions described above except by a vote of 66²/3% or more of our outstanding common stock.

As described in "—Preferred stock" above, our restated certificate will give our board of directors the authority, without further action by our stockholders, to issue up to _____ shares of preferred stock in one or more series, with any rights, preferences and privileges as they may designate, including the right to approve an acquisition or other change in control.

The combination of these provisions will make it more difficult for our existing stockholders to replace our board of directors as well as for another party to obtain control of us by replacing our board of directors. Since our board of directors has the power to retain and discharge our officers, these provisions could also make it more difficult for existing stockholders or another party to effect a change in management. In addition, the authorization of undesignated preferred stock makes it possible for our board of directors to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change our control.

These provisions are intended to enhance the likelihood of continued stability in the composition of our board of directors and its policies and to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed to reduce our vulnerability to hostile takeovers and to discourage certain tactics that may be used in proxy fights. However, such provisions could have the effect of discouraging others from making tender offers for our shares and may have the effect of delaying changes in our control or management. As a consequence, these provisions may also inhibit fluctuations in the market price of our stock that could result from actual or rumored takeover attempts. We believe that the benefits of these provisions, including increased protection of our potential ability to negotiate with the proponent of an unfriendly or unsolicited proposal to acquire or restructure our company, outweigh the disadvantages of discouraging takeover proposals, because negotiation of takeover proposals could result in an improvement of their terms.

Choice of forum

Our restated certificate will provide that the Court of Chancery of the state of Delaware will be the exclusive forum for the following types of actions or proceedings under Delaware statutory or common law:

- any derivative action or proceeding brought on our behalf;
- any action asserting a breach of fiduciary duty;
- any action asserting a claim against us arising pursuant to the Delaware General Corporation Law, our restated certificate, or our amended and restated bylaws; or
- any action asserting a claim against us that is governed by the internal affairs doctrine.

The provision would not apply to suits brought to enforce a duty or liability created by the Exchange Act. Furthermore, Section 22 of the Securities Act creates concurrent jurisdiction for federal and state courts over

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all such Securities Act actions. Accordingly, both state and federal courts have jurisdiction to entertain such claims. To prevent having to litigate claims in multiple jurisdictions and the threat of inconsistent or contrary rulings by different courts, among other considerations, our amended and restated certificate of incorporation will also provide that unless we consent in writing to the selection of an alternative forum, the federal district courts of the United States shall be the exclusive forum for the resolution of any complaint asserting a cause of action arising under the Securities Act.

While the Delaware courts have determined that such choice of forum provisions are facially valid, a stockholder may nevertheless seek to bring a claim in a venue other than those designated in the exclusive forum provisions. In such instance, we would expect to vigorously assert the validity and enforceability of the exclusive forum provisions of our restated certificate of incorporation. This may require significant additional costs associated with resolving such action in other jurisdictions and there can be no assurance that the provisions will be enforced by a court in those other jurisdictions.

These exclusive forum provisions may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers, or other employees, which may discourage lawsuits against us and our directors, officers and other employees. If a court were to find either exclusive-forum provision in our amended and restated certificate of incorporation to be inapplicable or unenforceable in an action, we may incur further significant additional costs associated with resolving the dispute in other jurisdictions, all of which could seriously harm our business.

Our restated certificate will further provide that the federal district courts of the United States of America will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act, subject to and contingent upon a final adjudication in the State of Delaware of the enforceability of such exclusive forum provision.

Transfer agent and registrar

The transfer agent and registrar for our common stock is . The transfer agent's address is .

Stock exchange listing

We have applied to list our common stock on the Nasdaq Global Market under the trading symbol "LABP."

Shares eligible for future sale

Prior to this offering, no public market existed for our common stock. 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 December 31, 2019, upon the closing of this offering and assuming no exercise of the underwriters' option to purchase additional shares, _____ shares of common stock will be outstanding, assuming no outstanding options are exercised. All of the shares of common stock sold in this offering will be freely tradable without restrictions or further registration under the Securities Act, except for any shares sold to our "affiliates," as that term is defined under Rule 144 under the Securities Act. The remaining _____ shares of common stock held by existing stockholders are "restricted securities," as that term is defined in Rule 144 under the Securities Act. Restricted securities may be sold in the public market only if registered or if their resale qualifies for exemption from registration described below under Rule 144 promulgated under the Securities Act or another available exemption.

As a result of the lock-up agreements described below and the provisions of Rules 144 and 701 under the Securities Act, the shares of common stock that will be deemed restricted securities after this offering will be available for sale in the public market as follows:

- none of the existing restricted shares will be eligible for immediate sale upon the completion of this offering; and
- _____ restricted shares will be eligible for sale in the public market upon expiration of lock-up agreements 180 days after the date of this prospectus, subject in certain circumstances to the volume, manner of sale and other limitations under Rule 144 and Rule 701 under the Securities Act, which are summarized below.

Rule 144

In general, non-affiliate persons who have beneficially owned restricted shares of our common stock for at least six months, and any affiliate of the company who owns either restricted or unrestricted shares of our common stock, are entitled to sell their securities without registration with the SEC under an exemption from registration provided by Rule 144 under the Securities Act.

Non-affiliates

Any person who is not deemed to have been one of our affiliates at the time of, or at any time during the three months preceding, a sale may sell an unlimited number of restricted securities under Rule 144 if:

- the restricted securities have been held for at least six months, including the holding period of any prior owner other than one of our affiliates (subject to certain exceptions);
- we have been subject to the Exchange Act periodic reporting requirements for at least 90 days before the sale; and
- we are current in our Exchange Act reporting at the time of sale.

Any person who is not deemed to have been an affiliate of ours at the time of, or at any time during the three months preceding, a sale and has held the restricted securities for at least one year, including the holding

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period of any prior owner other than one of our affiliates, will be entitled to sell an unlimited number of restricted securities without regard to the length of time we have been subject to Exchange Act periodic reporting or whether we are current in our Exchange Act reporting. Non-affiliate resales are not subject to the manner of sale, volume limitation or notice filing provisions of Rule 144.

Affiliates

Persons seeking to sell restricted securities who are our affiliates at the time of, or any time during the three months preceding, a sale, would be subject to the restrictions described above. They are also subject to additional restrictions, by which such person would be required to comply with the manner of sale and notice provisions of Rule 144 and would be entitled to sell within any three-month period only that number of securities that does not exceed the greater of either of the following:

- 1% of the number of shares of our common stock then outstanding, which will equal approximately _____ shares immediately after the completion of this offering based on the number of shares outstanding as of December 31, 2019; or
- the average weekly trading volume of our common stock on the stock exchange on which our shares are listed during the four calendar weeks preceding the filing of a notice on Form 144 with respect to the sale.

Additionally, persons who are our affiliates at the time of, or any time during the three months preceding, a sale may sell unrestricted securities under the requirements of Rule 144 described above, without regard to the six month holding period of Rule 144, which does not apply to sales of unrestricted securities.

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 in the section titled "Underwriting" and will become eligible for sale upon the expiration of the restrictions set forth in those agreements.

Form S-8 registration statements

We intend to file one or more registration statements on Form S-8 under the Securities Act to register all shares of common stock subject to outstanding stock options and common stock issued or issuable under our 2019 Plan. We expect to file the registration statement covering shares offered pursuant to our stock plans as soon as practicable after the closing of this offering, permitting the resale of such shares by non-affiliates in the public market without restriction under the Securities Act and the sale by affiliates in the public market, subject to compliance with the resale provisions of Rule 144 and expiration or release from the terms of the lock-up agreements described above.

Lock-up agreements

We, our executive officers and directors and substantially all of the holders of our common stock outstanding on the date of this prospectus have entered into lock-up agreements with the underwriters or otherwise agreed, subject to certain exceptions, that we and they will not, directly or indirectly, offer, sell, contract to sell, pledge, grant any option to purchase, make any short sale, or otherwise dispose of or hedge any of our shares of

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common stock, any options or warrants to purchase shares of our common stock, or any securities convertible into, or exchangeable for or that represent the right to receive shares of our common stock, without the prior written consent of
for a period of 180 days from the date of this prospectus.

In addition to the restrictions contained in the lock-up agreements described above, we have entered into an agreement with the holders of our preferred stock that contains market stand-off provisions imposing restrictions on the ability of such security holders to sell or otherwise transfer or dispose of any registrable securities for a period of 180 days following the date of this prospectus.

Registration rights

Upon the closing of this offering, the holders of 11,260,608 shares of our common stock, including common stock issuable upon the conversion of our preferred stock, or their transferees, will be entitled to specified rights with respect to the registration of their registrable shares under the Securities Act, subject to certain limitations and the expiration, waiver or termination of the lock-up agreements. Registration of these shares under the Securities Act would result in the shares becoming freely tradable without restriction under the Securities Act immediately upon effectiveness of the registration. See "Description of capital stock—Registration rights" for additional information.

Material U.S. federal income tax consequences to non-U.S. holders

The following summary describes the material U.S. federal income tax consequences to Non-U.S. Holders (as defined below) of the acquisition, ownership and disposition of our common stock acquired in this offering. This summary is not a complete analysis of all potential U.S. federal income tax consequences relating thereto, and does not deal with foreign, state and local consequences that may be relevant to Non-U.S. Holders in light of their particular circumstances, nor does it address U.S. federal tax consequences (such as gift and estate taxes) other than income taxes. Special rules different from those described below may apply to certain Non-U.S. Holders that are subject to special treatment under the Code, such as financial institutions, insurance companies, tax-exempt organizations, broker-dealers and traders in securities, U.S. expatriates, "controlled foreign corporations," "passive foreign investment companies," corporations that accumulate earnings to avoid U.S. federal income tax, corporations organized outside of the United States, any state thereof and the District of Columbia that are nonetheless treated as U.S. taxpayers for U.S. federal income tax purposes, persons that hold our common stock as part of a "straddle," "hedge," "conversion transaction," "synthetic security" or integrated investment or other risk reduction strategy, persons who acquire our common stock through the exercise of an option or otherwise as compensation, persons subject to the alternative minimum tax or federal Medicare contribution tax on net investment income, persons subject to special tax accounting rules under Section 451(b) of the Code, persons that hold more than 5% of our outstanding common stock, directly or indirectly during the applicable testing period (except to the extent specifically set forth below), "qualified foreign pension funds" as defined in Section 897(l)(2) of the Code and entities all of the interests of which are held by qualified foreign pension funds, partnerships and other pass-through entities or arrangements, and investors in such pass-through entities or arrangements. Non-U.S. Holders are urged to consult their own tax advisors to determine the U.S. federal, state, local and other tax consequences that may be relevant to them. Furthermore, the discussion below is based upon the provisions of the U.S. Internal Revenue Code of 1986, as amended, or the Code, and Treasury Regulations, rulings and judicial decisions thereunder as of the date hereof, and such authorities may be repealed, revoked or modified, perhaps retroactively, so as to result in U.S. federal income tax consequences different from those discussed below. We have not requested and will not request a ruling from the U.S. Internal Revenue Service, or the IRS, with respect to the statements made and the conclusions reached in the following summary, and there can be no assurance that the IRS will agree with such statements and conclusions.

This discussion assumes that the Non-U.S. Holder holds our common stock as a "capital asset" within the meaning of Section 1221 of the Code (generally, property held for investment).

If an entity or arrangement treated as a partnership for U.S. federal income tax purposes holds our common stock, the tax treatment of a partner in the partnership (or entity or arrangement treated as partnership for U.S. federal income tax purposes) will depend on the status of the partner, the activities of the partnership and certain determinations made at the partner level. Accordingly, partnerships holding our common stock and the partners in such partnerships should consult their tax advisors regarding the U.S. federal income tax consequences to them.

THIS DISCUSSION IS FOR INFORMATIONAL PURPOSES ONLY AND IS NOT TAX ADVICE. PERSONS CONSIDERING THE PURCHASE OF OUR COMMON STOCK PURSUANT TO THIS OFFERING SHOULD CONSULT THEIR OWN TAX ADVISORS CONCERNING THE U.S. FEDERAL INCOME, ESTATE AND OTHER TAX CONSEQUENCES OF ACQUIRING, OWNING AND DISPOSING OF OUR COMMON STOCK IN LIGHT OF THEIR PARTICULAR SITUATIONS AS WELL AS ANY CONSEQUENCES ARISING UNDER THE LAWS OF ANY OTHER TAXING JURISDICTION, INCLUDING ANY STATE, LOCAL OR FOREIGN TAX CONSEQUENCES.

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For the purposes of this discussion, the term "Non-U.S. Holder" means, for U.S. federal income tax purposes, a beneficial owner of common stock that is not a partnership (or other entity or arrangement treated as a partnership for U.S. federal income tax purposes regardless of its place of organization or formation) and is not, for U.S. federal income tax purposes, any of the following:

- an individual who is a citizen or resident of the United States;
- a corporation or other entity treated as a corporation for U.S. federal income tax purposes created or organized in or under the laws of the United States, any state thereof or the District of Columbia;
- an estate the income of which is subject to U.S. federal income taxation regardless of its source; or
- a trust if it (1) is subject to the primary supervision of a court within the United States and one or more U.S. persons have the authority to control all substantial decisions of the trust or (2) has a valid election in effect under applicable U.S. Treasury Regulations to be treated as a U.S. person.

Distributions

As discussed under "Dividend Policy" above, we do not anticipate to declare or pay any cash dividends to holders of our common stock in the foreseeable future. Distributions, if any, made on our common stock to a Non-U.S. Holder to the extent made out of our current or accumulated earnings and profits (as determined under U.S. federal income tax principles) generally will constitute dividends for U.S. federal income tax purposes. Amounts not treated as dividends for U.S. federal income tax purposes will constitute a return of capital and first be applied against and reduce a Non-U.S. Holder's adjusted tax basis in its common stock, but not below zero. Any excess will be treated as capital gain and will be treated as described below under "—Sale or Other Taxable Disposition."

Subject to the discussion below on effectively connected income, dividends paid to a Non-U.S. Holder will be subject to U.S. federal withholding tax at a rate of 30% of the gross amount of the dividends (or such lower rate specified by an applicable income tax treaty, provided the Non-U.S. Holder furnishes a properly executed IRS Form W-8BEN (in the case of individuals) or W-8BEN-E (in the case of entities), or other appropriate form, certifying the Non-U.S. Holder's entitlement to benefits under such income tax treaty). This certification must be provided to us or our paying agent prior to the payment of dividends and must be updated periodically. In the case of a Non-U.S. Holder that is a hybrid (or similar) entity, Treasury Regulations and the relevant tax treaty provide rules to determine whether, for purposes of determining the applicability of a tax treaty, dividends will be treated as paid to the entity or to those holding an interest in that entity. If a Non-U.S. Holder holds stock through a financial institution or other agent acting on the Non-U.S. Holder's behalf, the Non-U.S. Holder will be required to provide appropriate documentation to such agent. The Non-U.S. Holder's agent will then be required to provide certification to us or our paying agent, either directly or through other intermediaries. If a Non-U.S. Holder is eligible for a reduced rate of U.S. federal withholding tax under an income tax treaty and does not timely file the required certification, the Non-U.S. Holder may be able to obtain a refund or credit of any excess amounts withheld by timely filing an appropriate claim for a refund with the IRS. Non-U.S. Holders should consult their tax advisors regarding their entitlement to benefits under any applicable income tax treaties.

If dividends paid to a Non-U.S. Holder are effectively connected with the Non-U.S. Holder's conduct of a trade or business within the United States (and, if required by an applicable income tax treaty, the Non-U.S. Holder maintains a permanent establishment in the United States to which such dividends are attributable), the Non-U.S. Holder will be exempt from the U.S. federal withholding tax described above if a properly executed IRS Form W-8ECI, stating that the dividends are effectively connected with the Non-U.S. Holder's conduct of a trade

or business within the United States, is furnished to us (or, if stock is held through a financial institution or other agent, to such agent).

In general, such effectively connected dividends will be subject to U.S. federal income tax, on a net-income basis at the regular rates applicable to U.S. residents. A corporate Non-U.S. Holder receiving effectively connected dividends may also be subject to an additional "branch profits tax," which is imposed, under certain circumstances, at a rate of 30% (or such lower rate as may be specified by an applicable income tax treaty) on the corporate Non-U.S. Holder's effectively connected earnings and profits, subject to certain adjustments. Non-U.S. Holders should consult their tax advisors regarding any applicable income tax treaties that may provide for different rules.

Sale or other taxable disposition

Subject to the discussions below regarding backup withholding and foreign accounts, a Non-U.S. Holder generally will not be subject to U.S. federal income tax with respect to gain realized on a sale or other disposition of our common stock unless:

- the gain is effectively connected with a trade or business of such Non-U.S. Holder in the United States (and, if required by an applicable income tax treaty, is attributable to a permanent establishment or fixed base that such holder maintains in the United States);
- the Non-U.S. Holder is a nonresident alien individual and is present in the United States for 183 or more days in the taxable year of the disposition and certain other conditions are met; or
- our common stock constitutes a U.S. real property interest, or USRPI, by reason of our status as a "United States real property holding corporation," or USRPHC, within the meaning of Section 897(c)(2) of the Code, for U.S. federal income tax purposes

In general, we would be a USRPHC if our interests in U.S. real estate comprise (by fair market value) at least half of our business assets. We believe that we have not been and we are not, and do not anticipate becoming, a USRPHC. Even if we are treated as a USRPHC, gain realized by a Non-U.S. Holder on a disposition of our common stock will not be subject to U.S. federal income tax so long as (1) the Non-U.S. Holder owned, directly, indirectly and constructively, no more than 5% of our common stock at all times within the shorter of (i) the five-year period preceding the disposition or (ii) the Non-U.S. Holder holding period and (2) our common stock is regularly traded on an established securities market. There can be no assurance that our common stock will continue to qualify as regularly traded on an established securities market. If any gain on a Non-U.S. Holder's disposition is taxable because we are a USRPHC and your ownership of our common stock exceeds 5%, the Non-U.S. Holder will be taxed on such disposition generally in the manner as gain that is effectively connected with the conduct of a U.S. trade or business (subject to the provisions under an applicable income tax treaty), except that the branch profits tax generally will not apply.

A Non-U.S. Holder described in the first bullet point above generally will be subject to U.S. federal income tax on a net income basis at the regular rates, and corporate Non-U.S. Holders described in the first bullet point above may be subject to the additional branch profits tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty.

Gain described in second bullet point above will be subject to U.S. federal income tax at a flat 30% rate or such lower rate as may be specified by an applicable income tax treaty, which gain may be offset by certain U.S.-source capital losses (even though the Non-U.S. Holder 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.

Non-U.S. Holders should consult their tax advisors regarding any applicable tax treaties that may provide for different rules.

Information reporting requirements and backup withholding

Generally, we must report information to the IRS with respect to any distributions we pay on our common stock (even if the payments are exempt from withholding), regardless of whether such distributions constitute dividends, including the amount of any such distributions, the name and address of the recipient and the amount, if any, of tax withheld. A similar report is sent to the Non-U.S. Holder to whom any such distributions are paid. Pursuant to tax treaties or certain other agreements, the IRS may make its reports available to tax authorities of the country in which the Non-U.S. Holder's resides or is established.

Distributions paid by us (or our paying agents) to a Non-U.S. Holder may also be subject to U.S. backup withholding (currently at a rate of 24%). U.S. backup withholding generally will not apply to a Non-U.S. Holder who provides a properly executed IRS Form W-8BEN, IRS Form W-8BEN-E or IRS Form W-ECI (as applicable), or otherwise establishes an exemption. Notwithstanding the foregoing, backup withholding may apply if the payer has actual knowledge, or reason to know, that the holder is a U.S. person who is not an exempt recipient.

U.S. information reporting and backup withholding requirements generally will apply to the proceeds of a disposition of our common stock effected by or through a U.S. office of any broker, U.S. or foreign, except that information reporting and such requirements may be avoided if the Non-U.S. Holder provides a properly executed IRS Form W-8BEN or IRS Form W-8BEN-E or otherwise meets documentary evidence requirements for establishing non-U.S. person status or otherwise establishes an exemption. Generally, U.S. information reporting and backup withholding requirements 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 a non-U.S. office of a non-U.S. broker. Information reporting and backup withholding requirements may, however, apply to a payment of disposition proceeds if the broker has actual knowledge, or reason to know, that the holder is, in fact, a U.S. person. For information reporting purposes, certain brokers with substantial U.S. ownership or operations will generally be treated in a manner similar to U.S. brokers.

Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules may be credited against the tax liability of persons subject to backup withholding, provided that the required information is timely furnished to the IRS.

Foreign accounts

Sections 1471 through 1474 of the Code (commonly referred to as FATCA) impose a U.S. federal withholding tax of 30% on certain payments, including dividends paid on, and (subject to the proposed Treasury Regulations discussed below) the gross proceeds of a disposition of, our common stock paid to a non-U.S. financial institution (as specifically defined by applicable rules) unless such institution enters into an agreement with the U.S. government to withhold on certain payments and to collect and provide to the U.S. tax authorities substantial information regarding U.S. account holders of such institution (which includes certain equity holders of such institution, as well as certain account holders that are foreign entities with U.S. owners). FATCA also generally imposes a federal withholding tax of 30% on certain payments, including dividends paid on, and (subject to the proposed Treasury Regulations discussed below) the gross proceeds of a disposition of, our common stock to a non-financial non-U.S. entity unless such entity provides the withholding agent with either a certification that it does not have any substantial direct or indirect U.S. owners or provides information regarding substantial direct and indirect U.S. owners of the entity. An intergovernmental agreement between the United States and an applicable foreign country may modify those requirements. The withholding tax

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described above will not apply if the non-U.S. financial institution or non-financial non-U.S. entity otherwise qualifies for an exemption from the rules.

The withholding provisions described above currently apply to payments of dividends, and, subject to the recently released proposed Treasury Regulations described below, will also apply to payments of gross proceeds from a sale or other disposition of common stock.

The U.S. Treasury Department recently released proposed regulations which, if finalized in their present form, would eliminate the federal withholding tax of 30% applicable to the gross proceeds of a disposition of our common stock. In its preamble to such proposed regulations, the U.S. Treasury Department stated that taxpayers may generally rely on the proposed regulations until final regulations are issued. Non-U.S. Holders are encouraged to consult with their own tax advisors regarding the possible implications of FATCA on their investment in our common stock.

EACH PROSPECTIVE INVESTOR SHOULD CONSULT ITS OWN TAX ADVISOR REGARDING THE TAX CONSEQUENCES OF PURCHASING, HOLDING AND DISPOSING OF OUR COMMON STOCK, INCLUDING THE CONSEQUENCES OF ANY RECENT OR PROPOSED CHANGE IN APPLICABLE LAW.

Underwriting

We are offering the shares of common stock described in this prospectus through a number of underwriters. J.P. Morgan Securities LLC, Jefferies LLC and SVB Leerink LLC are acting as joint book-running managers of the offering and as representatives of the underwriters. We have entered into an underwriting agreement with the underwriters. Subject to the terms and conditions of the underwriting agreement, we have agreed to sell to the underwriters, and each underwriter has severally agreed to purchase, at the public offering price less the underwriting discounts and commissions set forth on the cover page of this prospectus, the number of shares of common stock listed next to its name in the following table:

Name	Number of shares
J.P. Morgan Securities LLC	
Jefferies LLC	
SVB Leerink LLC	
Raymond James & Associates, Inc.	
Total	

The underwriters are committed to purchase all shares of common stock offered by us if they purchase any shares. The underwriting agreement also provides that if an underwriter defaults, the purchase commitments of non-defaulting underwriters may also be increased or the offering may be terminated.

The underwriters propose to offer the common stock directly to the public at the initial public offering price set forth on the cover page of this prospectus and to certain dealers at that price less a concession not in excess of \$ _____ per share. Any such dealers may resell shares to certain other brokers or dealers at a discount of up to \$ _____ per share from the initial public offering price. After the initial offering of the shares to the public, if all of the shares of common stock are not sold at the initial public offering price, the underwriters may change the offering price and the other selling terms. Sales of any shares made outside of the United States may be made by affiliates of the underwriters.

The underwriters have an option to buy up to _____ additional shares of common stock from us to cover sales of shares by the underwriters which exceed the number of shares specified in the table above. The underwriters have 30 days from the date of this prospectus to exercise this option to purchase additional shares. If any shares are purchased with this option to purchase additional shares, the underwriters will purchase shares in approximately the same proportion as shown in the table above. If any additional shares of common stock are purchased, the underwriters will offer the additional shares on the same terms as those on which the shares are being offered.

The underwriting fee is equal to the public offering price per share of common stock less the amount paid by the underwriters to us per share of common stock. The underwriting fee is \$ _____ per share. The following table shows the per share and total underwriting discounts and commissions to be paid to the underwriters assuming both no exercise and full exercise of the underwriters' option to purchase additional shares.

	Without option to purchase additional shares exercise	With full option to purchase additional shares exercise
Per share	\$ _____	\$ _____
Total	\$ _____	\$ _____

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We estimate that the total expenses of this offering, including registration, filing and listing fees, printing fees and legal and accounting expenses, but excluding the underwriting discounts and commissions, will be approximately \$. We have also agreed to reimburse the underwriters for certain of their expenses related to the Financial Industry Regulatory Authority, Inc., in an amount up to \$.

A prospectus in electronic format may be made available on the web sites maintained by one or more underwriters, or selling group members, if any, participating in the offering. The underwriters may agree to allocate a number of shares to underwriters and selling group members for sale to their online brokerage account holders. Internet distributions will be allocated by the representatives to underwriters and selling group members that may make Internet distributions on the same basis as other allocations.

We have agreed that we will not (i) 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, or submit to, or file with, the Securities and Exchange Commission a registration statement under the Securities Act relating to, any shares of our common stock or securities convertible into or exercisable or exchangeable for any shares of our common stock, or publicly disclose the intention to make any offer, sale, pledge, loan, disposition or filing, or (ii) enter into any swap or other arrangement that transfers all or a portion of the economic consequences associated with the ownership of any shares of common stock or any such other securities (regardless of whether any of these transactions are to be settled by the delivery of shares of common stock or such other securities, in cash or otherwise), in each case without the prior written consent of for a period of 180 days after the date of this prospectus, other than the shares of our common stock to be sold in this offering.

The restrictions on our actions, as described above, do not apply to certain transactions, including (i) the issuance of shares of common stock or securities convertible into or exercisable for shares of our common stock pursuant to the conversion or exchange of convertible or exchangeable securities or the exercise of warrants or options (including net exercise) or the settlement of RSUs (including net settlement), in each case outstanding on the date of the underwriting agreement and described in this prospectus; (ii) grants of stock options, stock awards, restricted stock, RSUs, or other equity awards and the issuance of shares of our common stock or securities convertible into or exercisable or exchangeable for shares of our common stock (whether upon the exercise of stock options or otherwise) to our employees, officers, directors, advisors, or consultants pursuant to the terms of an equity compensation plan in effect as of the closing of this offering and described in this prospectus, provided that such recipients enter into a lock-up agreement with the underwriters; (iii) the issuance of up to % of the outstanding shares of our common stock, or securities convertible into, exercisable for, or which are otherwise exchangeable for, our common stock, immediately following the closing of this offering, in acquisitions or other similar strategic transactions, provided that such recipients enter into a lock-up agreement with the underwriters; or (iv) our filing of any registration statement on Form S-8 relating to securities granted or to be granted pursuant to any plan in effect on the date of the underwriting agreement and described in this prospectus or any assumed benefit plan pursuant to an acquisition or similar strategic transaction.

Our directors and executive officers, and substantially all of our shareholders (such persons, the "lock-up parties") have entered into lock-up agreements with the underwriters prior to the commencement of this offering pursuant to which each lock-up party, with limited exceptions, for a period of 180 days after the date of this prospectus (such period, the "restricted period"), may not (and may not cause any of their direct or indirect affiliates to), without the prior written consent of , (1) 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 our common stock or any securities convertible into or exercisable or exchangeable for our common stock (including, without limitation, common stock or such other securities which may be deemed to be beneficially owned by such lock-up parties in accordance with the rules and regulations of the SEC and

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securities which may be issued upon exercise of a stock option or warrant (collectively with the common stock, the “lock-up securities”), (2) enter into any hedging, swap or other agreement or transaction that transfers, in whole or in part, any of the economic consequences of ownership of the lock-up securities, whether any such transaction described in clause (1) or (2) above is to be settled by delivery of lock-up securities, in cash or otherwise, (3) make any demand for, or exercise any right with respect to, the registration of any lock-up securities, or (4) publicly disclose the intention to do any of the foregoing. Such persons or entities have further acknowledged that these undertakings preclude them from engaging in any hedging or other transactions or arrangements (including, without limitation, any short sale or the purchase or sale of, or entry into, any put or call option, or combination thereof, forward, swap or any other derivative transaction or instrument, however described or defined) designed or intended, or which could reasonably be expected to lead to or result in, a sale or disposition or transfer (by any person or entity, whether or not a signatory to such agreement) of any economic consequences of ownership, in whole or in part, directly or indirectly, of any lock-up securities, whether any such transaction or arrangement (or instrument provided for thereunder) would be settled by delivery of lock-up securities, in cash or otherwise.

The restrictions described in the immediately preceding paragraph and contained in the lock-up agreements between the underwriters and the lock-up parties do not apply, subject in certain cases to various conditions, to certain transactions, including (a) transfers of lock-up securities: (i) as bona fide gifts, or for bona fide estate planning purposes, (ii) by will or intestacy, (iii) to any trust for the direct or indirect benefit of the lock-up party or any immediate family member, (iv) to a partnership, limited liability company or other entity of which the lock-up party and its immediate family members are the legal and beneficial owner of all of the outstanding equity securities or similar interests, (v) to a nominee or custodian of a person or entity to whom a disposition or transfer would be permissible under clauses (i) through (iv), (vi) in the case of a corporation, partnership, limited liability company, trust or other business entity, (A) to another corporation, partnership, limited liability company, trust or other business entity that is an affiliate of the lock-up party, or to any investment fund or other entity controlling, controlled by, managing or managed by or under common control with the lock-up party or its affiliates or (B) as part of a distribution to members or stockholders of the lock-up party; (vii) by operation of law, (viii) to us from an employee upon death, disability or termination of employment of such employee, (ix) as part of a sale of lock-up securities acquired in open market transactions after the completion of this offering, (x) to us in connection with the vesting, settlement or exercise of restricted stock units, options, warrants or other rights to purchase shares of our common stock (including “net” or “cashless” exercise), including for the payment of exercise price and tax and remittance payments, or (xi) pursuant to a bona fide third-party tender offer, merger, consolidation or other similar transaction approved by our board of directors and made to all shareholders involving a change in control, provided that if such transaction is not completed, all such lock-up securities would remain subject to the restrictions in the immediately preceding paragraph; (b) exercise of the options, settlement of RSUs or other equity awards, or the exercise of warrants granted pursuant to plans described in this prospectus, provided that any lock-up securities received upon such exercise, vesting or settlement would be subject to restrictions similar to those in the immediately preceding paragraph; (c) the conversion of outstanding preferred stock, warrants to acquire preferred stock, or convertible securities into shares of our common stock or warrants to acquire shares of our common stock, provided that any common stock or warrant received upon such conversion would be subject to restrictions similar to those in the immediately preceding paragraph; and (d) the establishment by lock-up parties of trading plans under Rule 10b5-1 under the Exchange Act, provided that such plan does not provide for the transfer of lock-up securities during the restricted period.

in their sole discretion, may release the securities subject to any of the lock-up agreements with the underwriters described above, in whole or in part at any time.

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We have agreed to indemnify the underwriters against certain liabilities, including liabilities under the Securities Act of 1933.

We have applied to have our common stock approved for listing on the Nasdaq Global Market under the symbol "LABP."

In connection with this offering, the underwriters may engage in stabilizing transactions, which involves making bids for, purchasing and selling shares of common stock in the open market for the purpose of preventing or retarding a decline in the market price of the common stock while this offering is in progress. These stabilizing transactions may include making short sales of common stock, which involves the sale by the underwriters of a greater number of shares of common stock than they are required to purchase in this offering, and purchasing shares of common stock on the open market to cover positions created by short sales. Short sales may be "covered" shorts, which are short positions in an amount not greater than the underwriters' option to purchase additional shares referred to above, or may be "naked" shorts, which are short positions in excess of that amount. The underwriters may close out any covered short position either by exercising their option to purchase additional shares, in whole or in part, or by purchasing shares in the open market. In making this determination, the underwriters will consider, among other things, the price of shares available for purchase in the open market compared to the price at which the underwriters may purchase shares through the option to purchase additional shares. 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 that could adversely affect investors who purchase in this offering. To the extent that the underwriters create a naked short position, they will purchase shares in the open market to cover the position.

The underwriters have advised us that, pursuant to Regulation M of the Securities Act of 1933, they may also engage in other activities that stabilize, maintain or otherwise affect the price of the common stock, including the imposition of penalty bids. This means that if the representatives of the underwriters purchase common stock in the open market in stabilizing transactions or to cover short sales, the representatives can require the underwriters that sold those shares as part of this offering to repay the underwriting discount received by them.

These activities may have the effect of raising or maintaining the market price of the common stock or preventing or retarding a decline in the market price of the common stock, and, as a result, the price of the common stock may be higher than the price that otherwise might exist in the open market. If the underwriters commence these activities, they may discontinue them at any time. The underwriters may carry out these transactions on the Nasdaq Global Market, in the over-the-counter market or otherwise.

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 of the underwriters. In determining the initial public offering price, we and the representatives of the underwriters expect to consider a number of factors including:

- the information set forth in this prospectus and otherwise available to the representatives;
- our prospects and the history and prospects for the industry in which we compete;
- an assessment of our management;
- our prospects for future earnings;
- the general condition of the securities markets at the time of this offering;

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- the recent market prices of, and demand for, publicly traded common stock of generally comparable companies; and
- other factors deemed relevant by the underwriters and us.

Neither we nor the underwriters can assure investors that an active trading market will develop for shares of our common stock, or that the shares will trade in the public market at or above the initial public offering price.

Certain of the underwriters and their affiliates have provided in the past to us and our affiliates and may provide from time to time in the future certain commercial banking, financial advisory, investment banking and other services for us and our affiliates in the ordinary course of their business, for which they have received and may continue to receive customary fees and commissions. In addition, from time to time, certain of the underwriters and their affiliates may effect transactions for their own account or the account of customers, and hold on behalf of themselves or their customers, long or short positions in our debt or equity securities or loans, and may do so in the future.

Selling restrictions

General

Other than in the United States, no action has been taken by us or the underwriters that would permit a public offering of the securities offered by this prospectus in any jurisdiction where action for that purpose is required. The securities offered by this prospectus may not be offered or sold, directly or indirectly, nor may this prospectus or any other offering material or advertisements in connection with the offer and sale of any such securities be distributed or published in any jurisdiction, except under circumstances that will result in compliance with the applicable rules and regulations of that jurisdiction. Persons into whose possession this prospectus comes are advised to inform themselves about and to observe any restrictions relating to the offering and the distribution of this prospectus. This prospectus does not constitute an offer to sell or a solicitation of an offer to buy any securities offered by this prospectus in any jurisdiction in which such an offer or a solicitation is unlawful.

Notice to prospective investors in the European Economic Area

In relation to each Member State of the European Economic Area (each a "Member State"), no shares have been offered or will be offered pursuant to the offering to the public in that Member State prior to the publication of a prospectus in relation to the Shares 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 may be made to the public in that Member State at any time under the following exemptions under the Prospectus Regulation:

- to any legal entity which is a qualified investor as defined under the Prospectus Regulation;
- to fewer than 150 natural or legal persons (other than qualified investors as defined in the Prospectus Regulation), subject to obtaining the prior consent of the representatives for any such offer; or
- in any other circumstances falling within Article 1(4) of the Prospectus Regulation;

provided that no such offer of shares shall require the issuer or any underwriter to publish a prospectus pursuant to Article 3 of the Prospectus Regulation or supplement a prospectus pursuant to Article 23 of the Prospectus Regulation and each person who initially acquires any shares or to whom any offer is made will be deemed to have represented, acknowledged and agreed to and with each of the underwriters and us that it is a

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“qualified investor” within the meaning of Article 2(e) of the Prospectus Regulation. In the case of any shares being offered to a financial intermediary as that term is used in the Prospectus Regulation, each such financial intermediary will be deemed to have represented, acknowledged and agreed that the shares acquired by it in the offer have not been acquired on a non-discretionary basis on behalf of, nor have they been acquired with a view to their offer or resale to, persons in circumstances which may give rise to an offer of any shares to the public other than their offer or resale in a Member State to qualified investors as so defined or in circumstances in which the prior consent of the underwriters have been obtained to each such proposed offer or resale.

For the purposes of this provision, the expression an “offer to the public” in relation to any shares 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 to be offered so as to enable an investor to decide to purchase or subscribe for any shares, and the expression “Prospectus Regulation” means Regulation (EU) 2017/1129.

Notice to prospective investors in the United Kingdom

In addition, in the United Kingdom, this document is being distributed only to, and is directed only at, and any offer subsequently made may only be directed at persons who are “qualified investors” (as defined in the Prospectus Regulation) (i) who have professional experience in matters relating to investments falling within Article 19 (5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005, as amended, or the Order and/or (ii) who are high net worth companies (or persons to whom it may otherwise be lawfully communicated) falling within Article 49(2)(a) to (d) of the Order, all such persons together being referred to as “relevant persons” or otherwise in circumstances which have not resulted and will not result in an offer to the public of the shares in the United Kingdom within the meaning of the Financial Services and Markets Act 2000.

Any person in the United Kingdom that is not a relevant person should not act or rely on the information included in this document or use it as basis for taking any action. In the United Kingdom, any investment or investment activity that this document relates to may be made or taken exclusively by relevant persons.

Notice to prospective investors in Canada

The shares 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 the shares 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 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.

Notice to prospective investors in Switzerland

The shares may not be publicly offered in Switzerland and will not be listed on the SIX Swiss Exchange, or SIX, or on any other stock exchange or regulated trading facility in Switzerland. This document does not constitute a

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prospectus within the meaning of, and has been prepared without regard to the disclosure standards for issuance prospectuses under art. 652a or art. 1156 of the Swiss Code of Obligations or the disclosure standards for listing prospectuses under art. 27 ff. of the SIX Listing Rules or the listing rules of any other stock exchange or regulated trading facility in Switzerland. Neither this document nor any other offering or marketing material relating to the shares or the offering may be publicly distributed or otherwise made publicly available in Switzerland.

Neither this document nor any other offering or marketing material relating to the offering, the Company, the shares have been or will be filed with or approved by any Swiss regulatory authority. In particular, this document will not be filed with, and the offer of shares will not be supervised by, the Swiss Financial Market Supervisory Authority, or FINMA, and the offer of shares has not been and will not be authorized under the Swiss Federal Act on Collective Investment Schemes, or CISA. The investor protection afforded to acquirers of interests in collective investment schemes under the CISA does not extend to acquirers of shares.

Notice to prospective investors in the Dubai International Financial Centre, or DIFC

This document relates to an Exempt Offer in accordance with the Markets Rules 2012 of the Dubai Financial Services Authority (“DFSA”). This document is intended for distribution only to persons of a type specified in the Markets Rules 2012 of the DFSA. It must not be delivered to, or relied on by, any other person. The DFSA has no responsibility for reviewing or verifying any documents in connection with Exempt Offers. The DFSA has not approved this prospectus supplement nor taken steps to verify the information set forth herein and has no responsibility for this document. The securities to which this document relates may be illiquid and/or subject to restrictions on their resale. Prospective purchasers of the securities offered should conduct their own due diligence on the securities. If you do not understand the contents of this document you should consult an authorized financial advisor.

In relation to its use in the DIFC, this document is strictly private and confidential and is being distributed to a limited number of investors and must not be provided to any person other than the original recipient, and may not be reproduced or used for any other purpose. The interests in the securities may not be offered or sold directly or indirectly to the public in the DIFC.

Notice to prospective investors in the United Arab Emirates

The shares have not been, and are not being, publicly offered, sold, promoted or advertised in the United Arab Emirates (including the Dubai International Financial Centre) other than in compliance with the laws of the United Arab Emirates (and the Dubai International Financial Centre) governing the issue, offering and sale of securities. Further, this prospectus does not constitute a public offer of securities in the United Arab Emirates (including the Dubai International Financial Centre) and is not intended to be a public offer. This prospectus has not been approved by or filed with the Central Bank of the United Arab Emirates, the Securities and Commodities Authority or the Dubai Financial Services Authority.

Notice to prospective investors in Australia

This prospectus:

- does not constitute a disclosure document or a prospectus under Chapter 6D.2 of the Corporations Act 2001 (Cth) (the “Corporations Act”);
- has not been, and will not be, lodged with the Australian Securities and Investments Commission, or ASIC, as a disclosure document for the purposes of the Corporations Act and does not purport to include the information required of a disclosure document for the purposes of the Corporations Act; and

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- may only be provided in Australia to select investors who are able to demonstrate that they fall within one or more of the categories of investors, available under section 708 of the Corporations Act (“Exempt Investors”).

The shares may not be directly or indirectly offered for subscription or purchased or sold, and no invitations to subscribe for or buy the shares may be issued, and no draft or definitive offering memorandum, advertisement or other offering material relating to any shares may be distributed in Australia, except where disclosure to investors is not required under Chapter 6D of the Corporations Act or is otherwise in compliance with all applicable Australian laws and regulations. By submitting an application for the shares, you represent and warrant to us that you are an Exempt Investor.

As any offer of shares under this document will be made without disclosure in Australia under Chapter 6D.2 of the Corporations Act, the offer of those securities for resale in Australia within 12 months may, under section 707 of the Corporations Act, require disclosure to investors under Chapter 6D.2 if none of the exemptions in section 708 applies to that resale. By applying for the shares you undertake to us that you will not, for a period of 12 months from the date of issue of the shares, offer, transfer, assign or otherwise alienate those shares to investors in Australia except in circumstances where disclosure to investors is not required under Chapter 6D.2 of the Corporations Act or where a compliant disclosure document is prepared and lodged with ASIC.

Notice to prospective investors in Japan

The shares have not been and will not be registered pursuant to Article 4, Paragraph 1 of the Financial Instruments and Exchange Act. Accordingly, none of the shares nor any interest therein may be offered or sold, directly or indirectly, in Japan or to, or for the benefit of, any “resident” of Japan (which term as used herein means any person resident in Japan, including any corporation or other entity organized under the laws of Japan), or to others for re-offering or resale, directly or indirectly, in Japan or to or for the benefit of a resident of Japan, except pursuant to an exemption from the registration requirements of, and otherwise in compliance with, the Financial Instruments and Exchange Act and any other applicable laws, regulations and ministerial guidelines of Japan in effect at the relevant time.

Notice to prospective investors in Hong Kong

The shares have not been offered or sold and will not be offered or sold in Hong Kong, by means of any document, other than (a) to “professional investors” as defined in the Securities and Futures Ordinance (Cap. 571 of the Laws of Hong Kong), or the SFO, of Hong Kong and any rules made thereunder; or (b) in other circumstances which do not result in the document being a “prospectus” as defined in the Companies (Winding Up and Miscellaneous Provisions) Ordinance (Cap. 32) of Hong Kong, or the CO, or which do not constitute an offer to the public within the meaning of the CO. No advertisement, invitation or document relating to the shares has been or may be issued or has been or may be in the possession of any person for the purposes of issue, whether in Hong Kong or elsewhere, which is directed at, or the contents of which are likely to be accessed or read by, the public of Hong Kong (except if permitted to do so under the securities laws of Hong Kong) other than with respect to shares which are or are intended to be disposed of only to persons outside Hong Kong or only to “professional investors” as defined in the SFO and any rules made thereunder.

Notice to prospective investors in Singapore

Each underwriter has acknowledged that this prospectus has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, each underwriter has represented and agreed that it has not offered or sold any shares or caused the shares to be made the subject of an invitation for subscription or

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purchase and will not offer or sell any shares or cause the shares to be made the subject of an invitation for subscription or purchase, and has not circulated or distributed, nor will it circulate or distribute, this prospectus or any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of the shares, whether directly or indirectly, to any person in Singapore other than:

- (a) to an institutional investor (as defined in Section 4A of the Securities and Futures Act (Chapter 289) of Singapore, as modified or amended from time to time, or the SFA) pursuant to Section 274 of the SFA;
- (b) to a relevant person (as defined in Section 275(2) of the SFA) pursuant to Section 275(1) of the SFA, or any person pursuant to Section 275(1A) of the SFA, and in accordance with the conditions specified in Section 275 of the SFA; or
- (c) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA.

Where the shares are subscribed or purchased under Section 275 of the SFA by a relevant person which is:

- (a) a corporation (which is not an accredited investor (as defined in Section 4A of the SFA)) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or
- (b) a trust (where the trustee is not an accredited investor) whose sole purpose is to hold investments and each beneficiary of the trust is an individual who is an accredited investor,

securities or securities-based derivatives contracts (each term as defined in Section 2(1) of the SFA) of that corporation or the beneficiaries' rights and interest (howsoever described) in that trust shall not be transferred within six months after that corporation or that trust has acquired the shares pursuant to an offer made under Section 275 of the SFA except:

- (i) to an institutional investor or to a relevant person, or to any person arising from an offer referred to in Section 275(1A) or Section 276(4)(i) (B) of the SFA;
- (ii) where no consideration is or will be given for the transfer;
- (iii) where the transfer is by operation of law;
- (iv) as specified in Section 276(7) of the SFA; or
- (v) as specified in Regulation 37A of the Securities and Futures (Offers of Investments) (Securities and Securities-based Derivatives Contracts) Regulations 2018.

Singapore SFA Product Classification—In connection with Section 309B of the SFA and the CMP Regulations 2018, unless otherwise specified before an offer of shares, we have determined, and hereby notify all relevant persons (as defined in Section 309A(1) of the SFA), that the shares are “prescribed capital markets products” (as defined in the CMP Regulations 2018) and Excluded Investment Products (as defined in MAS Notice SFA 04-N12: Notice on the Sale of Investment Products and MAS Notice FAA-N16: Notice on Recommendations on Investment Products).

Legal matters

The validity of the shares of common stock offered hereby will be passed upon for us by Cooley LLP, New York, New York. Certain legal matters will be passed upon for the underwriters by Latham & Watkins LLP, New York, New York.

Experts

The consolidated financial statements of Landos Biopharma Inc. and Subsidiaries at December 31, 2019 and 2018, and for the years then ended, 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 under the Securities Act with respect to the shares of common stock being offered by this prospectus. This prospectus, which constitutes part of the registration statement, does not contain all of the information in the registration statement and its exhibits. For further information with respect to our company and the common stock offered by this prospectus, we refer you to the registration statement and its exhibits. Statements contained in this prospectus as to the contents of any contract or any other document referred to are not necessarily complete, and in each instance, we refer you to the copy of the contract or other document filed as an exhibit to the registration statement. Each of these statements is qualified in all respects by this reference.

You can read our SEC filings, including the registration statement, over the internet at the SEC's website at www.sec.gov. You may also read and copy any document we file with the SEC at its public reference room at 100 F Street, N.E., Room 1580, Washington, D.C. 20549. You may also obtain copies of these documents at prescribed rates by writing to the Public Reference Section of the SEC at 100 F Street, N.E., Washington, D.C. 20549. Please call the SEC at 1-800-SEC-0330 for further information on the operation of the public reference facilities.

Upon completion of this offering, we will be subject to the information reporting requirements of the Exchange Act, and we will file reports, proxy statements and other information with the SEC. These reports, proxy statements and other information will be available for inspection and copying at the public reference room and website of the SEC referred to above.

We also maintain a website at www.landosbiopharma.com, at which you may access these materials free of charge as soon as reasonably practicable after they are electronically filed with, or furnished to, the SEC. The information contained in, or that can be accessed through, our website is not part of, and is not incorporated into, this prospectus, and the inclusion of our website address in this prospectus is only as an inactive textual reference.

Landos Biopharma, Inc. and Subsidiaries

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Report of independent registered public accounting firm

To the Shareholders and the Board of Directors of Landos Biopharma, Inc. and Subsidiaries

Opinion on the financial statements

We have audited the accompanying consolidated balance sheets of Landos Biopharma, Inc. and Subsidiaries (the “Company”) as of December 31, 2019 and 2018, the related consolidated statements of operations and comprehensive loss, convertible preferred stock and stockholders’ deficit and cash flows for the years then ended, and the related notes (collectively referred to as the “consolidated financial statements”). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2019 and 2018, and the results of its operations and its cash flows for the years then ended 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. 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 LLP

We have served as the Company’s auditor since 2020.

Raleigh, North Carolina
June 30, 2020

Landos Biopharma, Inc. and Subsidiaries

Consolidated balance sheets

(In thousands, except share and per share amounts)

	December 31,	
	2018	2019
Assets		
Current assets:		
Cash and cash equivalents	\$ 359	\$ 9,808
Marketable securities, available for sale	—	40,157
Incentive and tax receivables	2,092	1
Prepaid expenses and other current assets	41	144
Total current assets	2,492	50,110
Property and equipment, net	304	359
Other assets	—	11
Total assets	\$ 2,796	\$ 50,480
Liabilities, convertible preferred stock and stockholders' (deficit) equity		
Current liabilities:		
Accounts payable	\$ 1,692	\$ 2,048
Accrued liabilities	104	978
Total current liabilities	1,796	3,026
Total liabilities	1,796	3,026
Commitments and contingencies (Note 8)		
Convertible preferred stock, \$0.01 par value, 11,260,608 shares authorized, issued and outstanding as of December 31, 2019; aggregate liquidation preference of \$70,254 as of December 31, 2019	—	73,037
Stockholders' (deficit) equity:		
Convertible preferred stock, \$0.01 par value, 3,224,034 shares authorized, issued and outstanding as of December 31, 2018; aggregate liquidation preference of \$9,995 as of December 31, 2018	32	—
Common stock, \$0.01 par value; 10,000,000 and 20,500,000 shares authorized as of December 31, 2018 and 2019, respectively; 6,033,984 and 6,457,421 shares issued and outstanding as of December 31, 2018 and 2019, respectively	59	63
Additional paid-in capital	10,044	16
Accumulated other comprehensive loss	—	(77)
Accumulated deficit	(9,135)	(25,585)
Total stockholders' (deficit) equity	\$ 1,000	\$(25,583)
Total liabilities, convertible preferred stock and stockholders' (deficit) equity	\$ 2,796	\$ 50,480

The accompanying notes are an integral part of these consolidated financial statements.

Landos Biopharma, Inc. and Subsidiaries

Consolidated statements of operations and comprehensive loss

(In thousands, except share and per share amounts)

	Year ended December 31,	
	2018	2019
Operating expenses:		
Research and development	\$ 6,803	\$ 11,812
General and administrative	1,136	1,478
Total operating expenses	7,939	13,290
Loss from operations	(7,939)	(13,290)
Other income (expenses):		
Research and development incentive income	2,005	—
Interest expense	(4)	(304)
Loss from foreign exchange	(106)	(33)
Other income, net	—	160
Other income (expense), net	1,895	(177)
Net loss	\$ (6,044)	\$ (13,467)
Net loss per share, basic and diluted	\$ (1.07)	\$ (2.16)
Weighted-average shares used to compute net loss per share, basic and diluted	5,637,905	6,243,382
Pro forma net loss per share, basic and diluted (unaudited)		\$ (1.06)
Weighted-average shares used in computing pro forma net loss per share, basic and diluted (unaudited)		12,660,028
Net loss	\$ (6,044)	\$ (13,467)
Unrealized gain/(loss) on available-for-sale securities	—	(77)
Comprehensive loss	\$ (6,044)	\$ (13,544)

The accompanying notes are an integral part of these consolidated financial statements.

Landos Biopharma, Inc. and Subsidiaries

Consolidated statements of convertible preferred stock and stockholders' deficit

(In thousands, except share amounts)

	Convertible preferred stock		Convertible preferred stock		Common stock		Additional paid-in capital	Tranche right	Accumulated deficit	Accumulated other comprehensive loss	Total stockholders' deficit
	Shares	Amounts	Shares	Amounts	Shares	Amounts					
Balance at December 31, 2017	—	\$ —	1,612,017	\$ 16	5,504,687	\$ 54	\$ 4,993	\$ 19	\$ (3,091)	\$ —	\$ 1,991
Issuance of Series A convertible preferred stock	—	—	1,612,017	16	—	—	4,984	—	—	—	5,000
Settlement of the preferred stock tranche obligation	—	—	—	—	—	—	19	(19)	—	—	—
Compensation expense related to vesting of common stock issued to Xontogeny (See Note 6)	—	—	—	—	529,297	5	48	—	—	—	53
Net loss and comprehensive loss	—	—	—	—	—	—	—	—	(6,044)	—	(6,044)
Balance at December 31, 2018	—	—	3,224,034	32	6,033,984	59	10,044	—	(9,135)	—	1,000
Compensation expense related to vesting of common stock issued to Xontogeny (See Note 6)	—	—	—	—	423,437	4	47	—	—	—	51
Beneficial conversion option on convertible promissory notes (See Note 5)	—	—	—	—	—	—	20	—	—	—	20
Issuance of Series B convertible preferred stock, net of issuance costs of \$267	6,935,086	51,668	—	—	—	—	—	—	—	—	—
Conversion of convertible promissory notes into convertible preferred stock (See Note 5)	1,101,488	8,279	—	—	—	—	(20)	—	—	—	(20)
Reclassification of Series A convertible preferred stock from permanent to mezzanine equity	3,224,034	13,090	(3,224,034)	(32)	—	—	(10,075)	—	(2,983)	—	(13,090)
Unrealized loss on marketable securities	—	—	—	—	—	—	—	—	—	(77)	(77)
Net loss	—	—	—	—	—	—	—	—	(13,467)	—	(13,467)
Balance at December 31, 2019	11,260,608	\$ 73,037	—	—	6,457,421	\$ 63	\$ 16	—	\$ (25,585)	\$ (77)	\$ (25,583)

The accompanying notes are an integral part of these consolidated financial statements.

Landos Biopharma, Inc. and Subsidiaries

Consolidated statements of cash flows

(In thousands)

	Year ended December 31,	
	2018	2019
CASH FLOWS FROM OPERATING ACTIVITIES:		
Net loss	\$ (6,044)	\$ (13,467)
Adjustments to reconcile net loss to net cash used in operating activities:		
Compensation expense related to vesting of common stock issued to Xontogeny	53	51
Depreciation of property and equipment	80	103
Accrued interest on convertible promissory notes	—	259
Accrued interest on marketable securities	—	(67)
Unrealized gain/(loss) from foreign exchange	316	(70)
Other	—	40
Changes in operating assets and liabilities:		
Incentive and tax receivables	(2,136)	2,091
Prepaid expenses and other current assets	(23)	(103)
Accounts payable	1,002	415
Accrued liabilities	(144)	874
Net cash provided by (used in) operating activities	(6,896)	(9,874)
CASH FLOWS FROM INVESTING ACTIVITIES:		
Purchase of available-for-sale marketable securities	—	(40,319)
Purchases of property and equipment	(43)	(158)
Return of principal on available-for-sale marketable securities	—	152
Net cash used in investing activities	(43)	(40,325)
CASH FLOWS FROM FINANCING ACTIVITIES:		
Proceeds from issuance of Series A convertible preferred stock	5,000	—
Proceeds from issuance of Series B convertible preferred stock, net of issuance costs of \$267	—	51,668
Proceeds from issuance of convertible promissory notes, net of issuance costs of \$20	—	7,980
Net cash provided by financing activities	5,000	59,648
Net change in cash and cash equivalents	(1,939)	9,449
Cash and cash equivalents at beginning of period	2,298	359
Cash and cash equivalents at end of period	\$ 359	\$ 9,808
SUPPLEMENTAL DISCLOSURE OF NONCASH FINANCING ITEM:		
Cash paid for interest	\$ 4	\$ 27
NONCASH INVESTING AND FINANCING ACTIVITY:		
Settlement of the preferred stock tranche obligation	\$ 19	\$ —
Conversion of convertible promissory notes and related interest to Series B preferred stock	\$ —	\$ 8,259
Unrealized loss on available-for-sale marketable securities	\$ —	\$ 77
Beneficial conversion feature discount on convertible promissory notes	\$ —	\$ 20

The accompanying notes are an integral part of these consolidated financial statements.

Landos Biopharma, Inc. and Subsidiaries

Notes to consolidated financial statements

As of and for the years ended December 31, 2019 and 2018

1. Organization and description of the business

Description of business

Landos Biopharma, Inc. (the “Company”) is a clinical-stage biopharmaceutical company discovering and developing novel treatments for autoimmune diseases. The Company has identified Lanthionine Synthetase C-Like 2 (“LANCL2”) as a novel therapeutic target for autoimmune diseases, including inflammatory bowel disease (“IBD”); Crohn’s disease (“CD”), and ulcerative colitis (“UC”). Landos’ wholly-owned lead clinical asset, BT-11, is the first therapeutic that targets LANCL2 and acts locally in the gastrointestinal tract for treatment of inflammatory bowel disease (IBD). The company completed Phase 1 clinical testing in 2018 and initiated global Phase 2 clinical testing of BT-11 for UC in 2019. Landos is a platform company that continues to discover innovative therapeutic targets (one to two new therapeutic targets per year and their associated drug development programs). Landos also has a robust pipeline of new compounds for other autoimmune diseases (lupus, rheumatoid arthritis, multiple sclerosis, type 1 diabetes), several of which Landos anticipates will advance to Phase 1 clinical testing in 2021. Since inception, the Company has devoted substantially all of its resources to performing research and development activities in support of its product development efforts. The Company does not have any products or partnered products approved for sale and has not generated any revenue from commercial product sales. The Company was incorporated in Delaware in January 2017. Since inception, the Company has devoted substantially all of its resources to performing research and development activities in support of its product development efforts. The Company does not have any products or partnered products approved for sale and has not generated any revenue from commercial product sales. The Company was incorporated in Delaware in January 2017.

Liquidity and capital resources

The Company has incurred net losses and negative cash flows from operations since inception and had an accumulated deficit of \$25.7 million as of December 31, 2019. Since inception through December 31, 2019, the Company has funded operations primarily through the issuance of convertible preferred stock and convertible promissory notes. The Company expects to incur substantial operating losses for at least the next several years and will need to obtain additional financing in order to initiate and complete clinical trials, discover, develop, seek regulatory approvals for and prepare for potential commercialization of its product candidates. There can be no assurance that such financing will be available or will be at terms acceptable to the Company.

As of December 31, 2019, the Company had cash, cash equivalents and marketable securities of \$50.0 million, which it believes will be sufficient to fund its planned operations for a period of at least 12 months from the date of the issuance of its consolidated financial statements.

2. Summary of significant accounting policies

Basis of presentation

The consolidated financial statements and accompanying notes have been prepared in accordance with accounting principles generally accepted in the United States of America (“U.S. GAAP”).

Principals of consolidation

The accompanying consolidated financial statements include the accounts of the Company and its wholly owned subsidiary, Landos Biopharma Australia Pty Ltd. (“Landos Australia”). All intercompany balances and transactions have been eliminated in consolidation.

Use of estimates

The preparation of consolidated financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the consolidated financial statements and the reported amounts of expenses during the reporting period. Significant estimates and assumptions made in the accompanying consolidated financial statements include but are not limited to accrued liabilities, fair value of equity instruments, and uncertain tax positions. 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.

Consolidated financial statements in U.S. dollars

The Company's functional currency is the U.S. dollar ("dollar" or "\$") since the dollar is the currency of the primary economic environment in which the Company has operated and expects to continue to operate in the foreseeable future. Transactions and balances denominated in dollars are presented at their original amounts. Transactions and balances denominated in foreign currencies have been re-measured to dollars. All transaction gains and losses from re-measurement of monetary balance sheet items denominated in non-dollar currencies are reflected in the consolidated statement of operations and comprehensive loss as other income, net. Net foreign currency transaction losses were not material for the years ended December 31, 2018 and 2019.

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 funds and commercial paper and are stated at fair value.

Marketable securities

The Company's investments in marketable securities are maintained by investment managers and consist of corporate debt securities with original maturities of over 90 days, all of which are considered available-for-sale debt securities. The Company classifies its available-for-sale securities as short-term marketable securities on the consolidated balance sheets, even though the stated maturity date may be one year or more beyond the current consolidated balance sheet date, as the Company views those securities as available for use in current operations, if needed.

Available-for-sale securities are carried at fair value with their unrealized gains and losses included in accumulated other comprehensive loss within stockholders' (deficit) equity, until such gains and losses are realized in other income (expense), net, within the consolidated statements of operations and comprehensive loss or until an unrealized loss is considered other-than-temporary.

The Company evaluates its investments with unrealized losses for other-than-temporary impairment. When assessing investments for other-than-temporary declines in value, the Company considers such factors as, among other things, how significant the decline in value is as a percentage of the original cost, how long the market value of the investment has been less than its original cost, the Company's ability and intent to retain the investment for a period of time sufficient to allow for any anticipated recovery in fair value and market conditions. If the Company determines from this analysis that it does not expect to receive cash flows sufficient to recover the entire amortized cost of the security, a credit loss exists, the impairment is considered other-than-temporary and is recognized in the consolidated statements of operations and comprehensive loss.

Concentrations of credit risk

Financial instruments that potentially subject the Company to a concentration of credit risk consist primarily of cash, cash equivalents, and marketable securities. Bank deposits are held by accredited financial institutions and these deposits may at times be in excess of insured limits. The Company limits its credit risk associated with cash and cash equivalents by placing them with financial institutions it believes are of high quality. The Company has not experienced any losses on its deposits of cash or cash equivalents. The Company's available-for-sale investments primarily consist of high-grade corporate debt, and potentially subject the Company to concentrations of credit risk. The Company has adopted investment guidelines that limit the amounts the Company may invest in any one type of investment and requires all investments held by the Company to be highly rated, thereby reducing credit risk exposure.

Property and equipment, net

Property and equipment are stated at cost, less accumulated depreciation. Depreciation is calculated using the straight-line method over the estimated useful lives of the related assets. The estimated useful lives of laboratory equipment, furniture and fixtures ranges from five to seven years. Maintenance, repair and calibration costs are expensed as incurred.

Impairment of long-lived assets

The Company periodically evaluates its long-lived assets, including property and equipment, for impairment whenever events or changes in business circumstances indicate that the carrying amount of the assets or group of assets may not be fully recoverable. If indicators of impairment exist and the undiscounted future cash flows that the assets are expected to generate are less than the carrying value of the assets, the Company reduces the carrying amount of the assets through an impairment charge, to their estimated fair values based on a discounted cash flow approach or, when available and appropriate, to comparable market values. In 2018 and 2019, there were no such indicators.

Deferred offering costs

The Company has deferred offering costs consisting of direct legal, accounting, filing and other fees and costs directly attributable to the Company's planned IPO. The deferred offering costs will be offset against the proceeds received upon the closing of the planned IPO. In the event the planned IPO is terminated, all of the deferred offering costs will be expensed within the Company's consolidated statement of operations. As of December 31, 2019, \$11 thousand of deferred offering costs were capitalized, which are included in other assets on the consolidated balance sheet. There were no such costs capitalized as of December 31, 2018.

Research and development expenses

Research and development expenses consist primarily of costs incurred for the development of the Company's lead clinical product candidates BT-11, NX-13 and other pipeline therapeutic assets. Research and development costs consist primarily of external costs related to clinical development, contract manufacturing and discovery as well as personnel costs. Personnel costs consist of salaries and employee benefits. The Company estimates preclinical and clinical study and research expenses based on the services performed, pursuant to contracts with research institutions that conduct and manage preclinical and clinical studies and research services on its behalf. The Company records the costs of research and development activities based upon the estimated amount of services provided but not yet invoiced and includes these costs in accrued liabilities in the consolidated balance sheets. These costs are a component of the Company's research and development

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expenses. The Company accrues for these costs based on factors such as estimates of the work completed and in accordance with agreements established with its third-party service providers under the service agreements. 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.

Research and development incentive income

The Company is eligible to obtain certain research and development tax credits including the Australian research and development tax incentive credit (the "Australia R&D credit") through a program administered through the Australian Tax Office, which provides for a cash refund based on a percentage of certain research and development activities undertaken in Australia by Landos Australia. The cash refund currently provides for a 43.5% refundable tax offset if eligible companies meet certain criteria such as i) have annual aggregate revenue of less than \$20.0 million (Australian) during the reimbursable period, ii) if the intellectual property being developed is Australian owned, have intercompany agreements to support the Australian ownership, iii) file an R&D tax incentive application to register its R&D activities, and iv) analyze its R&D expense to ensure they are qualified under Australian Industry guidelines. Certain of these research and development expenses can be incurred outside of Australia if applicable criteria are met. The Company recognized \$2.0 million of other income related to this program as of December 31, 2018. The tax incentives are available on the basis of specific criteria with which the Company must comply. Although the tax incentive may be administered through the local tax authority, the Company has accounted for the incentives outside of the scope of ASC Topic 740, Income Taxes, since the incentives are not linked to the Company's taxable income and can be realized regardless of whether the Company has generated taxable income in the respective jurisdictions.

The Australian Tax Office has the right to review the reimbursed amounts for eligibility until February 2023. The Company may be exposed to risks if the Australian Tax Office determines these expenses to be ineligible. The Company evaluated the exposure under ASC 450, Commitments and Contingencies, and does not believe determination of ineligible costs is probable. Therefore, no amount has been accrued as of December 31, 2018 and 2019.

In addition, Landos Australia incurs Goods and Services Tax ("GST") on services provided by Australian vendors. As an Australian entity, Landos Australia is entitled to a refund of the GST paid. The Company's estimate of the amount of cash refund it expects to receive related to GST incurred is included in Incentive and tax receivables in the accompanying consolidated balance sheets.

Income taxes

Landos Biopharma, Inc. began operations in 2017 and is considered a Subchapter C Corporation and is subject to an entity-level income tax. Income taxes are provided for the tax effects of transactions reported in the financial statements and consist of taxes currently due plus deferred income taxes. Deferred income taxes arise from temporary differences between the tax bases of assets and liabilities and their reported amounts in the financial statements. Deferred income tax assets are also recognized for loss carry forwards available to offset future taxable income. The deferred tax assets and liabilities represent the future tax return consequences of those differences, which will be taxable or deductible when the related assets are recovered or the liabilities are settled. A valuation allowance is established for deferred tax assets if it is considered more likely than not that the asset will not be realized.

In accordance with ASC 740-10, Accounting for Income Taxes, ("ASC 740-10"), a company must recognize a tax benefit or expense from an uncertain tax position only if it is more likely than not that the tax position will be

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sustained on examination by the taxing authorities, based on the technical merits of the position. The Company had an unrecorded tax benefit of \$479 thousand and \$1.1 million due to uncertain tax positions as of December 31, 2018 and 2019, respectively. The Company's policy for recording interest and penalties is to record them as a component of interest expense and operating expenses, respectively. As of December 31, 2019, the Company had no accrued interest or penalties related to uncertain tax positions. The total unrecorded benefit would affect the effective tax rate but for the Company's valuation allowance. The Company does not expect a material change in unrecognized tax benefits within the next 12 months.

Basic and diluted net loss per share

Basic loss per share is computed by dividing the net loss by the weighted-average number of shares of common stock outstanding during the period. Diluted loss per share is computed by dividing the net loss by the weighted-average number of shares of common stock together with the number of additional shares of common stock that would have been outstanding if all potentially dilutive shares of common stock had been issued. Since the Company was in a loss position for the periods presented, basic net loss per share is the same as diluted net loss per share since the effects of potentially dilutive securities are antidilutive.

Unaudited pro forma net loss per share

Unaudited pro forma basic and diluted net loss per share has been computed to give effect to the conversion of the convertible preferred stock into common stock as if such conversion had occurred at the beginning of the period or the date of issuance, if later. The unaudited pro forma net loss per share does not include the shares expected to be sold in the Company's proposed IPO.

Comprehensive loss

The Company's comprehensive loss is currently comprised of changes in unrealized losses on available-for-sale securities.

Segment reporting

The Company has one operating segment, which is the business of developing and commercializing novel therapeutics for autoimmune diseases. The Company's chief operating decision maker, its Chief Executive Officer, manages the Company's operations on an aggregated basis for the purposes of allocating resources and evaluating financial performance.

Emerging growth company status (unaudited)

The Company is an emerging growth company ("EGC"), 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 EGC or (ii) affirmatively and irrevocably opts out of the extended transition period provided in the JOBS Act. As a result, these combined and consolidated financial statements may not be comparable to companies that comply with the new or revised accounting pronouncements as of public company effective dates.

As described in "Recently Adopted Accounting Pronouncements" below, the Company early adopted multiple accounting standards, as the JOBS Act does not preclude an EGC from adopting a new or revised accounting

standard earlier than the time that such standard applies to private companies. The Company expects to use the extended transition period for any other new or revised accounting standards during the period in which it remains an emerging growth company.

Recently adopted accounting pronouncements

In May 2014, the Financial Accounting Standards Board (the “FASB”) issued Accounting Standards Update (“ASU”) 2014-09—*Revenue from Contracts with Customers (Topic 606)*, to achieve a consistent application of revenue recognition, resulting in a single revenue model to be applied by reporting companies under U.S. GAAP. Under the new model, recognition of revenue occurs when a customer obtains control of the promised goods or services in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. The standard is effective for public entities for fiscal years beginning after December 15, 2017, and is effective for nonpublic entities for fiscal years beginning after December 15, 2018, with early adoption permitted. The Company adopted this standard effective as of January 1, 2017, and as the Company has not incurred revenues to date, the adoption of the standard did not have a significant impact on its consolidated financial statements.

In June 2018, the FASB issued ASU 2018-07—*Compensation—Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting*, which is intended to reduce the cost and complexity and to improve financial reporting for nonemployee share based payment. The standard expands the scope of Topic 718, (which previously only included share-based payments to employees) to include share-based payments issued to nonemployees for goods or services. Consequently, the accounting for share-based payments to nonemployees and employees will be substantially aligned. The standard is effective for public entities for fiscal years beginning after December 15, 2019, and nonpublic entities for fiscal years beginning after December 15, 2020. Early adoption is permitted but no earlier than a company’s adoption date of Topic 606. The Company early adopted this standard effective as of January 1, 2017, and as the Company had not granted any share-based payment awards prior to the adoption date, the adoption of the standard did not have an impact on its consolidated financial statements.

In August 2018, the FASB issued ASU 2018-13—*Fair Measurement (Topic 820): Disclosure Framework – Changes to the Disclosure Requirements for Fair Value Measurement*, which modifies the disclosure requirements of Topic 820. The new guidance is effective for all entities for annual periods, and interim periods within those annual periods, beginning after December 15, 2019, with early adoption permitted. The Company early adopted this standard effective as of January 1, 2017, and the adoption of the standard did not have an impact on its consolidated financial statements.

Recently issued accounting pronouncements not yet adopted

In February 2016, the FASB issued ASU 2016-02—*Leases (Topic 842)*, requiring the recognition of lease assets and liabilities on the balance sheet. The standard: (a) clarifies the definition of a lease; (b) requires a dual approach to lease classification similar to current lease classifications; and (c) causes lessees to recognize leases on the balance sheet as a lease liability with a corresponding right-of-use asset for leases with a lease-term of more than twelve months. The standard is effective for public entities for fiscal years beginning after December 15, 2018 and was initially effective for nonpublic entities for fiscal years beginning after December 15, 2019. In October 2019, the FASB approved a one-year delay in the effective date for non-public companies and, in June 2020, approved an additional one-year delay in the effective date for non-public companies. As a result, the standard is now effective for fiscal years beginning after December 15, 2021. The Company does not expect the adoption of this ASU to have a material impact on its consolidated financial statements.

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In June 2016, the FASB issued ASU 2016-13—*Financial Instruments (Topic 326) Measurement of Credit Losses on Financial Instrument* (“CECL”), which requires an allowance for expected credit losses on financial assets be recognized as early as day one of the instrument. This ASU departs from the incurred loss model which means the probability threshold is removed. It considers more forward-looking information and requires the entity to estimate its credit losses as far as it can reasonably estimate. The ASU is effective for fiscal years beginning after December 15, 2019, including interim periods within those fiscal years, for public business entities that are U.S. Securities and Exchange Commission (SEC) filers, excluding entities eligible to be smaller reporting companies (SRC). For all other public business entities, including SRC, the ASU is effective for fiscal years beginning after December 15, 2022, including interim periods within those fiscal years. Early adoption is permitted for fiscal years beginning after December 15, 2018. The Company elects to adopt the new standard in annual reporting period beginning after December 31, 2022 and does not expect the adoption of this ASU to have a material impact on the consolidated financial statements.

In August 2018, the FASB issued ASU 2018-15, *Intangibles — Goodwill and Other — Internal-Use Software (Subtopic 350-40): Customer’s Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract* (“ASU 2018-15”). The intent of this pronouncement is to align the requirements for capitalizing implementation costs incurred in a cloud computing arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software as defined in ASC 350-40. Under ASU 2018-15, the capitalized implementation costs related to a cloud computing arrangement will be amortized over the term of the arrangement and all capitalized implementation amounts will be required to be presented in the same line items of the financial statements as the related hosting fees. ASU 2018-15 is effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years, with early adoption permitted. The Company will adopt ASU 2018-15 for its fiscal year beginning January 1, 2020, and does not expect the adoption to have a material impact on the consolidated financial statements.

3. Fair value measurement

Financial assets and liabilities are recorded at fair value on a recurring basis in the consolidated balance sheet. The carrying values of the Company’s financial assets and liabilities, including cash and cash equivalents, prepaids and other current assets, accounts payable, and accrued expenses approximate their fair value due to the short-term maturity of these instruments. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability (an exit price) in an orderly transaction between market participants at the reporting date. Assets and liabilities recorded at fair value in the consolidated financial statements are categorized based upon the level of judgment associated with the inputs used to measure their fair value. Hierarchical levels are directly related to the amount of subjectivity with the inputs to the valuation of these assets or liabilities as follows:

- Level 1**—Observable inputs such as unadjusted, quoted prices in active markets for identical assets or liabilities at the measurement date;
- Level 2**—Inputs (other than quoted prices included in Level 1) are either directly or indirectly observable inputs for similar assets or liabilities. These include quoted prices for identical or similar assets or liabilities in active markets and quoted prices for identical or similar assets of 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

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Financial assets and liabilities subject to fair value measurements on a recurring basis and the level of inputs used in such measurements are as follows (in thousands):

	December 31, 2019			
	Level 1	Level 2	Level 3	Aggregate fair value
Assets:				
Money market funds	\$ 1,333	\$ —	\$ —	\$ 1,333
Commercial paper	—	3,576	—	3,576
Fixed income securities	—	27,078	—	27,078
Asset backed securities	—	13,079	—	13,079
Total assets	\$ 1,333	\$43,733	\$ —	\$ 45,066

The contractual maturities of available for sale securities of December 31, 2019, are as follows (in thousands):

Within one year	\$ 9,088
Within one to five years	34,645
Total contractual maturities	\$43,733

There were no financial assets or liabilities as of December 31, 2018.

The Company's financial instruments consist of Level 1 and Level 2 assets. The Company values its Level 1 assets based on quoted prices in active markets for identical instruments. Level 1 assets consist primarily of highly liquid money market funds that are included in cash equivalents. The Company values its Level 2 assets consisting of commercial paper, fixed income securities, and asset backed securities with the help of a third-party pricing service using quoted market prices for similar instruments or nonbinding market prices that are corroborated by observable market data. The Company uses such pricing data as the primary input, to which no material adjustments have been made during the periods presented, to make its determination and assessments as to the ultimate valuation of these assets. The fair values of these instruments approximate amortized cost.

4. Consolidated balance sheet components

Property and equipment, net

Property and equipment, net consists of the following:

	As of December 31,	
	2018	2019
	(in thousands)	
Laboratory equipment	\$ 304	\$ 463
Furniture and fixtures	109	108
Total property and equipment	413	571
Less: accumulated depreciation	(109)	(212)
Total property and equipment, net	\$ 304	\$ 359

Depreciation expense for property and equipment was \$80 thousand and \$103 thousand for the years ended December 31, 2018 and 2019, respectively.

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Accrued liabilities

Accrued liabilities consist of the following:

	As of December 31,	
	2018	2019
	(in thousands)	
Accrued research and development	\$ 28	\$ 846
Accrued payroll and employee benefits	34	77
Other accrued liabilities	42	55
Total accrued liabilities	\$ 104	\$ 978

5. Convertible promissory notes

On January 24, 2019, the Company entered into a Note Purchase Agreement with Perceptive Sciences Master Fund Ltd. and Perceptive Xontogeny Venture Fund, LP (collectively the “Holders”), for the issuance of convertible promissory notes (the “Notes”) for an aggregate principal amount of \$8.0 million, net of issuance costs of \$20 thousand. The Company promised to pay the principal amount, together with guaranteed interest at the annual rate of 6%, with principal and accrued interest on the Notes due and payable on January 24, 2020 (unless converted under terms and provisions as set forth within the Agreement).

In the event of a change of control occurring before the maturity date, the holders could elect to (a) convert the outstanding principal and accrued interest into Series A shares at a conversion price equal \$3.10 or (b) require the Company to repurchase the Note at a repurchase price equal to 150% of the outstanding principal and accrued interest, in cash. If the Notes have not been paid or converted into equity interests as of January 24, 2020, then each holder could elect, in lieu of cash payment, to convert the outstanding balance into Series A Convertible Preferred Stock at a conversion price equal to \$3.10.

The indentures governing the Notes contain covenants that limit the Company’s ability to merge or consolidate and provide for customary events of default, which include nonpayment of principal or interest, breach of covenants, payment defaults, or acceleration of other indebtedness and certain events of bankruptcy. Further, the Notes contained certain clauses related to conversion upon an initial public offering (“IPO”) of the Company or an equity financing.

The Company evaluated the accounting for the Notes and identified an embedded derivative related to repayment upon a change of control, which it evaluated and deemed the likelihood of such an event to be remote. The Company also recorded a beneficial conversion feature discount of \$20 thousand in relation to the Notes.

In August 2019, outstanding principal and accrued interest of \$8.3 million was converted into 1,101,488 shares of Series B convertible preferred stock at a price of \$7.4981 per share upon the closing of the Series B financing.

6. Convertible preferred stock and stockholders’ deficit

Convertible preferred stock

In September 2017, the Company entered into the Series A Convertible Preferred Stock Purchase Agreement, pursuant to which an investor committed to invest an aggregate amount of up to \$10.0 million, net of issuance costs of \$35 thousand for the issuance of 3,224,034 shares of Series A convertible preferred stock at a price of \$3.10 per share.

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The initial closing occurred in September 2017, and the Company issued 1,612,017 shares of Series A convertible preferred stock at a price per share of \$3.10 for net cash proceeds of \$5.0 million. The investor also committed to purchase 1,612,017 shares of Series A convertible preferred stock at a price of \$3.10 per share in a second closing, contingent upon the achievement by the Company of certain development milestones.

The investor's commitment to purchase and the Company's commitment to sell Series A convertible preferred stock represents a freestanding, equity-classified instrument accounted for at fair value. On the date of the initial closing, the Company recorded the fair value of the commitments associated with the second closing of the Series A convertible preferred stock using a tranche preferred valuation method calculated of \$19 thousand.

As of December 31, 2017, 1,612,017 shares of Series A convertible preferred stock were subject to issuance upon completion of the milestones.

In June 2018, the Company issued the remaining 1,612,017 shares of Series A convertible preferred stock at a price of \$3.10, upon completion of a milestone event. The shares were issued for net proceeds of \$5.0 million. Upon issuance of the remaining Series A convertible preferred stock, the freestanding, equity-classified instrument was settled as an adjustment to additional paid-in capital.

In August 2019, the Company entered into the Series B Convertible Preferred Stock Purchase Agreement, pursuant to which the Company issued 8,036,574 shares of Series B convertible preferred stock at a price of \$7.4981 per share in exchange for proceeds of approximately \$51.7 million, net of issuance costs of \$0.3 million, and the conversion of \$8.3 million in outstanding principal and accrued interest due on the Notes.

The Company's authorized, issued and outstanding shares, carrying value and aggregate liquidation preferences of its convertible preferred stock are as follows (in thousands, except for share amounts):

	As of December 31, 2019			
	Shares authorized	Shares issued and outstanding	Carrying value	Liquidation preference
Convertible preferred stock				
Series A	3,224,034	3,224,034	\$ 13,090	\$ 9,995
Series B	8,036,574	8,036,574	59,947	60,259
Total	11,260,608	11,260,608	\$ 73,037	\$ 70,254

	As of December 31, 2018			
	Shares authorized	Shares issued and outstanding	Carrying value	Liquidation preference
Convertible preferred stock				
Series A	3,224,034	3,224,034	\$ 9,965	\$ 9,995
Total	3,224,034	3,224,034	\$ 9,965	\$ 9,995

The characteristics of the Series A and Series B convertible preferred stock are as follows:

Dividends

The holders of convertible preferred stock are entitled to receive noncumulative dividends at a rate per annum equal to 8% of the original issuance price per share, which is \$3.10 for Series A convertible preferred stock and \$7.4981 for Series B convertible preferred stock, subject to adjustment, if and when declared by the board of

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directors. These dividends are to be paid in advance of any distributions to common stockholders. No dividends have been declared as of December 31, 2018 and 2019.

Conversion rights

Series A and Series B convertible preferred stock is convertible into common stock at a rate of one share of common stock for each share of convertible preferred stock, subject to adjustment for certain dilutive stock issuance and stock splits.

Optional conversion. Holders of Series A and Series B convertible preferred stock may convert their stock at any time and at the option of the holder.

Automatic conversion. The shares of convertible preferred stock will automatically be converted to shares of common stock upon (a) the closing of a firm commitment underwritten public offering pursuant to an effective registration statement under the Securities Act of 1933, as amended, resulting in at least \$50.0 million of gross proceeds and a price of at least 1.5x the Series B original issue price per share; or (b) the vote of at least 66 2/3% of the then outstanding shares of convertible preferred stock voting together as a single class.

Voting rights

Each share of convertible preferred stock has voting rights equal to the number of common shares into which it is convertible. The holders of convertible preferred stock, voting together as a single class, are entitled to elect three directors of the Company. The holders of Series B convertible preferred stock have the right to elect one member of the Company's Board of Directors. The holders of Series A convertible preferred stock have the right to elect two members of the Company's Board of Directors.

As of December 31, 2018, the holders of Series A convertible preferred stock were entitled to elect one member of the Company's Board of Directors, and the holders of outstanding common stock are entitled to elect one member of the Company's Board of Directors.

Liquidation preference

A liquidation may be deemed to be occasioned by or to include (i) a consolidation or merger of the Company with or into any other corporation in which the Company's stockholders of record as constituted immediately prior to such transaction will, immediately after such transaction, fail to hold at least a majority of the voting power of the result of the surviving corporation; or (ii) a sale, lease, transfer, exclusive license or other disposition of all or substantially all of the assets of the Company.

In the event of any voluntary or involuntary liquidation, dissolution or winding up of the Company, or other deemed liquidation event the holders of Series B convertible preferred stock are entitled, before any distribution or payment is made to the holders of Series A convertible preferred stock or common stock, to receive payment based on the original issue price of Series B convertible preferred stock per share, plus all noncumulative unpaid dividends. If upon liquidation, the assets to be distributed to the holders of Series B convertible preferred stock are insufficient to permit payment of the full amounts distributable, the entire assets of the Company shall be distributed ratably among the holders of Series B convertible preferred stock.

After the payment in full of the preferred liquidation preference to the holders of Series B convertible preferred stock, the holders of Series A convertible preferred stock are entitled, before any distribution or payment is made to the holders of common stock, to receive payment based on the original issue price of Series A convertible preferred stock per share, plus all noncumulative unpaid dividends. If upon liquidation, the assets to be distributed to the holders of Series A convertible preferred stock are insufficient to permit payment of the full amounts distributable, the remaining assets of the Company, after such required distributions to the

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holders of Series B convertible preferred stock, shall be distributed ratably among the holders of Series A convertible preferred stock.

After the payment of the convertible preferred stock liquidation preference, the holders of convertible preferred stock are also entitled to share any remaining available funds on a pro-rata basis with holders of common stock.

Prior to the issuance of the Series B convertible preferred stock, in the event of any voluntary or involuntary liquidation, dissolution or winding up of the Company, or other deemed liquidation event the holders of Series A convertible preferred stock are entitled, before any distribution or payment is made to the holders of common stock, to receive payment based on the original issue price of Series A convertible preferred stock per share, plus all noncumulative unpaid dividends. If upon liquidation, the assets to be distributed to the holders of Series A convertible preferred stock are insufficient to permit payment of the full amounts distributable, the entire assets of the Company shall be distributed ratably among the holders of Series A convertible preferred stock. After the payment of the Series A convertible preferred stock liquidation preference, the holders of convertible preferred stock are also entitled to share any remaining available funds on a pro-rata basis with holders of common stock.

Classification

As of December 31, 2018, the Company has classified the convertible preferred stock as permanent equity on the consolidated balance sheet as the Series A convertible preferred stock outstanding does not have redemption features that were not solely within the Company's control.

On August 9, 2019, the Company amended and restated the articles of incorporation in connection with the issuance of the Series B convertible preferred stock (the "Amendment"). As a result of the Amendment, the control over the liquidation of the convertible preferred stock was no longer solely within the control of the Company due to a change in the voting rights of the preferred stockholders, as described above, triggering a change in the classification of the instruments. As a result of such change, the Company reclassified the Series A convertible preferred stock from permanent equity to mezzanine equity on the consolidated balance sheet. The Company remeasured the Series A convertible preferred stock at fair value as of the date of the reclassification, as determined by a third-party valuation specialist, resulting in a \$3.0 million charge to accumulated deficit.

As of December 31, 2019, the convertible preferred stock is classified outside of stockholders' equity (deficit) on the consolidated balance sheet, as mezzanine equity, as events triggering the liquidation preferences are not solely within the Company's control. Upon the occurrence of certain change in control events that are outside the Company's control, including a deemed liquidation event, holders of the convertible preferred stock can cause redemption for cash. The carrying values of the convertible preferred stock are adjusted to their liquidation preferences when and if it becomes probable that such an event will occur.

Common stock

Pursuant to the Amended and Restated Certificate of Incorporation effective August 9, 2019, the Company is authorized to issue a total of 20,500,000 shares of common stock, 6,457,421 of which are outstanding as of December 31, 2019.

Holders of common stock are entitled to one vote per share on all matters to be voted on by the stockholders of the Company. Subject to the preferences that may be applicable to any outstanding shares of the convertible preferred stock, the holders of the common stock are entitled to receive ratably such dividends, if any, as may be declared by the Board. No dividends have been declared to date.

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At December 31, 2019, the Company has reserved the following shares of common stock for the following purposes:

Convertible preferred stock on an as-converted basis	11,260,608
Options and restricted stock available for future grants	2,003,956
Total common stock reserved for issuance	13,264,564

Restricted stock

The Company entered into a Strategy & Business Advisor Agreement (“the Agreement”) with Xontogeny LLC (“Xontogeny”) on April 24, 2017, which provides for the grant 1,693,750 shares of common stock to Xontogeny in exchange for the provision of advisory services for a three-year period. The award contains a share repurchase feature at the nominal original share price that is exercisable only if Xontogeny ceases providing the advisory services. The Company accounted for this feature as a forfeiture provision. The shares of common stock vest over an approximate three-year period, 25% of the shares vested upon closing of the Series A financing (the “Series A Closing”), 25% on the first anniversary of the Series A Closing and the remaining 50% vesting monthly over two years commencing on such first anniversary. For accounting purposes, unvested restricted stock awards are not considered issued and outstanding and therefore are not reflected as issued and outstanding in the accompanying statements of convertible preferred stock and stockholders’ deficit until the awards vest.

As of December 31, 2018 and 2019, there were 741,016 and 317,579 unvested shares, respectively. The shares vest ratably over the remaining service period through September 2020. The Company has determined that the issuance of these shares of common stock to Xontogeny represents compensation for services to be provided under the Agreement. Accordingly, the shares are accounted for similar to a stock award granted to a non-employee of the Company. During the years ended December 31, 2018 and 2019, the Company recognized non-cash compensation expense of \$53 thousand and \$51 thousand, respectively, in general and administrative expense, related to the vesting of the shares of common stock.

7. Share-based compensation

2019 Equity Incentive Plan

In December 2019, the board of directors of the Company (the “Board”) adopted the 2019 Equity Incentive Plan (the “2019 Plan”). The 2019 Plan provides for the grant of share-based awards, including stock options and restricted stock units, to employees, directors, and non-employee service providers of the Company. In December 2019, the Board authorized 2,003,956 shares for future issuance under the 2019 Plan. All such shares authorized for issuance under the 2019 Plan have been reserved. As of December 31, 2019, the Company has not granted any share-based payment awards. Accordingly, 2,003,956 shares remain available for future issuance.

8. Commitments and contingencies

Operating leases

The Company leases office space for its corporate headquarters located in Blacksburg, Virginia, under non-cancelable operating lease. The leases expire in 2020. Rent expense is recognized on a straight-line basis over the term of the leases and accordingly, the Company records any differences between cash rent payments and the recognition of rent expense as a deferred rent liability.

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Future minimum lease payments as of December 31, 2019, are as follows (in thousands):

Year ending December 31:	
2020	\$33
Total future minimum annual payments	\$33

Rent expense was \$138 thousand and \$142 thousand for the year ended December 31, 2018 and 2019, respectively.

Other

Liabilities for loss contingencies arising from claims, assessments, litigation, fines, and penalties and other sources are recorded when it is probable that a liability has been incurred and the amount can be reasonably estimated. The Company believes there is no litigation pending or loss contingencies that could have, either individually or in the aggregate, a material impact on the Company's financial statements.

9. Income taxes

The following table presents a reconciliation of the statutory federal rate and the Company's effective tax rate:

	Year Ended December 31,	
	2018	2019
Federal statutory income tax rate	21.00%	21.00%
State taxes, net of federal benefit	1.84%	4.23%
Permanent differences	(11.97)%	(2.07)%
Other credits	5.34%	4.93%
True-ups	0.26%	0.02%
Foreign rate differential	3.24%	0.06%
Change in valuation allowance	(19.71)%	(28.17)%
Provision for income taxes	—%	—%

Deferred income taxes reflect the net tax 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 following table presents the significant components of the Company's deferred tax assets and liabilities for the periods presented:

	Year Ended December 31,	
	2018	2019
(in thousands)		
Deferred tax assets/(liabilities):		
Net operating loss carryforwards	\$ 1,247	\$ 4,152
Research and development credit, net of FIN 48	479	1,144
Accruals	—	224
Intangible assets	54	77
Unrealized gain	84	74
Fixed assets	(24)	(26)
Valuation Allowance	(1,840)	(5,645)
Net deferred tax assets	\$ —	\$ —

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At both December 31, 2018, and December 31, 2019, the Company evaluated all significant available positive and negative evidence, including the existence of losses in recent years and management's forecast of future taxable income, and, as a result, determined it was more likely than not that federal and state deferred tax assets, including benefits related to net operating loss carryforwards, would not be realized. The valuation allowance was increased from \$1.8 million at December 31, 2018, to \$5.6 million at December 31, 2019.

As of December 31, 2019, the Company has \$15.4 million and \$15.4 million of federal and state net operating loss carryforwards. Federal net operating loss carryforward incurred prior to 2018 as well as the state net operating loss carryforward begin to expire in 2037. Federal net operating losses incurred in 2018 and after have an unlimited carryforward period. The Company also has \$0.7 million of Australian net operating loss carryforwards which also have an unlimited carryforward period. Because the Company has incurred cumulative net operating losses since inception, all tax years remain open to examination by U.S. federal, state, and foreign income tax authorities.

The Company had an unrecorded tax benefit of \$479 thousand and \$1.1 million due to uncertain tax positions as of December 31, 2018 and 2019, respectively. The Company's policy for recording interest and penalties is to record them as a component of interest expense and operating expenses, respectively. As of December 31, 2019, the Company had no accrued interest or penalties related to uncertain tax positions. The total unrecorded benefit would affect the effective tax rate but for the Company's valuation allowance. The Company does not expect a material change in unrecognized tax benefits within the next 12 months.

A reconciliation of the beginning and ending amounts of unrecognized tax benefits is as follows:

	Year Ended December 31,	
	2018	2019
	(In thousands)	
Balance at the beginning of the year	\$ 156	\$ 479
Additions for tax positions taken in the current year	323	666
Balance at the end of the year	\$ 479	\$ 1,144

Potential 382 limitation

The Company's ability to utilize its net operating loss ("NOL") and research and development ("R&D") credit carryforwards may be substantially limited due to ownership changes that may have occurred or that could occur in the future, as required by Section 382 of the Internal Revenue Code of 1986, as amended (the "Code"), as well as similar state provisions. These ownership changes may limit the amount of NOL and R&D credit carryforwards that can be utilized annually to offset future taxable income and tax, respectively. In general, an "ownership change," as defined by Section 382 of the Code, results from a transaction or series of transactions over a three-year period resulting in an ownership change of more than 50 percent of the outstanding stock of a company by certain stockholders or public groups.

The Company has not completed a study to assess whether one or more ownership changes have occurred since the Company became a loss corporation under the definition of Section 382. If the Company has experienced an ownership change, utilization of the NOL or R&D credit carryforwards would be subject to an annual limitation, which is determined by first multiplying the value of the Company's stock at the time of the ownership change by the applicable long-term, tax-exempt rate, and then could be subject to additional adjustments, as required. Any such limitation may result in the expiration of a portion of the NOL or R&D credit carryforwards before utilization. Until a study is completed and any limitation known, no amounts are being considered as an uncertain tax position or disclosed as an unrecognized tax benefit under ASC-740. Any carryforwards that expire prior to utilization as a result of such limitations will be removed from deferred tax assets with a

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corresponding reduction of the valuation allowance. Due to the existence of the valuation allowance, it is not expected that any possible limitation will have an impact on the results of operations of the Company.

On March 27, 2020, the President of the United States signed into law the "Coronavirus Aid, Relief, and Economic Security ("CARES") Act." The CARES Act, among other things, includes provisions relating to refundable payroll tax credits, deferment of employer side social security payments, net operating loss carryback periods, alternative minimum tax credit refunds, modifications to the net interest deduction limitations, increased limitations on qualified charitable contributions, and technical corrections to tax depreciation methods for qualified improvement property. At this time, the Company does not believe the CARES Act has a material impact to its overall tax position but will continue to assess in subsequent periods.

10. Net loss per share common share and pro forma net loss per share (unaudited)

The following table sets forth the computation of basic and diluted net loss per share during the periods presented (in thousands, except share and per share amounts):

	Year Ended December 31,	
	2018	2019
Numerator:		
Net loss	\$ (6,044)	\$ (13,467)
Denominator:		
Weighted-average shares of common stock issued and outstanding	6,775,000	6,775,000
Less: weighted-average unvested common stock subject to repurchase	(1,137,095)	(531,618)
Weighted-average common stock outstanding used to calculate net loss per common share, basic and diluted	5,637,905	6,243,382
Net loss per share of common stock, basic and diluted	\$ (1.07)	\$ (2.16)

The following outstanding shares of potentially dilutive securities have been excluded from diluted net loss per common share for the periods presented, because their inclusion would be anti-dilutive:

	As of December 31,	
	2018	2019
Convertible preferred stock on an as-converted basis	3,224,034	11,260,608
Unvested common stock	741,016	317,579
Total	3,965,050	11,578,187

Unaudited pro forma net loss per share

The following table sets forth the computation of the Company's unaudited pro forma basic and diluted net loss per share after giving effect to the conversion of convertible preferred stock into common stock using the as-if converted method into common stock as though the conversions had occurred at the beginning of the respective period, or the date of issuance, if later (in thousands, except share and per share amounts):

	Year Ended December 31, 2019
Numerator:	
Net loss	\$ (13,467)
Denominator:	
Weighted-average shares of common stock outstanding used to calculate net loss per common share	6,243,382
Weighted-average pro forma adjustment to reflect assumed conversion of convertible preferred stock	6,416,646
Weighted-average shares of common stock used to compute pro forma net loss per share	12,660,028
Pro forma net loss per share, basic and diluted (unaudited)	\$ (1.06)

11. Subsequent events

Subsequent events were evaluated through June 30, 2020, the date the consolidated financial statements were available for issuance.

In May 2020, the Company entered into an extension of the lease for its office space for its corporate headquarters through July 2021.

In March 2020, the World Health Organization declared the outbreak of a novel coronavirus, or COVID-19, as a pandemic, which continues to spread throughout the United States and worldwide. As of June 30, 2020, the Company's operations have not been significantly impacted by the COVID-19 outbreak. However, the Company cannot at this time predict the specific extent, duration, or full impact that the COVID-19 outbreak will have on its financial condition and operations, including ongoing and planned clinical trials. The Company does believe that there will be an impact on the clinical development of its product candidates, which may include potential delays, halts, or modifications to its ongoing and planned trials.

Landos Biopharma, Inc., and Subsidiaries

Condensed consolidated balance sheets

(In thousands, except share and per share amounts)

	<u>December 31,</u> 2019	<u>September 30,</u> 2020 (Unaudited)	<u>September 30,</u> 2020 Pro forma as of
Assets			
Current assets:			
Cash and cash equivalents	\$ 9,808	\$ 2,477	
Marketable securities, available for sale	40,157	32,854	
Incentive and tax receivables	1	113	
Prepaid expenses and other current assets	144	133	
Total current assets	50,110	35,577	
Property and equipment, net	359	348	
Other assets	11	837	
Total assets	\$ 50,480	\$ 36,762	
Liabilities, Convertible Preferred Stock and Stockholders' (Deficit) Equity			
Current liabilities:			
Accounts payable	\$ 2,048	\$ 6,652	
Accrued liabilities	978	1,307	
Total current liabilities	3,026	7,959	
Total liabilities	3,026	7,959	
Commitments and contingencies (Note 8)			
Convertible preferred stock, \$0.01 par value, 11,260,608 shares authorized, issued and outstanding as of September 30, 2020 (unaudited) and December 31, 2019; aggregate liquidation preference of \$70,254 as of September 30, 2020 (unaudited) and December 31, 2019; no shares outstanding as of September 30, 2020 (pro forma unaudited)	73,037	73,037	—
Stockholders' (deficit) equity:			
Common stock, \$0.01 par value; 20,500,000 shares authorized as of September 30, 2020 (unaudited) and December 31, 2019; 6,775,000 and 6,457,421 shares issued and outstanding as of September 30, 2020 (unaudited) and December 31, 2019, respectively; 18,035,608 shares issued and outstanding at September 30, 2020 (pro forma unaudited)	63	67	180
Additional paid-in capital	16	51	72,975
Accumulated other comprehensive gain (loss)	(77)	36	36
Accumulated deficit	(25,585)	(44,388)	(44,388)
Total stockholders' (deficit) equity	(25,583)	(44,234)	28,803
Total liabilities, convertible preferred stock and stockholders' (deficit) equity	\$ 50,480	\$ 36,762	

The accompanying notes are an integral part of these consolidated financial statements.

Landos Biopharma, Inc., and Subsidiaries

Condensed consolidated statement of operations and comprehensive loss

(Unaudited)

(In thousands, except share and per share amounts)

	Nine Months Ended September 30,	
	2019	2020
Operating expenses:		
Research and development	\$ 8,455	\$ 15,379
General and administrative	1,097	3,898
Total operating expenses	9,552	19,277
Loss from operations	(9,552)	(19,277)
Other income (expenses):		
Interest expense	(304)	—
Gain (loss) from foreign exchange	(103)	37
Other income, net	—	437
Other income (expense), net	(407)	474
Net loss	\$ (9,959)	\$ (18,803)
Net loss per share, basic and diluted	\$ (1.61)	\$ (2.84)
Weighted-average shares used to compute net loss per share, basic and diluted	6,190,123	6,613,248
Net loss	\$ (9,959)	\$ (18,803)
Unrealized gain on available-for-sale securities	—	113
Comprehensive loss	\$ (9,959)	\$ (18,690)

The accompanying notes are an integral part of these consolidated financial statements.

Landos Biopharma, Inc., and Subsidiaries

Condensed consolidated statements of convertible preferred stock and stockholders' deficit

(Unaudited)

(In thousands, except share amounts)

	Convertible preferred stock		Convertible preferred stock		Common stock		Additional paid-in capital	Accumulated deficit	Accumulated other comprehensive loss	Total stockholders' deficit
	Shares	Amounts	Shares	Amounts	Shares	Amounts				
Balance at December 31, 2018	—	\$ —	3,224,034	\$ 32	6,033,984	\$ 59	\$ 10,044	\$ (9,135)	\$ —	\$ 1,000
Compensation expense related to vesting of common stock issued to Xontogeny (See Note 6)	—	—	—	—	105,859	1	12	—	—	13
Beneficial conversion option convertible promissory notes (See Note 5)	—	—	—	—	—	—	20	—	—	20
Net loss and comprehensive loss	—	—	—	—	—	—	—	(3,034)	—	(3,034)
Balance at March 31, 2019	—	\$ —	3,224,034	\$ 32	6,139,843	\$ 60	\$ 10,076	\$ (12,169)	\$ —	\$ (2,001)
Compensation expense related to vesting of common stock issued to Xontogeny (See Note 6)	—	—	—	—	105,860	1	11	—	—	12
Net loss and comprehensive loss	—	—	—	—	—	—	—	(3,823)	—	(3,823)
Balance at June 30, 2019	—	—	3,224,034	\$ 32	6,245,703	61	10,087	(15,992)	—	(5,812)
Compensation expense related to vesting of common stock issued to Xontogeny (See Note 6)	—	—	—	—	105,859	1	12	—	—	13
Conversion of promissory notes to Series B convertible preferred stock	1,101,488	8,279	—	—	—	—	(20)	—	—	(20)
Issuance of Series B convertible preferred stock, net of issuance costs of \$267,172	6,935,086	51,668	—	—	—	—	—	—	—	—
Reclassification of Series A convertible preferred stock to temporary equity	3,224,034	13,090	(3,224,034)	(32)	—	—	(10,075)	(2,983)	—	(13,090)
Net loss and comprehensive loss	—	—	—	—	—	—	—	(3,102)	—	(3,102)
Balance at September 30, 2019	11,260,608	73,037	—	—	6,351,562	62	4	(22,077)	—	(22,011)

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	Convertible preferred stock		Common stock		Additional paid-in capital	Accumulated deficit	Accumulated other comprehensive loss	Total stockholders' deficit
	Shares	Amounts	Shares	Amounts				
Balance at December 31, 2019	11,260,608	\$ 73,037	6,457,421	\$ 63	\$ 16	\$ (25,585)	\$ (77)	\$ (25,583)
Compensation expense related to vesting of common stock issued to Xontogeny (See Note 6)	—	—	105,859	2	12	—	—	14
Unrealized loss on marketable securities	—	—	—	—	—	—	(686)	(686)
Net loss	—	—	—	—	—	(5,796)	—	(5,796)
Balance at March 31, 2020	11,260,608	\$ 73,037	6,563,280	\$ 65	\$ 28	\$ (31,381)	\$ (763)	\$ (32,051)
Compensation expense related to vesting of common stock issued to Xontogeny (See Note 6)	—	—	105,859	1	12	—	—	13
Unrealized gain on marketable securities	—	—	—	—	—	—	774	774
Net loss	—	—	—	—	—	(4,777)	—	(4,777)
Balance at June 30, 2020	11,260,608	73,037	6,669,139	66	40	(36,158)	11	(36,041)
Compensation expense related to vesting of common stock issued to Xontogeny (See Note 6)	—	—	105,861	1	11	—	—	12
Unrealized gain on marketable securities	—	—	—	—	—	—	25	25
Net loss and comprehensive loss	—	—	—	—	—	(8,230)	—	(8,230)
Balance at September 30, 2020	11,260,608	73,037	6,775,000	67	51	(44,388)	36	(44,234)

The accompanying notes are an integral part of these consolidated financial statements.

Landos Biopharma, Inc., and Subsidiaries

Condensed consolidated statements of cash flows

(Unaudited)

(In thousands, except share amounts)

	Nine months ended September 30,	
	2019	2020
CASH FLOWS FROM OPERATING ACTIVITIES:		
Net loss	\$ (9,959)	\$ (18,803)
Adjustments to reconcile net loss to net cash used in operating activities:		
Compensation expense related to vesting of common stock issued to Xontogeny	38	39
Depreciation of property and equipment	75	102
Net (accretion of discount) amortization of premium on marketable securities	—	83
Accrued interest on convertible promissory notes	259	—
Net realized loss from sale of marketable securities	—	41
Unrealized gain/loss from foreign exchange	72	(39)
Other	40	—
Changes in operating assets and liabilities:		
Incentive and tax receivables	2,085	(112)
Prepaid expenses and other current assets	(202)	(90)
Accounts payable	50	4,179
Accrued liabilities	483	29
Net cash (used in) operating activities	<u>(7,059)</u>	<u>(14,571)</u>
CASH FLOWS FROM INVESTING ACTIVITIES:		
Purchase of available-for-sale marketable securities	—	(14,423)
Purchases of property and equipment	(159)	(91)
Proceeds from sales, maturities, and returns of available-for-sale marketable securities	—	21,715
Net cash provided by (used in) investing activities	<u>(159)</u>	<u>7,201</u>
CASH FLOWS FROM FINANCING ACTIVITIES:		
Proceeds from issuance of Series B convertible preferred stock, net of issuance costs of \$267	51,668	—
Proceeds from issuance of convertible promissory notes, net of issuance costs of \$20	7,980	—
Net cash provided by financing activities	<u>59,648</u>	<u>—</u>
Net change in cash and cash equivalents	52,430	(7,370)
Cash and cash equivalents at beginning of period	359	9,808
Effect of exchange rates on cash	—	39
Cash and cash equivalents at end of period	<u>\$52,789</u>	<u>\$ 2,477</u>
NONCASH INVESTING AND FINANCING ACTIVITY:		
Deferred offering costs included in accounts payable and accruals	\$ —	\$ 725
Conversion of promissory notes to Series B preferred stock	\$ 8,259	\$ —
Unrealized gain on available-for-sale marketable securities	\$ —	\$ 113
Beneficial conversion feature discount on convertible promissory notes	\$ 20	\$ —

The accompanying notes are an integral part of these consolidated financial statements.

Landos Biopharma, Inc., and Subsidiaries

Notes to the interim condensed consolidated financial statements

(Information pertaining to the nine months ended September 30, 2020 and 2019 is unaudited)

1. Organization and description of the business

Description of business

Landos Biopharma, Inc. (the "Company") is a clinical-stage biopharmaceutical company discovering and developing novel treatments for autoimmune diseases. The Company has identified Lanthionine Synthetase C-Like 2 ("LANCL2") as a novel therapeutic target for autoimmune diseases, including inflammatory bowel disease ("IBD"); Crohn's disease ("CD"), and ulcerative colitis ("UC"). Landos' wholly-owned lead clinical asset, BT-11, is the first therapeutic that targets LANCL2 and acts locally in the gastrointestinal tract for treatment of inflammatory bowel disease (IBD). The company completed Phase 1 clinical testing in 2018 and initiated global Phase 2 clinical testing of BT-11 for UC in 2019. Landos is a platform company that continues to discover innovative therapeutic targets (2 new therapeutic targets per year and their associated drug development programs). Landos also has a robust pipeline of new compounds for other autoimmune diseases (lupus, rheumatoid arthritis, multiple sclerosis, type 1 diabetes), several of which Landos anticipates will advance to Phase 1 clinical testing in 2020. Since inception, the Company has devoted substantially all of its resources to performing research and development activities in support of its product development efforts. The Company does not have any products or partnered products approved for sale and has not generated any revenue from commercial product sales. The Company was incorporated in Delaware in January 2017.

Liquidity and capital resources

The Company has incurred net losses and negative cash flows from operations since inception and had an accumulated deficit of \$44.4 million as of September 30, 2020. Since inception through September 30, 2020, the Company has funded operations primarily through the issuance of convertible preferred stock and convertible promissory notes. The Company expects to incur substantial operating losses for at least the next several years and will need to obtain additional financing in order to initiate and complete clinical trials, discover, develop, seek regulatory approvals for and prepare for potential commercialization of its product candidates. There can be no assurance that such financing will be available or will be at terms acceptable to the Company.

As of September 30, 2020, the Company had cash, cash equivalents and marketable securities of \$35.3 million, which it believes will be sufficient to fund its planned operations for a period of at least 12 months from the date of the issuance of its condensed consolidated financial statements.

2. Summary of significant accounting policies

Basis of presentation

The condensed consolidated financial statements and accompanying notes have been prepared in accordance with accounting principles generally accepted in the United States of America ("U.S. GAAP").

Principals of consolidation

The accompanying condensed consolidated financial statements include the accounts of the Company and its wholly owned subsidiary, Landos Biopharma Australia Pty Ltd. ("Landos Australia"). All intercompany balances and transactions have been eliminated in consolidation.

Unaudited pro forma consolidated balance sheet

The unaudited pro forma stockholders' equity as of September 30, 2020, presents the Company's stockholders' deficit as though all of the Company's outstanding Series A and Series B convertible preferred stock had converted into 11,260,608 shares of common stock immediately prior to the Company's planned initial public offering ("IPO"). The shares of common stock issuable and the proceeds expected to be received in the planned IPO are excluded from such pro forma financial information.

Use of estimates

The preparation of condensed consolidated financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the condensed consolidated financial statements and the reported amounts of expenses during the reporting period. Significant estimates and assumptions made in the accompanying condensed consolidated financial statements include but are not limited to accrued liabilities, fair value of equity instruments, and uncertain tax positions. 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.

COVID-19

In March 2020, the World Health Organization declared the outbreak of the novel coronavirus disease ("COVID-19") as a pandemic, and we expect our operations in all locations to be affected as the virus continues to proliferate. We have adjusted certain aspects of our operations to protect our employees and customers while still meeting customers' needs for vital technology. We will continue to monitor the situation closely and it is possible that we will implement further measures. In light of the uncertainty as to the severity and duration of the pandemic, the impact on our financial position is uncertain at this time.

Consolidated financial statements in U.S. dollars

The Company's functional currency is the U.S. dollar ("dollar" or "\$") since the dollar is the currency of the primary economic environment in which the Company has operated and expects to continue to operate in the foreseeable future. Transactions and balances denominated in dollars are presented at their original amounts. Transactions and balances denominated in foreign currencies have been re-measured to dollars. All transaction gains and losses from re-measurement of monetary balance sheet items denominated in non-dollar currencies are reflected in the consolidated statement of operations and comprehensive loss as other income, net. Net foreign currency transaction losses were not material for the nine months ended September 30, 2019 and 2020.

Unaudited interim condensed consolidated financial statements

The accompanying interim condensed consolidated balance sheet as of September 30, 2020, the interim condensed consolidated statements of operations and comprehensive loss, condensed consolidated statements of convertible preferred stock and stockholders' deficit, and condensed consolidated statements of cash flows for the nine months ended September 30, 2019 and 2020, and amounts relating to the interim periods included in the accompanying notes to the interim condensed consolidated financial statements are unaudited. The unaudited interim financial statements have been prepared on the same basis as the audited condensed consolidated financial statements, and in management's opinion, includes all adjustments, consisting of only normal recurring adjustments, necessary for the fair presentation of the Company's condensed consolidated balance sheet as of September 30, 2020, and its results of operations and cash flows for the nine months ended September 30, 2019 and 2020. The results for the nine months ended September 30, 2020, are not necessarily

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indicative of the results expected for the fiscal year or any other periods. These interim financial statements should be read in conjunction with the Company's consolidated financial statements and related notes for the fiscal year ended December 31, 2019 ("Audited Financial Statements").

Deferred offering costs

The Company has deferred offering costs consisting of direct legal, accounting, filing and other fees and costs directly attributable to the Company's planned IPO. The deferred offering costs will be offset against the proceeds received upon the closing of the planned IPO. In the event the planned IPO is terminated, all of the deferred offering costs will be expensed within the Company's condensed consolidated statement of operations. As of December 31, 2019, and September 30, 2020, \$11 thousand and \$837 thousand, respectively, of deferred offering costs were capitalized, which are included in other assets on the condensed consolidated balance sheet.

Recently issued accounting pronouncements not yet adopted

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842). This ASU requires a lessee to recognize in the statement of financial position a liability to make lease payments (the lease liability) and a right-to-use asset representing its right to use the underlying asset for the lease term. This ASU is effective for public and private companies' fiscal years beginning after December 15, 2018, and December 15, 2021, respectively, with early adoption permitted. The Company expects to adopt ASU 2016-02 under the private company transition guidance beginning January 1, 2021 and is currently evaluating the impact on the Company's consolidated financial statements. The Company does not expect the adoption of this ASU to have a material impact on its consolidated financial statements.

In June 2016, the FASB issued ASU 2016-13—Financial Instruments (Topic 326) Measurement of Credit Losses on Financial Instrument ("CECL"), which requires an allowance for expected credit losses on financial assets be recognized as early as day one of the instrument. This ASU departs from the incurred loss model which means the probability threshold is removed. It considers more forward-looking information and requires the entity to estimate its credit losses as far as it can reasonably estimate. The ASU is effective for fiscal years beginning after December 15, 2019, including interim periods within those fiscal years, for public business entities that are U.S. Securities and Exchange Commission (SEC) filers, excluding entities eligible to be smaller reporting companies (SRC). For all other public business entities, including SRC, the ASU is effective for fiscal years beginning after December 15, 2022, including interim periods within those fiscal years. Early adoption is permitted for fiscal years beginning after December 15, 2018. The Company elects to adopt the new standard in annual reporting period beginning after December 31, 2022 and does not expect the adoption of this ASU to have a material impact on the consolidated financial statements.

In August 2018, the FASB issued ASU 2018-15, Intangibles—Goodwill and Other—Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract ("ASU 2018-15"). The intent of this pronouncement is to align the requirements for capitalizing implementation costs incurred in a cloud computing arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software as defined in ASC 350-40. Under ASU 2018-15, the capitalized implementation costs related to a cloud computing arrangement will be amortized over the term of the arrangement and all capitalized implementation amounts will be required to be presented in the same line items of the financial statements as the related hosting fees. For public business entities, ASU 2018-15 is effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years, with early adoption permitted. For all other entities the amendments in this update are effective for annual reporting periods beginning after December 15, 2020, and for interim periods within annual periods beginning December 15, 2021. The Company will adopt ASU 2018-15 for its fiscal

year beginning January 1, 2022. The Company is evaluating the impact of this accounting standard update on the consolidated financial statements. The Company does not expect the adoption of this ASU to have a material impact on its consolidated financial statements.

3. Fair value measurement

Financial assets and liabilities are recorded at fair value on a recurring basis in the consolidated balance sheet. The carrying values of the Company's financial assets and liabilities, including cash and cash equivalents, prepaids and other current assets, accounts payable, and accrued expenses approximate their fair value due to the short-term maturity of these instruments. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability (an exit price) in an orderly transaction between market participants at the reporting date. Assets and liabilities recorded at fair value in the condensed consolidated financial statements are categorized based upon the level of judgment associated with the inputs used to measure their fair value. Hierarchical levels are directly related to the amount of subjectivity with the inputs to the valuation of these assets or liabilities as follows:

Level 1—Observable inputs such as unadjusted, quoted prices in active markets for identical assets or liabilities at the measurement date;

Level 2—Inputs (other than quoted prices included in Level 1) are either directly or indirectly observable inputs for similar assets or liabilities. These include quoted prices for identical or 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

Financial assets and liabilities subject to fair value measurements on a recurring basis and the level of inputs used in such measurements are as follows (in thousands):

	September 30, 2020			
	Level 1	Level 2	Level 3	Aggregate fair value
Assets:				
Commercial paper	\$ —	\$ 3,000	\$ —	\$ 3,000
Fixed income securities	—	22,382	—	22,382
Asset backed securities	—	7,472	—	7,472
Total assets	\$ —	\$32,854	\$ —	\$ 32,854
	December 31, 2019			
	Level 1	Level 2	Level 3	Aggregate fair value
Assets:				
Money market funds	\$ 1,333	\$ —	\$ —	\$ 1,333
Fixed income securities	—	27,078	—	27,078
Asset backed securities	—	13,079	—	13,079
Commercial paper	—	3,576	—	3,576
Total assets	\$ 1,333	\$43,733	\$ —	\$ 45,066

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The contractual maturities of available for sale securities as of September 30, 2020, are as follows (in thousands):

Within one year	\$17,660
Within one to five years	15,194
Total contractual maturities	\$32,854

The Company values its Level 1 assets based on quoted prices in active markets for identical instruments. Level 1 assets consist primarily of highly liquid money market funds or other cash instruments that are included in cash equivalents. The Company values its Level 2 assets consisting of commercial paper, fixed income securities, certificates of deposit, and asset backed securities with the help of a third-party pricing service using quoted market prices for similar instruments or nonbinding market prices that are corroborated by observable market data. The Company uses such pricing data as the primary input, to which no material adjustments have been made during the periods presented, to make its determination and assessments as to the ultimate valuation of these assets. The fair values of these instruments approximate amortized cost. Interest income of \$578 thousand for the nine months ended September 30, 2020 was recognized and recorded in "other income" on the statements of operations and comprehensive loss.

4. Consolidated balance sheet components

Property and equipment, net

Property and equipment, net consists of the following:

	As of December 31, 2019	As of September 30, 2020
		(In thousands)
Laboratory equipment	\$ 463	\$ 468
Furniture and fixtures	108	189
Total property and equipment	571	657
Less: accumulated depreciation	(212)	(309)
Total property and equipment, net	\$ 359	\$ 348

Depreciation expense for property and equipment was \$75 thousand and \$102 thousand for the nine months ended September 30, 2019 and 2020, respectively.

Accrued liabilities

Accrued liabilities consist of the following:

	As of December 31, 2019	As of September 30, 2020
		(In thousands)
Accrued research and development	\$ 846	\$ 817
Accrued selling, general, and administrative	—	419
Accrued payroll and employee benefits	77	71
Other accrued liabilities	55	—
Total accrued liabilities	\$ 978	\$ 1,307

5. Convertible promissory notes

On January 24, 2019, the Company entered into a Note Purchase Agreement with Perceptive Sciences Master Fund Ltd. and Perceptive Xontogeny Venture Fund, LP (collectively the “Holders”), for the issuance of convertible promissory notes (the “Notes”) for an aggregate principal amount of \$8.0 million, net of issuance costs of \$20 thousand. The Company promised to pay the principal amount, together with guaranteed interest at the annual rate of 6%, with principal and accrued interest on the Notes due and payable on January 24, 2020 (unless converted under terms and provisions as set forth within the Agreement).

In the event of a change of control occurring before the maturity date, the holders could elect to (a) convert the outstanding principal and accrued interest into Series A shares at a conversion price equal \$3.10 or (b) require the Company to repurchase the Note at a repurchase price equal to 150% of the outstanding principal and accrued interest, in cash. If the Notes have not been paid or converted into equity interests as of January 24, 2020, then each holder could elect, in lieu of cash payment, to convert the outstanding balance into Series A Convertible Preferred Stock at a conversion price equal to \$3.10.

The indentures governing the Notes contain covenants that limit the Company’s ability to merge or consolidate and provide for customary events of default, which include nonpayment of principal or interest, breach of covenants, payment defaults, or acceleration of other indebtedness and certain events of bankruptcy. Further, the Notes contained certain clauses related to conversion upon an initial public offering (“IPO”) of the Company or an equity financing.

The Company evaluated the accounting for the Notes and identified an embedded derivative related to repayment upon a change of control, which it evaluated and deemed the likelihood of such an event to be remote. The Company also recorded a beneficial conversion feature discount of \$20 thousand in relation to the Notes.

In August 2019, outstanding principal and accrued interest of \$8.3 million was converted into 1,101,488 shares of Series B convertible preferred stock at a price of \$7.4981 per share upon the closing of the Series B financing.

6. Convertible preferred stock and stockholders’ deficit

Convertible preferred stock

The Company’s authorized, issued and outstanding shares, carrying value and aggregate liquidation preferences of its convertible preferred stock are as follows (in thousands, except for share amounts):

	As of September 30, 2020			
	Shares authorized	Shares issued and outstanding	Carrying value	Liquidation preference
Convertible preferred stock				
Series A	3,224,034	3,224,034	\$ 13,090	\$ 9,995
Series B	8,036,574	8,036,574	59,947	60,259
Total	11,260,608	11,260,608	\$ 73,037	\$ 70,254

	As of December 31, 2019			
	Shares authorized	Shares issued and outstanding	Carrying value	Liquidation preference
Convertible preferred stock				
Series A	3,224,034	3,224,034	\$ 13,090	\$ 9,995
Series B	8,036,574	8,036,574	59,947	60,259
Total	11,260,608	11,260,608	\$ 73,037	\$ 70,254

Common stock

Pursuant to the Amended and Restated Certificate of Incorporation effective August 9, 2019, the Company is authorized to issue a total of 20,500,000 shares of common stock, 6,775,000 of which are outstanding as of September 30, 2020.

Holders of common stock are entitled to one vote per share on all matters to be voted on by the stockholders of the Company. Subject to the preferences that may be applicable to any outstanding shares of the convertible preferred stock, the holders of the common stock are entitled to receive ratably such dividends, if any, as may be declared by the Board. No dividends have been declared to date.

At September 30, 2020, the Company has reserved the following shares of common stock for the following purposes:

Convertible preferred stock on an as-converted basis	11,260,608
Options and restricted stock available for future grants	2,003,956
Total common stock reserved for issuance	13,264,564

Restricted stock

The Company entered into a Strategy & Business Advisor Agreement (“the Agreement”) with Xontogeny LLC (“Xontogeny”) on April 24, 2017, which provides for the grant 1,693,750 shares of common stock to Xontogeny in exchange for the provision of advisory services for a three-year period. The award contains a share repurchase feature at the nominal original share price that is exercisable only if Xontogeny ceases providing the advisory services. The Company accounted for this feature as a forfeiture provision. The shares of common stock vest over an approximate three-year period, 25% of the shares vested upon closing of the Series A financing (the “Series A Closing”), 25% on the first anniversary of the Series A Closing and the remaining 50% vesting monthly over two years commencing on such first anniversary. For accounting purposes, unvested restricted stock awards are not considered issued and outstanding and therefore are not reflected as issued and outstanding in the accompanying statements of convertible preferred stock and stockholders’ deficit until the awards vest.

As of September 30, 2020, the shares were fully vested. The shares vested ratably over the remaining service period through September 2020. The Company has determined that the issuance of these shares of common stock to Xontogeny represents compensation for services to be provided under the Agreement. Accordingly, the shares are accounted for similar to a stock award granted to a non-employee of the Company. During the nine months ended September 30, 2019 and 2020, the Company recognized non-cash compensation expense of \$38 thousand and \$39 thousand, respectively, in general and administrative expense, related to the vesting of the shares of common stock.

7. Share-based compensation

2019 Employee incentive plan

In December 2019, the board of directors of the Company (the "Board") adopted the 2019 Equity Incentive Plan (the "2019 Plan"). The 2019 Plan provides for the grant of share-based awards, including stock options and restricted stock units, to employees, directors, and non-employee service providers of the Company. In December 2019, the Board authorized 2,003,956 shares for future issuance under the 2019 Plan. All such shares authorized for issuance under the 2019 Plan have been reserved. As of September 30, 2020, the Company has not granted any share-based payment awards. Accordingly, 2,003,956 shares remain available for future issuance.

8. Commitments and contingencies

Operating leases

The Company leases office space for its corporate headquarters located in Blacksburg, Virginia, under non-cancelable operating lease. The leases expire in 2021. Rent expense is recognized on a straight-line basis over the term of the leases and accordingly, the Company records any differences between cash rent payments and the recognition of rent expense as a deferred rent liability.

Future minimum lease payments as of September 30, 2020, are as follows (in thousands):

Three months ending December 31, 2020	\$ 71
Year ending December 31, 2021	\$ 197
Total future minimum annual payments	\$268

Rent expense was \$101 thousand and \$156 thousand for the nine months ended September 30, 2019 and 2020, respectively.

Other

Liabilities for loss contingencies arising from claims, assessments, litigation, fines, and penalties and other sources are recorded when it is probable that a liability has been incurred and the amount can be reasonably estimated. The Company believes there is no litigation pending or loss contingencies that could have, either individually or in the aggregate, a material impact on the Company's financial statements.

9. Income taxes

The Company did not record a provision or benefit for income taxes during the nine months ended September 30, 2020 and 2019. The Company continues to maintain a full valuation allowance for its net U.S. federal and state deferred tax assets.

On March 27, 2020, the Coronavirus Aid, Relief, and Economic Security Act ("CARES Act") was enacted in response to the COVID-19 pandemic. The CARES Act, among other things, permits NOL carryovers and carrybacks to offset 100% of taxable income for taxable years beginning before 2021. In addition, the CARES Act allows NOLs incurred in 2018, 2019 and 2020 to be carried back to each of the five preceding taxable years to generate a refund of previously paid income taxes. The Company has evaluated the impact of the CARES Act and does not expect that the NOL carryback provision of the CARES Act would result in a cash benefit since the company has had taxable losses since inception. Other income tax benefits relevant include a favorable increase in the interest expense limitation under IRC section 163(j). The effect of the favorable 163(j) CARES Act changes will not have a significant impact the Company.

10. Net loss per common share

The following table sets forth the computation of basic and diluted net loss per share during the periods presented (in thousands, except share and per share amounts):

	Nine Months Ended September 30,	
	2019	2020
Numerator:		
Net loss	\$ (9,959)	\$ (18,803)
Denominator:		
Weighted-average shares of common stock issued and outstanding	6,775,000	6,775,000
Less: weighted-average unvested common stock subject to repurchase	(584,877)	(161,752)
Weighted-average common stock outstanding used to calculate net loss per common share, basic and diluted	6,190,123	6,613,248
Net loss per common stock, basic and diluted	\$ (1.61)	\$ (2.84)

The following outstanding shares of potentially dilutive securities have been excluded from diluted net loss per common share for the periods presented, because their inclusion would be anti-dilutive:

	Nine Months Ended September 30,	
	2019	2020
Convertible preferred stock on an as-converted basis	11,260,608	11,260,608
Unvested common stock	423,438	—
Total	11,684,046	11,260,608

11. Subsequent events

Subsequent events were evaluated through November 30, 2020, the date the condensed consolidated financial statements were available for issuance. In October 2020, the Company granted 906,400 options to key personnel to purchase common stock under our 2019 Equity Incentive Plan with an exercise price of \$3.40 per share.

shares



Common stock

Prospectus

J.P. Morgan

Jefferies

SVB Leerink

Raymond James

, 2021

Part II

Information not required in prospectus

Item 13. Other expenses of issuance and distribution.

The following table indicates the expenses to be incurred in connection with the offering described in this registration statement, other than underwriting discounts and commissions, all of which will be paid by us. All amounts are estimated except the Securities and Exchange Commission, or SEC, registration fee, the Financial Industry Regulatory Authority, Inc., or FINRA, filing fee and the Nasdaq Global Market listing fee.

	Amount
SEC Registration fee	\$ *
FINRA filing fee	*
Nasdaq Global Market initial listing fee	*
Accountants' fees and expenses	*
Legal fees and expenses	*
Blue Sky fees and expenses	*
Transfer Agent's fees and expenses	*
Printing and engraving expenses	*
Miscellaneous	*
Total expenses	\$ *

* To be provided by amendment

Item 14. Indemnification of directors and officers.

We are incorporated under the laws of the State of Delaware. Section 102 of the Delaware General Corporation Law permits a corporation to eliminate the personal liability of directors of a corporation to the corporation or its stockholders for monetary damages for a breach of fiduciary duty as a director, except where the director breached his 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.

Section 145 of the Delaware General Corporation Law provides that a corporation has the power to indemnify a director, officer, employee or agent of the corporation and certain other persons serving at the request of the corporation in related capacities against expenses (including attorneys' fees), judgments, fines and amounts paid in settlements actually and reasonably incurred by the person in connection with an action, suit or proceeding to which he is or is threatened to be made a party by reason of such position, if such person acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the corporation, and, in any criminal action or proceeding, had no reasonable cause to believe his conduct was unlawful, except that, in the case of actions brought by or in the right of the corporation, no indemnification shall be made with respect to any claim, issue or matter as to which such person shall have been adjudged to be liable to the corporation unless and only to the extent that the Court of Chancery or other adjudicating court determines that, despite the adjudication of liability but in view of all of the circumstances of the case, such person is fairly and reasonably entitled to indemnity for such expenses which the Court of Chancery or such other court shall deem proper.

As permitted by the Delaware General Corporation Law, our amended and restated certificate of incorporation and bylaws to be in effect upon the closing of this offering will provide that: (i) we are required to indemnify our directors to the fullest extent permitted by the Delaware General Corporation Law; (ii) we may, in our

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discretion, indemnify our officers, employees and agents as set forth in the Delaware General Corporation Law; (iii) we are required, upon satisfaction of certain conditions, to advance all expenses incurred by our directors in connection with certain legal proceedings; (iv) the rights conferred in the bylaws are not exclusive; and (v) we are authorized to enter into indemnification agreements with our directors, officers, employees and agents.

In connection with this offering, we expect to enter into indemnification agreements with each of our directors and executive officers that require us to indemnify them against expenses, judgments, fines, settlements and other amounts that any such person becomes legally obligated to pay (including with respect to a derivative action) in connection with any proceeding, whether actual or threatened, to which such person may be made a party by reason of the fact that such person is or was a director or officer of us or any of our affiliates, provided such person acted in good faith and in a manner such person reasonably believed to be in, or not opposed to, our best interests. The indemnification agreements will also set forth certain procedures that will apply in the event of a claim for indemnification thereunder. We intend to enter into similar indemnification agreements with our executive officers prior to the completion of this offering. At present, no litigation or proceeding is pending that involves any of our directors or officers regarding which indemnification is sought, nor are we aware of any threatened litigation that may result in claims for indemnification.

We maintain a directors' and officers' liability insurance policy. The policy insures directors and officers against unindemnified losses arising from certain wrongful acts in their capacities as directors and officers and reimburses us for those losses for which we have lawfully indemnified the directors and officers. The policy contains various exclusions.

In addition, the underwriting agreement filed as Exhibit 1.1 to this Registration Statement provides for indemnification by the underwriters of us and our officers and directors for certain liabilities arising under the Securities Act, or otherwise. Our investor rights agreement with certain investors also provides for cross-indemnification in connection with the registration of our common stock on behalf of such investors.

Item 15. Recent sales of unregistered securities.

Issuances of capital stock

The following list sets forth information regarding all unregistered securities sold by us since our inception through the date of the prospectus that forms a part of this registration statement.

- In April 2017, we issued an aggregate of 1,693,750 shares of our common stock to an investor in connection with certain business development services performed by the investor.
- In September 2017, we issued an aggregate of 1,612,017 shares of our Series A convertible preferred stock to two investors at a purchase price of \$3.10 per share, for aggregate consideration of \$5.0 million.
- In June 2018, we issued an aggregate of 1,612,017 shares of our Series A convertible preferred stock to two investors at a purchase price of \$3.10 per share, for aggregate consideration of \$5.0 million.
- In January 2019, we sold convertible promissory notes in aggregate principal amount of \$8.0 million to two investors. In August 2019, the outstanding principal and accrued interest under the notes of \$8.3 million was converted into 1,101,488 shares of our Series B convertible preferred stock.
- In August 2019, we issued an aggregate of 8,036,574 shares of our Series B convertible preferred stock to 10 investors at a purchase price of \$7.4981 per share, for aggregate consideration of \$60.3 million.

The offers, sales and issuances of the securities described in the paragraphs above were exempt from registration under Section 4(a)(2) of the Securities Act and Regulation D promulgated under the Securities Act. Each of the purchasers represented to us that they acquired the securities for investment only and not with a view to or for sale in connection with any distribution thereof and appropriate legends were affixed to the

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securities issued in these transactions. The purchasers also represented to us that they were accredited investors as defined in Rule 501 promulgated under the Securities Act.

None of the foregoing transactions involved any underwriters, underwriting discounts or commissions, or any public offering.

Stock option grants

From January 1, 2017 through the date of the prospectus that is a part of this registration statement, we granted 906,040 options to purchase common stock under our 2019 Equity Incentive Plan to our officers and employees, with an exercise price of \$3.40 per share. Of these, 221,500 shares were issued upon the exercise of a stock option at an exercise price of \$3.40, for aggregate proceeds of \$753,100.

The offers, sales and issuances of the securities described in the preceding paragraph were deemed to be exempt from registration under Rule 701 promulgated under the Securities Act, in that the transactions were under compensatory benefit plans and contracts relating to compensation. The recipients of such securities were our employees and received the securities under our equity incentive plans. Appropriate legends were affixed to the securities issued in these transactions.

Item 16. Exhibits and financial statement schedules.

The exhibits to the registration statement are listed below. Financial statement schedules have been omitted because the information required to be set forth therein is not applicable or is shown in the financial statements or notes thereto.

Exhibit Number	Description of Exhibit
1.1†	Form of Underwriting Agreement
3.1	Amended and Restated Certificate of Incorporation of the Registrant (currently in effect)
3.2	Bylaws of the Registrant (currently in effect)
3.3†	Form of Amended and Restated Certificate of Incorporation of the Registrant (to be effective upon the closing of this offering)
3.4†	Form of Amended and Restated Bylaws of the Registrant (to be effective upon the closing of this offering)
5.1†	Opinion of Cooley LLP
10.1	Amended and Restated Investors' Rights Agreement by and among the Registrant and certain of its stockholders, dated August 9, 2019
10.2+	2019 Equity Incentive Plan
10.3†+	Form of Indemnification Agreement with Executive Officers and Directors
10.4+	Employment Agreement by and between the Registrant and Dr. Josep Bassaganya-Riera, effective as of January 1, 2020.
23.1†	Consent of Ernst & Young LLP, independent registered public accounting firm
23.2†	Consent of Cooley LLP (included in Exhibit 5.1)
24.1†	Power of Attorney (included on signature page)

+ Indicates management contract or compensatory plan.

† To be submitted by amendment.

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 SEC 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, the registrant has duly caused this registration statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Blacksburg, State of Virginia, on this day of , 2021.

LANDOS BIOPHARMA, INC.

By: _____
Josep Bassaganya-Riera, Ph.D.
Chairman, President and Chief Executive Officer

KNOW ALL BY THESE PRESENTS, that each person whose signature appears below hereby constitutes and appoints Josep Bassaganya-Riera, Ph.D. as his true and lawful agent, proxy and attorney-in-fact, with full power of substitution and resubstitution, for him and in his name, place and stead, in any and all capacities, to (i) act on, sign and file with the Securities and Exchange Commission any and all amendments (including post-effective amendments) to this registration statement together with all schedules and exhibits thereto and any subsequent registration statement filed pursuant to Rule 462(b) under the Securities Act of 1933, as amended, together with all schedules and exhibits thereto, (ii) act on, sign and file such certificates, instruments, agreements and other documents as may be necessary or appropriate in connection therewith, (iii) act on and file any supplement to any prospectus included in this registration statement or any such amendment or any subsequent registration statement filed pursuant to Rule 462(b) under the Securities Act of 1933, as amended, and (iv) take any and all actions which may be necessary or appropriate to be done, as fully for all intents and purposes as he might or could do in person, hereby approving, ratifying and confirming all that such agent, proxy and attorney-in-fact or any of his substitutes may lawfully do or cause to be done by virtue thereof.

Pursuant to the requirements of the Securities Act of 1933, this Registration Statement on Form S-1 has been signed by the following persons in the capacities held on the dates indicated.

Signature	Title	Date
_____ Josep Bassaganya-Riera, Ph.D.	Chairman, President and Chief Executive Officer (Principal Executive, Financial and Accounting Officer)	, 2021
_____ Christopher Garabedian	Director	, 2021
_____ Konstantin Poukalov	Director	, 2021
_____ Roderick Wong, M.D.	Director	, 2021

AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
LANDOS BIOPHARMA INC.

(Pursuant to Sections 242 and 245 of the
General Corporation Law of the State of Delaware)

Landos Biopharma 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 Landos Biopharma Inc., and that this corporation was originally incorporated pursuant to the General Corporation Law on January 6, 2017 under the name Landos Biopharma Inc.
2. That the Board of Directors duly adopted resolutions proposing to amend and restate the Certificate of Incorporation 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 Certificate of Incorporation of this corporation be amended and restated in its entirety to read as follows:

FIRST: The name of this corporation is Landos Biopharma Inc. (the “**Corporation**”).

SECOND: The address of the registered office of the Corporation in the State of Delaware is 1209 Orange Street, City of Wilmington, County of New Castle, 19801. 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) 20,500,000 shares of Common Stock, \$0.01 par value per share (“**Common Stock**”) and (ii) 11,260,608 shares of Preferred Stock, \$0.01 par value per share (“**Preferred Stock**”), of which 3,224,034 shares are hereby designated as “**Series A Preferred Stock**” and 8,036,574 shares are hereby designated as “**Series B 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 Amended and Restated Certificate of Incorporation (as may be amended from time to time, the "**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 are entitled, either separately or together with the holders or one or more other such series, to vote thereon pursuant to this Certificate of Incorporation or pursuant to the General Corporation Law. 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 the 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 and without a separate class vote of the holders of Common Stock.

B. PREFERRED STOCK

The Preferred Stock shall have 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.

1. Dividends.

From and after the date of the issuance of any shares of Preferred Stock, dividends at the rate per annum of eight percent (8%) of the applicable Original Issue Price (as defined below) per share shall accrue on such shares of the applicable series of Preferred Stock (subject to appropriate adjustments in the event of any stock dividend, stock split, combination or other similar recapitalization with respect to the Preferred Stock) (the "**Accruing Dividends**"). Accruing Dividends shall accrue from day to day, whether or not declared, and shall be non-cumulative; provided, however, that except as set forth in the following sentence of this Section 1 or in Subsection 2.1, such Accruing Dividends shall be payable only when, as, and if declared by the Board of Directors and the Corporation shall be under no obligation to pay such Accruing Dividends.

The Corporation shall not declare, pay or set aside any dividends on shares of any other class or series of capital stock of the Corporation unless (in addition to the obtaining of any consents required elsewhere in the Certificate of Incorporation) the holders of the Preferred Stock then outstanding shall first receive, or simultaneously receive, a dividend on each outstanding share of Preferred Stock, in an amount at least equal to the sum of (i) the amount of the aggregate Accruing Dividends then accrued on such share of Preferred Stock, and not previously paid and (ii) (A) in the case of a dividend on Common Stock or any class or series that is convertible into Common Stock, that dividend per share of the applicable series of Preferred Stock as would equal the product of (1) the dividend payable on each share of such class or series determined, if applicable, as if all shares of such class or series had been converted into Common Stock and (2) the number of shares of Common Stock issuable upon conversion of a share of the applicable series of Preferred Stock, in each case calculated on the record date for determination of holders entitled to receive such dividend or (B) in the case of a dividend on any class or series that is not convertible into Common Stock, at a rate per share of the applicable series of Preferred Stock, determined by (1) dividing the amount of the dividend payable on each share of such class or series of capital stock by the original issuance price of such class or series of capital stock (subject to appropriate adjustment in the event of any stock dividend, stock split, combination or other similar recapitalization with respect to such class or series) and (2) multiplying such fraction by an amount equal to the applicable Original Issue Price; provided that if the Corporation declares, pays or sets aside, on the same date, a dividend on shares of more than one class or series of capital stock of the Corporation, the dividend payable to the holders of Preferred Stock pursuant to this Section 1 shall be calculated based upon the dividend on the class or series of capital stock that would result in the highest dividend for such series of Preferred Stock. The “**Series A Original Issue Price**” shall mean \$3.10 per share, subject to appropriate adjustment in the event of any stock dividend, stock split, combination or other similar recapitalization with respect to the Series A Preferred Stock. The “**Series B Original Issue Price**” shall mean \$7.4981 per share, 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. The term “**Original Issue Price**” shall refer to the Series A Original Issue Price or the Series B Original Issue Price or both of them, as applicable.

2. Liquidation, Dissolution or Winding Up; Certain Mergers, Consolidations and Asset Sales.

2.1 General. In the event of any voluntary or involuntary liquidation, dissolution or winding up of the Corporation or Deemed Liquidation Event, the assets of the Corporation should be distributed as set forth in Subsection 2.1.1.

2.1.1 Preferential Payments to Holders of Series B Preferred Stock and Series A Preferred Stock.

(a) In the event of any voluntary or involuntary liquidation, dissolution or winding up of the Corporation, the holders of shares of Series B Preferred Stock then outstanding shall be entitled to be paid out of the assets of the Corporation available for distribution to its stockholders or, in the case of a Deemed Liquidation Event (as defined below), out of the consideration payable to stockholders in such Deemed Liquidation Event or the Available Proceeds (as defined below), before any payment shall be made to the

holders of shares of any other class or series of capital stock, including the Series A Preferred Stock and the Common Stock by reason of their ownership thereof, an amount per share equal to the Series B Original Issue Price, plus any Accruing Dividends accrued but unpaid thereon, whether or not declared, together with any other dividends declared but unpaid thereon. 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 shares of Series B Preferred Stock the full amount to which they shall be entitled under this Subsection 2.1.1(a), the holders of shares of Series B Preferred Stock shall share ratably 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.

(b) After the payment of all amounts required to be paid to the holders of shares of Series B Preferred Stock under Subsection 2.1.1(a), the holders of shares of the Series A Preferred Stock then outstanding shall be entitled to be paid out of the assets of the Corporation available for distribution to its stockholders or, in the case of a Deemed Liquidation Event (as defined below), out of the consideration payable to stockholders in such Deemed Liquidation Event or the Available Proceeds (as defined below), before any payment shall be made to the holders of shares of any other class of stock, including the Common Stock by reason of their ownership thereof, an amount per share equal to the Series A Original Issue Price, plus any Accruing Dividends accrued but unpaid, whether or not declared, together with any other dividends declared but unpaid thereon. If upon any such liquidation, dissolution or winding up of the Corporation or Deemed Liquidation Event, after the payment in full of all amounts required to be paid to the holders of shares of Series B Preferred Stock under Subsection 2.1.1(a), the assets of the Corporation available for distribution to its stockholders shall be insufficient to pay the holders of shares of Series A Preferred Stock the full amount to which they shall be entitled under this Subsection 2.1.1(b), the holders of shares of Series A Preferred Stock shall share ratably 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.

2.1.2 Distribution of Remaining Assets. In the event of any voluntary or involuntary liquidation, dissolution or winding up of the Corporation, after the payment in full of all preferential amounts required to be paid to the holders of shares of Series B Preferred Stock and Series A Preferred Stock pursuant to Subsection 2.1.1, 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 Series B Preferred Stock or Series A Preferred Stock pursuant to Subsection 2.1.1 or the remaining Available Proceeds, as the case may be, shall be distributed among the holders of the shares of Series A Preferred Stock, Series B Preferred Stock and Common Stock, pro rata based on the number of shares held by each such holder, treating for this purpose all such securities as if they had been converted to Common Stock pursuant to the terms of this Amended and Restated Certificate of Incorporation immediately prior to such liquidation, dissolution or winding up of the Corporation or Deemed Liquidation Event. The aggregate amount which a holder of a share of Series A Preferred Stock and a holder of Series B Preferred Stock, is entitled to receive under Subsections 2.1.1 and 2.1.2 is referred to as the “**Series A Liquidation Amount**” and the “**Series B Liquidation Amount**”, respectively and each, as applicable, the “**Liquidation Amount**”).

2.2 Deemed Liquidation Events.

2.2.1 Definition. Each of the following events shall be considered a “**Deemed Liquidation Event**” unless the holders of at least sixty-six and two-thirds percent (66 2/3%) of the outstanding shares of Preferred Stock (voting together as a single class) (the “**Requisite Holders**”) 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 or consolidation 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 or consolidation involving the Corporation or a subsidiary in which the shares of capital stock of the Corporation outstanding immediately prior to such merger or consolidation continue to represent, or are converted into or exchanged for shares of capital stock that represent, immediately following such merger or consolidation, 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 wholly owned subsidiary of another corporation immediately following such merger or consolidation, the parent corporation of such surviving or resulting corporation; 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 or disposition (whether by merger, consolidation or otherwise, and whether in a single transaction or a series of 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.

2.2.2 Effecting a Deemed Liquidation Event.

(a) The Corporation shall not have the power to effect a Deemed Liquidation Event referred to in Subsection 2.2.1(a)(i), unless the agreement or plan of merger or consolidation for such transaction (the “**Merger 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 Subsection 2.1.

(b) In the event of a Deemed Liquidation Event referred to in Subsection 2.2.1(a)(ii) or 2.2.1(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 clause to require the redemption of such shares of Preferred Stock, and (ii) if the Requisite 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 (the “**Redemption Date**”), to redeem all outstanding shares of Series B Preferred Stock at a price per share equal to the Series B Liquidation Amount, and thereafter the shares of Series A Preferred Stock at a price per share equal to the Series A Liquidation Amount. 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, the Corporation shall redeem a pro rata portion (A) first, each holder’s shares of Series B Preferred Stock to the fullest extent of such Available Proceeds (in payment of the Series B Liquidation Amount, ratably among the holders of the shares of Series B Preferred Stock) based on the respective amounts which would otherwise be payable in respect of the shares to be redeemed if the Available Proceeds were sufficient to redeem all such shares and shall redeem the remaining shares as soon as it may lawfully do so under Delaware law governing distributions to stockholders, and (B) second, each holder’s shares of Series A Preferred Stock to the fullest extent of any remaining Available Proceeds (in payment of the Series A Liquidation Amount, ratably among the holders of the shares of Series A Preferred Stock) based on the respective amounts which would otherwise be payable in respect of the shares to be redeemed if the Available Proceeds were sufficient to redeem all such shares and shall redeem the remaining shares as soon as it may lawfully do so under Delaware law governing distributions to stockholders. The Corporation shall send written notice of the redemption pursuant to this Subsection 2.2.2(b) to each holder of Series B Preferred Stock and Series A Preferred Stock not less than forty (40) days prior to the Redemption Date, which notice (the “**Redemption Notice**”) shall state (I) the number of shares of Series B Preferred Stock or Series A Preferred Stock held by the holder that the Corporation shall redeem on the Redemption Date specified in the Redemption Notice, (II) the Redemption Date and redemption price, (III) the date upon which the holder’s right to convert such shares terminates (as determined in accordance with Subsection 4.1) and (IV) that the holder is to surrender to the Corporation, in the manner and at the place designated, his, her or its certificate or certificates representing the shares of Series B Preferred Stock or Series A Preferred Stock to be redeemed. On or before the Redemption Date, each holder of shares of Series B Preferred Stock or Series A Preferred Stock shall surrender the certificate or certificates representing such shares (or, if such certificate has been lost, stolen or destroyed, a lost certificate affidavit) 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. Prior to the distribution or redemption provided for in this Subsection 2.2.2(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.

2.2.3 Amount Deemed Paid or Distributed. The amount deemed paid or distributed to the holders of capital stock of the Corporation upon any such merger, consolidation, sale, transfer, exclusive license, other disposition or redemption shall be the cash or the value of the property, rights or securities paid or distributed to such holders by the Corporation or the acquiring person, firm or other entity. The value of such property, rights or securities shall be determined in good faith by the Board of Directors of the Corporation.

2.2.4 Allocation of Escrow and Contingent Consideration. In the event of a Deemed Liquidation Event pursuant to Subsection 2.2.1(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 Merger 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 Subsection 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 Subsection 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 2.2.4, 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 Preferred Stock shall be entitled to cast the number of votes equal to the number of whole shares of Common Stock into which the shares of 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 the Certificate of Incorporation, holders of Preferred Stock shall vote together with the holders of Common Stock as a single class.

3.2 Election of Directors. The holders of record of the shares of Series A Preferred Stock, exclusively and as a separate class, shall be entitled to elect two (2) directors of the Corporation (the “**Series A Directors**” and each a “**Series A Director**”), the holders of record of the shares of Series B Preferred Stock, exclusively and as a separate class, shall be entitled to elect one (1) director of the Corporation (the “**Series B Director**”), 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 66 2/3% 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 the stockholders, except for the director elected by the holders of the Common Stock who may be removed without cause by the affirmative vote of the holders of a majority of the shares of Common Stock. If the holders of shares of Series A Preferred Stock, Series B 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 B 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; provided, however, for administrative convenience, the initial Series B Director and Series A Directors may also be appointed by the Board of Directors in connection with the initial issuance of Series B Preferred Stock without separate action by each of the holders of the Series A Preferred Stock and Series B Preferred Stock. 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 and the Series B Preferred Stock), exclusively and voting together as a single class, 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 any shares of Preferred Stock are outstanding, the Corporation shall not, either directly or indirectly (itself or through any subsidiary) by resolution, consent, amendment, merger, consolidation or otherwise, do any of the following without (in addition to any other vote required by law or the Certificate of Incorporation) the written consent or affirmative vote of the Requisite Holders, given in writing or by vote at a meeting, consenting or voting (as the case may be) together as a single 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 any merger or consolidation or any other Deemed Liquidation Event, or consent to any of the foregoing;

3.3.2 amend, alter or repeal any provision of the 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 (including any security convertible into or exchangeable for such capital stock) of the Corporation unless the same ranks junior to the 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;

3.3.4 increase or decrease the authorized number of shares of Common Stock or Preferred Stock;

3.3.5 increase or decrease the authorized number of directors constituting the Board of Directors of the Corporation;

3.3.6 (i) reclassify, alter or amend any existing security of the Corporation that is pari passu with any series of 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 series of 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 series of 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 series of 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 and (iii) repurchases of stock from 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;

3.3.8 create, or authorize the creation of, or issue, or authorize the issuance of any debt security or create any lien or security interest (except for purchase money liens or statutory liens of landlords, mechanics, materialmen, workmen, warehousemen and other similar persons arising or incurred in the ordinary course of business) 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, lien, security interest or other indebtedness for borrowed money, in each case, other than in connection with bank lines of credit in an amount not to exceed \$500,000 in the aggregate, unless such debt security has received the prior approval of the Board of Directors, including the approval of the Series B Director and at least one Series A Director;

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 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 or intellectual property of such subsidiary;

3.3.10 increase the number of shares reserved for issuance under any of the Company's equity incentive plans;

3.3.11 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 Securities Exchange Act of 1934, as amended) of any such director, officer, or employee, except for 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 of the Corporation; or

3.3.12 change the strategic direction or line of business of the Company.

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 Series B 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 Series B Original Issue Price by the Series B Conversion Price (as defined below) in effect at the time of conversion. Each share of Series A 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 Series A Original Issue Price by the Series A Conversion Price (as defined below) in effect at the time of conversion. The “**Series A Conversion Price**” shall initially be equal to \$3.10. The “**Series B Conversion Price**” shall initially be equal to \$7.4981. The “**Conversion Price**” shall refer to the Series B Conversion Price or the Series A Conversion Price, as applicable. Such initial Series A Conversion Price and Series B Conversion Price, and the rate at which shares of Series A Preferred Stock and Series B 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 notice of redemption of any shares of Preferred Stock pursuant to Section 6, the Conversion Rights of the shares designated for redemption shall terminate at the close of business on the last full day preceding the date fixed for redemption, unless the redemption price is not fully paid on such redemption date, in which case the Conversion Rights for such shares shall continue until such price is paid in full. 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 required by the Corporation, any certificates surrendered for conversion shall be endorsed or accompanied by a written instrument or instruments of transfer, in form 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. If the conversion is in connection with an underwritten offering of securities registered pursuant to the Securities Act of 1933, as amended (the "**Securities Act**"), the conversion may, at the option of any holder tendering Preferred Stock for conversion, be conditioned upon the closing with the underwriters of the sale of securities pursuant to such offering, in which event the persons entitled to receive the Common Stock upon conversion of the Preferred Stock shall not be deemed to have converted such Preferred Stock until immediately prior to the closing of such sale of securities. 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 the Certificate of Incorporation. Before taking any action which would cause an adjustment reducing the Conversion Price below the then par value of the shares of Common Stock issuable upon conversion of the 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 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 the 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 Series A Conversion Price and Series B 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 rights, options or warrants to subscribe for, purchase or otherwise acquire Common Stock or Convertible Securities.

(b) “**Series 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 to Subsection 4.4.3 below, deemed to be issued) by the Corporation after the Series B 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 Series A 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 by Subsection 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 of the Corporation; or
- (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.

4.4.2 No Adjustment of Conversion Price.

(a) No adjustment in the Series A Conversion Price 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 66 2/3% of the then outstanding shares of Series A Preferred Stock 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 Series B Conversion Price shall be made as a 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 66 2/3% of the then outstanding shares of Series B Preferred Stock 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 Series B 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) 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 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 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 Conversion Price to an amount which exceeds the lower of (i) the 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 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 Series B Original Issue Date), are revised after the Series B 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 pursuant to the terms of Subsection 4.4.4, the 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.

(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 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 the Conversion Price that such issuance or amendment took place at the time such calculation can first be made.

4.4.4 Adjustment of Conversion Price Upon Issuance of Additional Shares of Common Stock. In the event the Corporation shall at any time after the Series B 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 but excluding any Additional Shares of Common Stock issued in connection with a Licensor Share Issuance as defined and described in Subsection 4.11 below), without consideration or for a consideration per share less than the Conversion Price of any series of Preferred Stock in effect immediately prior to such issue, then the applicable Conversion Price shall be reduced, concurrently with such issue, 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:

Stock

(a) "CP₂" shall mean the Conversion Price in effect immediately after such issuance of Additional Shares of Common

(b) "CP₁" shall mean the 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 conversion or exchange of the Preferred Stock outstanding immediately prior to such issue);

(d) "B" shall mean the number of shares of Common Stock that would have been issued if such Additional Shares of Common Stock had been issued or deemed 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 CP₁); 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 pursuant to the terms of Subsection 4.4.4, and such issuance dates occur within a period of no more than ninety (90) days from the first such issuance to the final such issuance, then, upon the final such issuance, the 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 Series B Original Issue Date effect a subdivision of the outstanding Common Stock, the 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 Series B Original Issue Date combine the outstanding shares of Common Stock, the 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 Series B 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 the 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 the 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, the Conversion Price shall be recomputed accordingly as of the close of business on such record date and thereafter the Conversion Price shall be adjusted pursuant to this subsection as of the time of actual payment of such dividends or distributions; and (b) no such adjustment shall be made to the Series B Conversion Price or Series A Conversion Price, as applicable, if the holders of Series B Preferred Stock or Series A Preferred Stock, as applicable, 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 such series 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 Series B 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, 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 Series B Preferred Stock and/or the Series A 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 such series 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 Series B Preferred Stock or Series A Preferred Stock (as applicable) 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 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 such 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 the applicable 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 such Preferred Stock.

4.9 Certificate as to Adjustments. Upon the occurrence of each adjustment or readjustment of the Conversion Price of any 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 ten (10) days thereafter, compute such adjustment or readjustment in accordance with the terms hereof and furnish to each holder of such series of Preferred Stock a certificate setting forth such adjustment or readjustment (including the kind and amount of securities, cash or other property into which such series of 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 any series 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 for such series of preferred Stock, 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 series of 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 any 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;

(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 or winding-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 subscription right, and the amount and character of such dividend, distribution or subscription 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.

4.11 Adjustments to Conversion Price for Other Capitalization Matters.

(a) Notwithstanding anything to the contrary contained herein, if, after the Series B Original Issue Date, the Corporation shall consummate a Licensor Share Issuance (as defined in that certain letter agreement, dated August 9, 2019, by and among the Corporation and the stockholders of the Corporation party thereto), then the Conversion Price of the Series A Preferred Stock and Series B Preferred Stock shall each be adjusted concurrently with such Licensor Share Issuance (the “**Conversion Price Adjustment**”) such that, as of immediately following such Licensor Share Issuance, (i) the then outstanding shares of Series A Preferred Stock will be convertible into that number of shares of Common Stock representing a percentage of the Fully Diluted Capitalization (calculated as of immediately following the Licensor Share Issuance) that is equal to the Pre-Issuance Series A Percentage, and (ii) the then outstanding shares of Series B Preferred Stock will be convertible into that number of shares of Common Stock representing a percentage of the Fully Diluted Capitalization (calculated as of immediately following the Licensor Share Issuance) that is equal to the Pre-Issuance Series B Percentage.

(b) Notwithstanding anything to the contrary set forth in this Section 4.11, (i) the Conversion Price Adjustment shall occur only in connection with the first Licensor Share Issuance following the Series B Original Issue Date and (ii) any subsequent Licensor Share Issuance or any other issuance of the Corporation’s capital stock, whether pursuant to a license relating to the Company’s technology or otherwise, shall not result in a Conversion Price Adjustment.

(c) As used herein, the “**Fully Diluted Capitalization**” shall mean the sum of (i) the outstanding shares of Common Stock, (ii) the shares of Common Stock directly or indirectly issuable upon conversion or exchange of all outstanding securities directly or indirectly convertible into or exchangeable for Common Stock and the exercise of all outstanding options and warrants, and (iii) the shares of Common Stock reserved, but neither issued nor the subject of outstanding awards, under any equity incentive or similar plan of the Corporation.

(d) As used herein, the “**Pre-Issuance Series A Percentage**” shall mean the percentage, expressed as a fraction, the numerator of which is equal to the aggregate number of shares of Common Stock issuable upon conversion of all outstanding shares of Series A Preferred Stock, and the denominator of which is equal to the Fully Diluted Capitalization, in each case, calculated as of immediately prior to the Licensor Share Issuance.

(e) As used herein, the “**Pre-Issuance Series B Percentage**” shall mean the percentage, expressed as a fraction, the numerator of which is equal to the aggregate number of shares of Common Stock issuable upon conversion of all outstanding shares of Series B Preferred Stock, and the denominator of which is equal to the Fully Diluted Capitalization, in each case, calculated as of immediately prior to the Licensor Share Issuance.

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 one and one-half times (1.5x) the Series B Original Issue Price (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 (a “**Qualifying IPO**”) or (b) the date and time, or the occurrence of an event, specified by vote or written consent of the Requisite Holders (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 rate applicable thereto based upon the Conversion Price of each such series of Preferred Stock, as calculated pursuant to Subsection 4.1.1 and (ii) such shares may not be reissued by the Corporation.

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. Upon receipt of such notice, each holder of shares of Series A 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 at the place 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 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 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 Preferred Stock accordingly.

6. Converted, Redeemed or Otherwise Acquired Shares. Any shares of Preferred Stock that are converted, 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.

7. Waiver. Except to the extent stated to the contrary in this Certificate of Incorporation, any of the rights, powers, preferences and other terms of the Preferred Stock set forth herein may be amended, modified or waived on behalf of all holders of Preferred Stock by the Requisite Holders, including Perceptive Life Sciences Master Fund, Ltd., Perceptive Xontogeny Venture Fund, L.P., RTW Master Fund, Ltd. and RTW Innovation Master Fund, Ltd., provided, however, that the rights, powers, preferences and other terms of any series of Preferred Stock set forth herein may not be amended, modified or waived with respect to any such series of Preferred Stock, without the written consent of the holders of a majority of the shares of Common Stock issued or issuable upon conversion of the then outstanding shares of such series of Preferred Stock (voting as a separate class), unless such amendment, modification or waiver applies to all series of Preferred Stock in the same fashion.

8. 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 the 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 the Certificate of Incorporation, the number of directors of the Corporation shall be determined in the manner set forth in the Bylaws of the Corporation.

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 the certificate of incorporation, these by-laws, agreement, 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.

10. Excluded Opportunities. 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 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.

ELEVENTH: 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 Eleventh 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 Eleventh including, without limitation, each portion of any sentence of this Article Eleventh 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.

* * *

3. 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.

4. That this Amended and Restated 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.

[Signature Page Follows]

IN WITNESS WHEREOF, this Amended and Restated Certificate of Incorporation has been executed by a duly authorized officer of this corporation on this 9th day of August, 2019.

By: _____
President

LANDOS BIOPHARMA, INC.

BYLAWS

(the "Corporation")

These Bylaws have been approved by the Board of Directors of the Corporation.

ARTICLE IStockholders

1. Annual Meeting. The annual meeting of stockholders shall be held each year at the place, date and time determined by the Board of Directors or the President. The purposes for which the annual meeting is to be held, in addition to those prescribed by law, by the Certificate of Incorporation (as may be amended or restated from time to time, the "Certificate of Incorporation") or by these Bylaws, may be specified by the Board of Directors or the President. If no annual meeting has been held in any fiscal year, a special meeting in lieu thereof may be held or there may be action by written consent of the stockholders on matters to be voted on at the annual meeting, and such special meeting or written consent shall have for the purposes of these Bylaws or otherwise all the force and effect of an annual meeting.

2. Special Meetings. Special meetings of stockholders may be called by the President or by the Board of Directors, or by the holder or holders of ten percent (10%) or more of any class (or series of a class) of capital stock of the Corporation. Special meetings shall be called by the Secretary, or in case of death, absence, incapacity or refusal of the Secretary, by any other officer, upon written application of one or more stockholders who hold at least a majority in interest of the capital stock entitled to vote at such meeting. The call for the meeting shall state the place (if any), date, hour and purposes of the meeting. Only the purposes specified in the notice of special meeting shall be considered or dealt with at such special meeting.

3. Place of Meeting. Meetings of stockholders may be held at such place, either within or without the State of Delaware, as may be determined by the Board of Directors. The Board of Directors may, in its sole discretion, determine that the meeting shall not be held at any place, but may instead be held solely by means of remote communication. The Board of Directors may also, in its sole discretion, determine that stockholders and proxy holders may attend and participate by means of remote communication in a stockholder meeting held at a designated place. As to any meeting where attendance and participation by remote communication authorized by the Board of Directors in its sole discretion (including any meeting held solely by remote communication), and subject to such guidelines and procedures as the Board of Directors may adopt for any meeting, stockholders and proxy holders not physically present at such meeting of the stockholders shall be entitled to: (i) participate in any meeting of the stockholders; and (ii) be deemed present in person and vote at such meeting of the stockholders whether such meeting is to be held at a designated place or solely by means of remote communication, provided that (A) the Corporation shall implement reasonable measures to verify that each person deemed present and permitted to vote at the meeting by means of

remote communication is a stockholder or proxy holder, (B) the Corporation shall implement reasonable measures to provide stockholders and proxy holders a reasonable opportunity to participate in the meeting and to vote on matters submitted to the stockholders, including an opportunity to read or hear the proceedings substantially concurrently with such proceedings, and (C) if any stockholder or proxy holder votes or takes other action at the meeting by means of remote communication, a record of such vote or other action shall be maintained by the Corporation.

4. Notice of Meetings. Except as otherwise provided by law or the Certificate of Incorporation, notice given in writing or by electronic transmission of each meeting of stockholders 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, such notice to specify the place, if any, date and hour and purpose or purposes of the meeting and the means of remote communications, if any, by which stockholders and proxy holders may be deemed to be present in person and vote at such meeting. Without limiting the manner by which notice otherwise may be given to stockholders, any notice shall be effective if given by a form of electronic transmission consented to (in a manner consistent with the Delaware General Corporation Law (the “*DGCL*”)) by the stockholder to whom the notice is given, and such notice shall be deemed to be given at the time, if delivered by electronic mail when directed to an electronic mail address at which the stockholder has consented to receive notice, and if delivered by any other form of electronic transmission when directed to the stockholder. Notice of the time, place, if any, and purpose of any meeting of stockholders may be waived (i) in writing signed by the person entitled to notice thereof or (ii) by electronic transmission made by the person entitled to notice, either before or after such meeting. Notice will be waived by any stockholder by his attendance thereat in person, by remote communication, or by proxy, except when the stockholder 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. Any stockholder so waiving notice of such meeting shall be bound by the proceedings of any such meeting in all respects as if due notice thereof had been given.

5. Quorum. The holders of a majority of the voting power of all shares of capital stock issued, outstanding and entitled to vote at a meeting shall constitute a quorum. Any meeting may be adjourned from time to time by the holders of a majority of the votes properly cast upon the question, whether or not a quorum is present. The stockholders present at a duly constituted meeting may continue to transact business until adjournment notwithstanding the withdrawal of enough stockholders to reduce the voting shares below a quorum.

6. Voting and Proxies. Stockholders shall have one vote for each share of stock entitled to vote owned by them of record according to the books of the Corporation unless otherwise provided by law or by the Certificate of Incorporation. Stockholders may vote either in person or by written proxy or express directly or by written proxy their consent or dissent to a corporate action taken without a meeting, but no proxy shall be voted or acted upon after three years from its date, unless the proxy provides for a longer period or is irrevocable and coupled with an interest. Proxies shall be filed with the secretary of the meeting, or of any adjournment thereof. Except as otherwise limited therein, proxies shall entitle the persons authorized thereby to vote at any adjournment of such meeting.

7. Action at a Meeting. When a quorum is present, any matter before the meeting shall be decided by vote of the holders of a majority of the voting power of the shares of stock voting on such matter except where a larger vote is required by law, by the Certificate of Incorporation or by these Bylaws. Any election of Directors by stockholders shall be determined by a plurality of the votes cast, except where a larger vote or different vote is required by law, by the Certificate of Incorporation or by these Bylaws. The Corporation shall not directly or indirectly vote any share of its own stock; provided, however, that the Corporation may vote shares which it holds in a fiduciary capacity to the extent permitted by law.

8. Action without a Meeting. Unless otherwise restricted by the Certificate of Incorporation or these Bylaws, any action required or permitted by law to be taken at any annual or special meeting of stockholders may be taken without a meeting, without prior notice and without a vote (a) if a consent or consents thereto in writing setting forth the action so taken, shall be signed by the holders of all of the outstanding shares of stock having not less 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 voted and shall be delivered to the Corporation by delivery to its registered office, by hand or by certified mail, return receipt requested or to the Corporation's principal place of business or to the officer of the Corporation having custody of the minute book or (b) by electronic transmission setting forth the action so taken made by the holders of all of the outstanding shares of stock having not less 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 voted. Every written consent or electronic transmission shall bear the date of signature or proper identity of the stockholder, respectively, and no written consent or electronic transmission shall be effective unless, within sixty (60) days of the earliest dated consent or electronic transmission delivered pursuant to these Bylaws, written consents signed, or electronic transmissions made, by a sufficient number of stockholders entitled to take action are delivered to the Corporation in the manner set forth in these Bylaws. Prompt notice of the taking of corporate action without a meeting by less than unanimous written consent or electronic transmission shall be given to those stockholders who have not consented in writing.

9. Stockholder Lists. The officer who has charge of the stock ledger of the Corporation shall prepare and make, at least ten (10) days before every meeting of stockholders, a complete list of the stockholders entitled to vote at the meeting, arranged in alphabetical order, and showing the address of each stockholder and the number of shares registered in the name of each stockholder; provided that such list shall not be required to contain the electronic mail address or other electronic contact information of any stockholder. Such list shall be open to the examination of any stockholder, for any purpose germane to the meeting, for a period of at least ten (10) days prior to the meeting, either (i) on a reasonably accessible electronic network, provided that the information required to gain access to such list is provided with the notice of the meeting, or (ii) during ordinary business hours, at the principal place of business of the Corporation. If the meeting is to be held at a place, the list shall also be produced and kept at the time and place of the meeting during the whole time thereof, and may be inspected by any stockholder who is present. If the meeting is to be held solely by means of electronic communication or if attendance at and participation in the meeting is permitted by means of remote communication, then the list shall also be open to the examination of any stockholder during the whole time of the meeting on or a reasonably acceptable electronic network, and the information required to access such list shall be provided with the notice of the meeting.

ARTICLE II

Directors

1. Powers. The business of the Corporation shall be managed by or under the direction of a Board of Directors who may exercise all the powers of the Corporation except as otherwise provided by law, by the Certificate of Incorporation or by these Bylaws. In the event of a vacancy in the Board of Directors, the remaining Directors, except as otherwise provided by law, may exercise the powers of the full Board of Directors until the vacancy is filled.

2. Election and Qualification. Unless otherwise provided in the Certificate of Incorporation, the number of Directors which shall constitute the whole Board of Directors shall be fixed from time to time by resolution of the Board of Directors or by the stockholders at an annual meeting of the stockholders. Directors need not be stockholders.

3. Vacancies: Reduction of Board. Subject to the provisions of the Certificate of Incorporation and any stockholders agreement to which the Corporation is a party, a majority of the Directors then in office, although less than a quorum, or a sole remaining Director, may fill vacancies in the Board of Directors occurring for any reason and newly created directorships resulting from any increase in the authorized number of Directors.

4. Tenure. Except as otherwise provided by law, by the Certificate of Incorporation or by these Bylaws, Directors shall hold office until their successors are duly elected and qualified or until their earlier resignation or removal. Any Director may resign by delivering his written resignation to the Corporation. Such resignation shall be effective upon receipt unless it is specified to be effective at some other time or upon the happening of some other event.

5. Removal. Subject to the provisions of the Certificate of Incorporation and any stockholders agreement to which the Corporation is a party, to the extent permitted by law, a Director may be removed from office with or without cause by vote of the holders of a majority of the shares of stock entitled to vote in the election of such Director. The vote of 66 2/3% of the Series A Preferred Stock (on an as-converted basis) and the Common Stock, voting together as a single class will be required for the removal of the current Chairman of the Board and the Series A Director.

6. Meetings. Regular meetings of the Board of Directors may be held without notice at such time, date and place (if any) as the Board of Directors may from time to time determine. Special meetings of the Board of Directors may be called, in writing, by the President, the Chief Executive Officer, or one or more Directors (or the sole Director, if applicable), and designating the time, date and place (if any) thereof. Directors may participate in meetings of the Board of Directors by means of conference telephone or similar communications equipment by means of which all Directors participating in the meeting can hear each other, and participation in a meeting in accordance herewith shall constitute presence in person at such meeting.

7. Notice of Meetings. Notice of the time, date and place (if any) of all special meetings of the Board of Directors shall be given to each Director by the Secretary, or Assistant Secretary, or in case of the death, absence, incapacity or refusal of such persons, by the officer or one of the Directors calling the meeting. Notice shall be given to each Director in person or by telephone, including a voice messaging system or other system or technology designed to record and communicate messages, facsimile, telegraph, or by electronic mail or other electronic means, during normal business hours, at least twenty-four (24) hours in advance of the meeting, or by written notice mailed to his business or home address at least forty-eight (48) hours in advance of the meeting. Notice need not be given to any Director if a written waiver of notice is executed by him before or after the meeting, or if communication with such Director is unlawful, and will be waived by any director by attendance thereat, except when the director attends the 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. A notice or waiver of notice of a meeting of the Board of Directors need not specify the purposes of the meeting.

8. Quorum. At any meeting of the Board of Directors, a majority of the Directors then in office shall constitute a quorum. Less than a quorum may adjourn any meeting from time to time and the meeting may be held as adjourned without further notice.

9. Action at Meeting. At any meeting of the Board of Directors at which a quorum is present, a majority of the Directors present may take any action on behalf of the Board of Directors, unless a larger number is required by law, by the Certificate of Incorporation or by these Bylaws.

10. Action without a Meeting. 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 committee thereof may be taken without a meeting if all members of the Board of Directors or committee thereof consent thereto in writing or by electronic transmission, and such writings or electronic transmissions are filed with the records of the meetings of the Board of Directors or committee thereof. Such filing shall be in paper form if the minutes are maintained in paper form and shall be in electronic form if the minutes are maintained in electronic form. Such consent shall be treated as a vote of the Board of Directors or committee thereof for all purposes.

11. Committees. The Board of Directors, by vote of a majority of the Directors then in office, may establish one or more committees, each committee to consist of one or more Directors, and may delegate thereto some or all of its powers except those which by law, by the Certificate of Incorporation, or by these Bylaws may not be delegated. Except as the Board of Directors may otherwise determine, any such committee may make rules for the conduct of its business, but in the absence of such rules its business shall be conducted so far as possible in the same manner as is provided in these Bylaws for the Board of Directors. All members of such committees shall hold their committee offices at the pleasure of the Board of Directors, and the Board may abolish any committee at any time. Each such committee shall report its action to the Board of Directors who shall have power to rescind any action of any committee without retroactive effect.

12. Protection of Confidential Information; Recusal from Meetings. Each director acknowledges that as part of his or her service to the Corporation, and the exercise of his or her fiduciary duties on behalf of the Corporation, the director may receive confidential information of the Corporation (and its customers, strategic partners, vendors and suppliers). This confidential information includes, without limitation, nonpublic financial information, business and market strategy reports and presentations, pricing information, research and development activities, plans and strategies (including reports and presentations to the Board of Directors), invention disclosures, patentable and unpatentable inventions, technical specifications and information, and other scientific data, laboratory notebooks, unpublished patent or invention disclosures blueprints, biological and chemical compounds and properties, scientific reports, technical specifications and data, whether in hard copy or electronic media. Each director shall not use or disclose such confidential information for any purpose other than to promote and serve the best interests of the Corporation and its stockholders. The executive officers and the Board of Directors may limit or restrict the information to be provided to any director in order to protect sensitive or competitive information. A majority of the disinterested members of the Board of Directors shall have the right to exclude any director from portions of meetings of the Board of Directors (or any Committee) or omit to provide the director with certain information if such members of the Board of Directors believe in good faith and with the exercise of due care that such exclusion or omission is necessary (a) in order to preserve the Corporation's attorney-client privilege, (b) in order to fulfill the Corporation's obligations with respect to confidential or proprietary information of third parties, or to protect the confidentiality of unpatentable information or competitive business information of the Corporation (or its customers, strategic partners, vendors and suppliers), or (c) because such meeting or information would include information, analyses or discussions which could pose a potential conflict of interest for the director or his or her affiliated organization or entity and the prospects of the Corporation.

ARTICLE III

Officers

1. Enumeration. The officers of the Corporation shall consist of a President, a Treasurer, a Secretary, and such other officers, including one or more Vice Presidents, Assistant Treasurers and Assistant Secretaries, as the Board of Directors may determine.

2. Election. The President, Treasurer and Secretary shall be elected every three (3) years by the Board of Directors at their first meeting following the annual meeting of stockholders. Other officers may be chosen by the Board of Directors at such meeting or at any other meeting. For the initial term, Dr. Bassaganya-Riera will be President, CEO, Chairman of the Board, and Treasurer. Christopher Garabedian will be Secretary.

3. Qualification. No officer need be a stockholder or Director. Any two or more offices may be held by the same person.

4. Tenure. Except as otherwise provided by the Certificate of Incorporation or by these Bylaws, each of the officers of the Corporation shall hold his office until his successor is duly elected and qualified or until his earlier resignation or removal. Any officer may resign by delivering his written resignation to the Corporation, and such resignation shall be effective upon receipt unless it is specified to be effective at some other time or upon the happening of some other event.

5. Removal. The vote of 66 2/3% of the Series A Preferred Stock (on an as-converted basis) and the Common Stock, voting together as a single class will be required for the removal during the initial term of Dr. Bassaganya-Riera as President and Treasurer and Christopher Garabedian as Secretary. The Board of Directors may remove any other officer with or without cause by a vote of a majority of the entire number of Directors then in office.

6. Vacancies. Any vacancy in any office may be filled for the unexpired portion of the term by the Board of Directors.

7. Chairman. The Chairman of the Board shall preside, when present, at all meetings of the stockholders and of the Board of Directors. The Chairman of the Board shall have such other powers and perform such other duties as the Board of Directors may from time to time designate.

8. President and Vice Presidents. The President shall be the chief operating officer of the Corporation and shall have general charge of its business operations, subject to the direction of the Board of Directors. The President shall preside, when present, at all meetings of stockholders and the Board of Directors. The Board of Directors shall have the authority to appoint a temporary presiding officer to serve at any meeting of the stockholders or Board of Directors if the President is unable to do so for any reason.

Any Vice President shall have such powers and shall perform such duties as the Board of Directors may from time to time designate. In the absence of the President or in the event of his inability or refusal to act, the Vice President (or in the event there be more than one Vice President, the Vice Presidents in the order designated by the Directors, or in the absence of any designation, then in the order of their election) shall perform the duties of the President, and when so acting, shall have all the powers and responsible of and be subject to all the restrictions upon the President.

9. Treasurer and Assistant Treasurers. The Treasurer shall, subject to the direction of the Board of Directors, have general charge of the financial affairs of the Corporation and shall cause to be kept accurate books of account. The Treasurer shall have custody of all funds, securities, and valuable documents of the Corporation, except as the Board of Directors may otherwise provide.

Any Assistant Treasurer shall have such powers and perform such duties as the Board of Directors may from time to time designate.

10. Secretary and Assistant Secretaries. The Secretary shall record the proceedings of all meetings of the stockholders and the Board of Directors in books kept for that purpose. In his absence from any such meeting an Assistant Secretary, or if he is absent, a temporary secretary chosen at the meeting, shall record the proceedings thereof.

The Secretary shall have charge of the stock ledger (which may, however, be kept by any transfer or other agent of the Corporation) and shall have such other duties and powers as may be designated from time to time by the Board of Directors or the President.

Any Assistant Secretary shall have such powers and perform such duties as the Board of Directors may from time to time designate.

11. Other Powers and Duties. Subject to these Bylaws, each officer of the Corporation shall have in addition to the duties and powers specifically set forth in these Bylaws, such duties and powers as are customarily incident to his office, and such duties and powers as may be designated from time to time by the Board of Directors.

ARTICLE IV

Capital Stock

1. Certificates of Stock. Unless the Board of Directors has provided by resolution that some or all of any or all classes or series of stock of the Corporation shall be uncertificated shares, each stockholder shall be entitled to a certificate of stock of the Corporation in such form as may from time to time be prescribed by the Board of Directors. Such certificate shall be signed by the Chairperson or Vice-Chairperson of the Board of Directors or the President or a Vice President and by the Treasurer or an Assistant Treasurer or the Secretary or an Assistant Secretary. Such signatures may be facsimile. In case any officer, transfer agent or registrar who has signed or whose facsimile signature has been placed on such 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 he were such officer, transfer agent or registrar at the time of its issue. Every certificate for shares of stock which are subject to any restriction on transfer and every certificate issued when the Corporation is authorized to issue more than one class or series of stock shall contain such legend with respect thereto as is required by law. The Corporation shall, at the option of the Board of Directors or as otherwise stated in the Certificate of Incorporation, be permitted to issue fractional shares.

2. Transfers. Subject to any restrictions on transfer, shares of stock may be transferred on the books of the Corporation by the surrender to the Corporation or its transfer agent of the certificate therefor properly endorsed or accompanied by a written assignment or power of attorney properly executed, with transfer stamps (if necessary) affixed, and with such proof of the authenticity of signature as the Corporation or its transfer agent may reasonably require.

3. Record Holders. Except as may otherwise be required by law, by the Certificate of Incorporation or by these Bylaws, the Corporation shall be entitled to treat the record holder of stock as shown on its books as the owner of such stock for all purposes, including the payment of dividends and the right to vote with respect thereto, regardless of any transfer, pledge or other disposition of such stock, until the shares have been transferred on the books of the Corporation in accordance with the requirements of these Bylaws. It shall be the duty of each stockholder to notify the Corporation of his post office address.

4. Record Date. 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 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, in advance, a record date, which shall not precede the date on which it is established, and which shall not be more than sixty (60) nor less than ten (10) days before the date of such meeting, more than ten (10) days after the date on which the resolution fixing the record date for stockholder consent without a meeting is established, nor more than sixty (60) days prior to any other action. In such case, only stockholders of record on such record date shall be so entitled notwithstanding any transfer of stock on the books of the Corporation after the record date.

If no record date is fixed, (a) 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 next preceding the day on which notice is given, or, if notice is waived, at the close of business on the day next preceding the day on which the meeting is held, (b) the record date for determining stockholders entitled to consent to corporate action in writing without a meeting, when no prior action by the Board of Directors is necessary, 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 by delivery to its registered office in this state, to its principal place of business, or to an officer or agent of the Corporation having custody of the book in which proceedings of meetings of stockholders are recorded, and (c) 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.

5. Replacement of Certificates. In case of the alleged loss, destruction or mutilation of a certificate of stock, a duplicate certificate may be issued in place thereof, upon such terms as the Board of Directors may prescribe.

ARTICLE V

Indemnification

1. Indemnification of Directors and Officers. The Corporation shall indemnify, to the fullest extent permitted by the DGCL, any person who was or is a party or is threatened to be made a party to or is otherwise involved in any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative, investigative or otherwise, and whether by or in the right of the Corporation, its stockholders, a third party or otherwise (a "Proceeding"), by reason of the fact that he is or was a Director or officer of the Corporation, or is or was a Director or officer of the Corporation serving at its request as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise, against all expense (including, but not limited to, attorneys' fees), liability, loss, judgments, fines, excise taxes, penalties and amounts paid in settlement actually and reasonably incurred by him in connection with such Proceeding, including expenses incurred in seeking such indemnification. In addition, the Corporation shall grant such indemnification to each of its Directors and officers with respect to any matter in a Proceeding as to which his liability is limited pursuant to the Certificate of

Incorporation of the Corporation. However, such indemnification shall exclude (i) indemnification with respect to any improper personal benefit which a Director or officer is determined to have received and of the expenses of defending against an improper personal benefit claim unless the Director or officer is successful on the merits in said defense, and (ii) indemnification of present or former officers, directors, employees or agents of a constituent corporation absorbed in a merger or consolidation transaction with this Corporation with respect to their activities prior to said transaction, unless specifically authorized by the Board of Directors or stockholders of this Corporation. Such indemnification shall include prompt payment of expenses reasonably incurred by a Director or officer in defending a Proceeding in advance of the final disposition of such Proceeding, upon receipt of an undertaking by or on behalf of the Director or officer to repay such amounts if it shall ultimately be determined that he is not entitled to be indemnified by the Corporation under this Article V, which undertaking shall be an unsecured general obligation of the Director or officer and may be accepted without regard to his or her ability to make repayment.

2. Indemnification of Employees and Agents. The Corporation may, to the extent authorized from time to time by the Board of Directors, grant rights to indemnification and to an advancement of expenses, pursuant to the provisions of this Article V, to any person who was or is a party or is threatened to be made a party to or is otherwise involved in any Proceeding by reason of the fact that he is or was an employee or agent of the Corporation or is or was serving at the request of the Corporation, as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise.

3. Nature of Indemnification Rights. The indemnification rights provided in this Article V shall be a contract right and shall not be deemed exclusive of any other rights to which any person, whether or not entitled to be indemnified hereunder, may be entitled by law or under any bylaw, agreement, vote of stockholders or Directors or otherwise, both as to action in his official capacity and as to action in another capacity while holding such office, and shall continue as to a person who has ceased to be a Director, officer, employee or agent and inure to the benefit of the heirs, executors and administrators of such a person. A Director or officer shall be entitled to the benefit of any amendment of the DGCL which enlarges indemnification rights hereunder, but any such amendment which adversely affects indemnification rights with respect to prior activities shall not apply to him without his consent unless otherwise required by law. Each person who is or becomes a Director or officer of the Corporation shall be deemed to have served or to have continued to serve in such capacity in reliance upon the indemnity provided for in this Article V.

4. Amendment. The provisions of this Article V may be amended as provided in Article VI; provided, however, no amendment or repeal of such provisions which adversely affects the rights of a Director or officer under this Article V with respect to his acts or omissions prior to such amendment or repeal, shall apply to him without his consent.

ARTICLE VI

Miscellaneous Provisions

1. Fiscal Year. Except as otherwise determined by the Board of Directors, the fiscal year of the Corporation shall end on December 31st of each year.
2. Seal. The Board of Directors shall have power to adopt and alter the seal of the Corporation.
3. Notices and Waivers Thereof. Except as otherwise provided by law, the Certificate of Incorporation or these Bylaws, whenever by law or under the provisions of the Certificate of Incorporation or these Bylaws notice is required to be given to any Director or stockholder, it will not be construed to require personal notice, but such notice may be given in writing, by mail or courier service, addressed to such Director or stockholder, at the address of such Director or stockholder as it appears on the records of the Company, with postage thereon prepaid, and such notice will be deemed to be given at the time when the same is deposited in the United States mail or upon delivery, if given by courier service. Notice to Directors or stockholders may also be given by telephone, telegram, facsimile, electronic mail, electronic transmission or similar medium of communication or as otherwise may be permitted by these Bylaws. If such notice is delivered to a Director or stockholder by electronic mail, such notice shall be deemed given when directed to the electronic mail address provided by such Director or stockholder, and if such notice is delivered by any other electronic transmission, such notice shall be deemed given when directed to such Director or stockholder.

Whenever any notice is required to be given by law or under the provisions of the Certificate of Incorporation or these Bylaws, a waiver thereof, in writing, signed by the person or persons entitled to such notice, or a waiver by electronic transmission by the person entitled to such notice, whether before or after the time of the event for which notice is to be given, will be deemed equivalent to such notice. Attendance of a person at a meeting will constitute a waiver of notice of such meeting, except when the person attends a meeting for the sole and express purpose of objecting, at the time of the meeting, to the transaction of any business because the meeting is not lawfully called or convened.

4. Execution of Instruments. All deeds, leases, transfers, contracts, bonds, notes and other obligations authorized to be executed by an officer of the Corporation in its behalf shall be signed by the President or Treasurer, or by any other officer of the Corporation designated by the Board of Directors, except as the Board of Directors may generally or in particular cases otherwise determine.

5. Voting of Securities. Unless otherwise provided by the Board of Directors, the President or Treasurer may waive notice of and act on behalf of this Corporation, or appoint another person or persons to act as proxy or attorney in fact for this Corporation with or without discretionary power and/or power of substitution, at any meeting of stockholders or shareholders of any other corporation or organization, any of whose securities are held by this Corporation.

6. Resident Agent. The Board of Directors may appoint a resident agent in any jurisdiction upon whom legal process may be served in any action or proceeding against the Corporation.

7. Corporate Records. The original or attested copies of the Certificate of Incorporation, Bylaws and records of all meetings of the incorporator, stockholders and the Board of Directors and the stock and transfer records, which shall contain the names of all stockholders, their record addresses and the amount of stock held by each, shall be kept at the principal office of the Corporation, at the office of its counsel, or at an office of its transfer agent.

8. Certificate of Incorporation. All references in these Bylaws to the Certificate of Incorporation shall be deemed to refer to the Certificate of Incorporation of the Corporation, as amended and in effect from time to time.

9. Amendments. These Bylaws may be amended or repealed or additional Bylaws adopted by the stockholders or by the Board of Directors; provided that (a) the Board of Directors may not amend or repeal Article V or this Section 9 of Article VI or any provision of these Bylaws which by law, by the Certificate of Incorporation or by these Bylaws requires action by the stockholders, and (b) any amendment or repeal of these Bylaws by the Board of Directors and any Bylaw adopted by the Board of Directors may be amended or repealed by the stockholders.

10. Conflicts. In the event of any conflict between these Bylaws or any stockholders, voting, investor rights or other agreement to which the Corporation and the holders of shares of any class or series of capital stock of the Corporation are a party, then such agreement shall govern. In the event of any conflict between these Bylaws and the Certificate of Incorporation, the Certificate of Incorporation shall govern.

Adopted by the Board of Directors: August 28, 2017

**AMENDED AND RESTATED
INVESTOR'S RIGHTS AGREEMENT**

THIS AMENDED AND RESTATED INVESTOR'S RIGHTS AGREEMENT (this "**Agreement**"), is made as of the 9th day of August, 2019, by and among Landos Biopharma, 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**".

RECITALS

WHEREAS, certain of the Investors (the "**Existing Investors**") hold shares of the Company's Series A Preferred Stock and/or shares of the 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 September 19, 2017, by and among the Company and such Existing Investors (the "**Prior Agreement**"); and

WHEREAS, the Existing Investors are holders of at least 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; and

WHEREAS, certain of the Investors are parties to that certain Series B Preferred Stock Purchase Agreement of even date herewith by and among the Company and such Investors (the "**Purchase Agreement**"), under which certain of the Company's and such Investors' obligations are conditioned upon the execution and delivery of this Agreement by such Investors, the Existing Investors holding at least a majority of the Registrable Securities, and the Company;

NOW, THEREFORE, the Existing Investors 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 of such Person or any investment fund now or hereafter existing that is controlled by one or more general partners, managing members or investment adviser 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 "**Certificate of Incorporation**" means the Company's Amended and Restated Certificate of Incorporation, filed with the Secretary of State of the State of Delaware on the date hereof (as amended and/or restated, from time to time).

1.4 “**Common Stock**” means shares of the Company’s common stock, par value \$0.01 per share.

1.5 “**Common Stock Director**” means any director of the Company that the holders of record of the Common Stock are entitled to elect pursuant to the Certificate of Incorporation.

1.6 “**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.

1.7 “**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.

1.8 “**Exchange Act**” means the Securities Exchange Act of 1934, as amended, and the rules and regulations promulgated thereunder.

1.9 “**Excluded Registration**” means (i) a registration relating to the sale of securities to employees of the Company or a subsidiary pursuant to a stock option, stock purchase, 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.

1.10 “**FOIA Party**” means a Person that, in the reasonable determination of the Board of Directors, may be subject to, and thereby required to disclose non-public information furnished by or relating to the Company under, the Freedom of Information Act, 5 U.S.C. 552 (“**FOIA**”), any state public records access law, any state or other jurisdiction’s laws similar in intent or effect to FOIA, or any other similar statutory or regulatory requirement.

1.11 “**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.

1.12 “**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 incorporation of substantial information by reference to other documents filed by the Company with the SEC.

1.13 “**GAAP**” means generally accepted accounting principles in the United States as in effect from time to time.

1.14 “**Holder**” means any holder of Registrable Securities who is a party to this Agreement.

1.15 “**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.

1.16 “**Initiating Holders**” means, collectively, Holders who properly initiate a registration request under this Agreement.

1.17 “**IPO**” means the Company’s first underwritten public offering of its Common Stock under the Securities Act.

1.18 “**Major Investor**” means any Investor that, individually or together with such Investor’s Affiliates, holds at least 666,000 shares of (i) Series A Preferred Stock or (ii) Series B Preferred Stock (in each case as adjusted for any stock split, stock dividend, combination, or other recapitalization or reclassification effected after the date hereof).

1.19 “**New Securities**” means, collectively, equity securities of the Company (other than Exempted Securities (as defined in the Company’s Certificate of Incorporation)), 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.

1.20 “**Osage**” means Osage University Partners III, LP

1.21 “**Perceptive**” means Perceptive Life Sciences Master Fund, L.P. and Perceptive Xontogeny Venture Fund, L.P.

1.22 “**Person**” means any individual, corporation, partnership, trust, limited liability company, association or other entity.

1.23 “**Preferred Stock**” means, collectively, shares of the Company Series A Preferred Stock and Series B Preferred Stock.

1.24 “**Registrable Securities**” means (i) the Common Stock issuable or issued upon conversion of the Series A Preferred Stock; (ii) the Common Stock issuable or issued upon conversion of the Series B Preferred Stock; (iii) 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 date hereof; and (iv) 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), (ii), and (iii) above; and (v) any Common Stock acquired by an Investor pursuant to the Amended and Restated Right of First Refusal and Co-Sale Agreement dated as of the date hereof; 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.

1.25 “**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.

1.26 “**Restricted Securities**” means the securities of the Company required to be notated with the legend set forth in Subsection 2.12(b) hereof.

1.27 “**RTW**” means RTW Investments, LP and its Affiliated funds, including RTW Master Fund, Ltd., RTW Innovation Master Fund, Ltd. and RTW Special Purpose Fund I, LLC.

1.28 “**SEC**” means the Securities and Exchange Commission.

1.29 “**SEC Rule 144**” means Rule 144 promulgated by the SEC under the Securities Act.

1.30 “**SEC Rule 145**” means Rule 145 promulgated by the SEC under the Securities Act.

1.31 “**Securities Act**” means the Securities Act of 1933, as amended, and the rules and regulations promulgated thereunder.

1.32 “**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 Selling Holder Counsel borne and paid by the Company as provided in Subsection 2.6.

1.33 “**Series A Director**” means any director of the Company that the holders of record of the Series A Preferred Stock are entitled to elect pursuant to the Certificate of Incorporation.

1.34 “**Series A Preferred Stock**” means shares of the Company’s Series A Preferred Stock, par value \$0.01 per share.

1.35 “**Series B Director**” means any director of the Company that the holders of record of the Series B Preferred Stock are entitled to elect pursuant to the Certificate of Incorporation.

1.36 “**Series B Preferred Stock**” means shares of the Company’s Series B Preferred Stock, par value \$0.01 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 twenty percent (20%) of the Registrable Securities then outstanding that the Company file a Form S-1 registration statement with respect to such percent of the Registrable Securities then outstanding for which the anticipated aggregate offering price, net of Selling Expenses, would exceed \$10 million, 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 (or any equivalent or successor form), the Company receives a request from Holders of at least ten percent (10%) 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 \$1 million, 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 one hundred twenty (120) 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 one hundred twenty (120) day 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 registration 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).

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 Common Stock 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 Company 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 and reasonably satisfactory to the Holders holding a majority of the Registrable Securities participating in such offering; provided, however, that the liability of each such Holder shall be several and not joint, and limited to an amount equal to the net proceeds from the offering received by such Holder. Notwithstanding any other provision of this Subsection 2.3, if the managing 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 or the Holders of a majority of the Registrable Securities otherwise consent thereto. 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 to Subsection 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 or by the Initiating Holders pursuant to Subsection 2.1) are first entirely excluded from the offering, (ii) in no event shall 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 and (iii) in no event shall the number of Registrable Securities held by Holders who hold or will hold Common Stock then issued or issuable upon conversion of any Series A Preferred Stock or Series B Preferred Stock be reduced without the consent of the holders of at least a majority of Registrable Securities, unless all other Registrable Securities are first entirely excluded from the 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 Subsection 2.1, a registration shall not be counted as "effected" if, as a result of an exercise of the underwriter's cutback provisions in Subsection 2.3(a), fewer than fifty percent (50%) of the 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 one hundred twenty (120) 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 \$35,000, of one counsel for the selling Holders selected by the Holders of a majority of the Registrable Securities to be registered ("**Selling 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 Subsections 2.1(a) or 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, other than fees and disbursements of counsel to any Holder (other than the Selling Holder Counsel), which shall be borne solely by the Holder engaging such counsel.

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 except to the extent such information was corrected in a subsequent writing delivered to the Company within a reasonable time prior to the sale of Registrable Securities to the Person asserting the claim.

(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 which was not corrected in a subsequent writing delivered to the Company within a reasonable time prior to the sale of Registrable Securities to the Person asserting the claim; 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, only to the extent that such failure (i) materially and irrevocably prejudices the indemnifying party's ability to defend such action or (ii) results in a material increase in the amount of Damages for which indemnification is being sought. 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 this Subsection 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; provided that in no event shall any indemnity obligations of any Holder exceed the net proceeds from the offering received by such Holder.

(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); (ii) a copy of the most recent annual or quarterly report of the Company and such other reports and documents so filed by the Company; and (iii) 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 a majority of the Registrable Securities then outstanding, enter into any agreement with any holder or prospective holder of any securities of the Company that would (a) provide to such holder or prospective holder the right to include securities in any registration on other than either a pro rata basis with respect to the Registrable Securities or on a subordinate basis after all Holders have had the opportunity to include in the registration and offering all shares of Registrable Securities that they wish to so include; or (b) allow such holder or prospective holder (i) 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) 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 by any additional Investor who 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 registration by the Company for its own behalf of shares of its Common Stock or any other equity securities under the Securities Act on a registration statement on Form S-1 or Form S-3, and ending on the date specified by the Company and the managing underwriter (such period not to exceed one hundred eighty (180) days in the case of the IPO, 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 IPO (and for the avoidance of doubt, specifically excluding any shares acquired in or following the IPO) 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 apply only to the IPO, shall not apply to the sale of any shares to an underwriter pursuant to an underwriting agreement, or to any shares purchased on or after the date of the IPO, 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 Company stockholders that are subject to such agreements, based on the number of shares subject to such agreements.

Notwithstanding the foregoing, for so long as either Perceptive (or its Affiliates) or RTW (or its Affiliates) own any Registrable Securities, in addition to any consent requirements described above in this Section or elsewhere in this Agreement, the obligations in this Section 2.11 may only be amended, waived or terminated with the prior written consent of Perceptive and/or RTW, as applicable, with respect to any shares of the Company's Common Stock that are (i) acquired in the IPO, (ii) acquired in any of the Company's public offerings that occur after the IPO or (iii) acquired in the open market at any time after the IPO, in each case, by such Holder and/or its Affiliates.

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 Series A Preferred Stock, (ii) the Series B Preferred Stock, (iii) the Registrable Securities, and (iv) any other securities issued in respect of the securities referenced in clauses (i), (ii) and (iii), 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; (y) any transaction in which RTW Investments, LP distributes Restricted Securities to an investment fund for which it serves as investment advisor for consideration equal to or less than the aggregate purchase price paid by RTW Investments, LP under the Purchase Agreement; or (z) in any transaction in which such Holder distributes Restricted Securities to an Affiliate of such Holder for no consideration; provided that each transferee agrees in writing to be subject to the terms of this Subsection 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) such time 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 and (b) the fifth anniversary of the IPO.

3. Information and Observer Rights.

3.1 Delivery of Financial Statements. The Company shall deliver to each Investor, provided that the Board of Directors has not reasonably determined that such Investor is a competitor of the Company (provided that neither RTW, Perceptive nor their respective Affiliates shall be deemed a competitor of the Company hereunder):

(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) a balance sheet as of the end of such year, (ii) statements of income and of cash flows for such year, and a comparison between (x) the actual amounts as of and for such fiscal year and (y) the comparable amounts for the prior year and as included in the Budget (as defined in Subsection 3.1(e)) for such year, with an explanation of any material differences between such amounts and a schedule as to the sources and applications of funds for such year, and (iii) a statement of stockholders' equity as of the end of such year, all such financial statements audited and certified by independent public accountants of regionally recognized standing selected by the Company;

(b) 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, 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 (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); and a comparison of such quarterly statements against the applicable quarterly portion of the Budget (as defined below) for each such quarter each year;

(c) 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 Investors to calculate their respective percentage equity ownership in the Company, and certified by the chief financial officer or chief executive officer of the Company as being true, complete, and correct;

(d) as soon as practicable, but in any event within thirty (30) days of the end of each month, copies of management financial accounts in the form prepared by Company management in the ordinary course of business;

(e) as soon as practicable, but in any event thirty (30) days before the end of each fiscal year, a budget and business plan for the next fiscal year (collectively, the "**Budget**"), approved by the Board of Directors in accordance with Section 6.4, 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;

(f) with respect to the financial statements called for in Subsection 3.1(a), (b) and (d), an instrument executed by the chief financial officer and chief executive officer of the Company certifying that such financial statements were prepared in accordance with GAAP consistently applied with prior practice for earlier periods (except as otherwise set forth in Subsection 3.1(b) and Subsection 3.1(d)) and fairly present the financial condition of the Company and its results of operation for the periods specified therein; and

(g) such other information relating to the financial condition, business, prospects, or corporate affairs of the Company as any 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, 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 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 of the Company (provided that neither RTW, Perceptive nor their respective Affiliates shall be deemed a competitor of the Company hereunder)), 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. As long as RTW qualifies as a Major Investor, the Company shall invite a representative of RTW 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.

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 12(g) or 15(d) of the Exchange Act, or (iii) upon a Deemed Liquidation Event, as such term is defined in the Company's Certificate of Incorporation, 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 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 the Investor without use of the Company's confidential information, or (c) is or has been made known or disclosed to the 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, provided that the Investor promptly notifies the Company of such disclosure and takes reasonable steps to minimize the extent of any such required disclosure. The Company understands and acknowledges that in the regular course of each of Perceptive's and RTW's business, each of Perceptive and RTW and any of their respective Affiliates and/or representatives currently may be invested in, may invest in or may consider investments companies that have issued securities that are publicly traded (each, a "**Public Company**"). Accordingly, the Company covenants and agrees that before providing material non-public information about a Public Company ("**Public Company Information**") to each of Perceptive and RTW, as applicable, the Company will use commercially reasonable efforts to provide prior written notice to the compliance personnel at each of RTW or Perceptive, as

applicable, describing such information in reasonable detail. The Company shall not disclose Public Company Information to Perceptive or RTW without written authorization from the applicable compliance personnel, provided, however, that, the Company will be permitted to disclose agreements entered into with Public Companies in the ordinary course of business, such as routine customer, supplier, advertising and publishing agreements without such written authorization.

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 Investor. An 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, (ii) its Affiliates and (iii) its beneficial interest holders, such as limited partners, members or any other Person having “beneficial ownership,” as such term is defined in Rule 13d-3 promulgated under the Exchange Act, of such Investor (“**Investor Beneficial Owners**”); provided that each such Affiliate or Investor Beneficial Owner (x) is not a competitor of the Company (provided that neither RTW, Perceptive nor their respective Affiliates shall be deemed a competitor of the Company hereunder) or FOIA Party, unless such party’s purchase of New Securities is otherwise consented to by the Board of Directors, (y) agrees to enter into this Agreement and each of the Amended and Restated Voting Agreement and Amended and Restated Right of First Refusal and Co-Sale Agreement of even date herewith among the Company, the Investors and the other parties named therein, as an “**Investor**” under each such agreement (provided that any competitor of the Company or FOIA Party shall not be entitled to any rights as an Investor or Major Investor, as applicable, under Subsections 3.1, 3.2 and 4.1 hereof).

(a) Perceptive/RTW Right of First Offer.

(i) The Company shall give notice (the “**Perceptive/RTW Offer Notice**”) to each of Perceptive and RTW, 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.

(ii) By notification to the Company within twenty (20) days after the Perceptive/RTW Offer Notice is given, each of Perceptive or RTW may elect to purchase or otherwise acquire, at the price and on the terms specified in the Perceptive/RTW Offer Notice, up to that portion of such New Securities which equals one and one-half (1.5) times the proportion that the Common Stock then held by each of Perceptive and RTW (including all shares of Common Stock then issuable (directly or indirectly) upon conversion and/or exercise, as applicable, of the Series A Preferred Stock, Series B Preferred Stock, and any other Derivative Securities then held by each of Perceptive and RTW) bears to the total Common Stock of the Company then outstanding (assuming full conversion and/or exercise, as applicable, of all Series A Preferred Stock, Series B Preferred Stock and other Derivative Securities then outstanding). The New Securities remaining after Perceptive and/or RTW exercise, waive or fail to timely exercise their right pursuant to this Subsection 4.1 shall be the “**Remaining New Securities**”.

(b) Remaining Investor Right of First Offer.

(i) At the expiration of the twenty (20) day period described in Subsection 4.1(a)(ii), the Company shall promptly give notice (the “**Remaining Investor Offer Notice**”) to each Investor besides Perceptive or RTW (the “**Remaining Investors**”), stating (i) its bona fide intention to offer such Remaining New Securities, (ii) the number of such Remaining New Securities to be offered, and (iii) the price and terms, if any, upon which it proposes to offer such Remaining New Securities.

(ii) By notification to the Company within twenty (20) days after the Remaining Investor Offer Notice is given, each Remaining 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 Remaining New Securities which equals the proportion that the Common Stock then held by each such Remaining Investor (including all shares of Common Stock then issuable (directly or indirectly) upon conversion and/or exercise, as applicable, of the Series A Preferred Stock, Series B Preferred Stock, and any other Derivative Securities then held by such Remaining Investors) bears to the total Common Stock of the Company then outstanding (assuming full conversion and/or exercise, as applicable, of all Series A Preferred Stock, Series B Preferred Stock and other Derivative Securities then outstanding).

(c) At the expiration of the twenty (20) day period described in Subsection 4.1(b)(i), the Company shall promptly notify each Investor that elects to purchase or acquire all the shares available to it under this Subsection 4.1 (each, a “**Fully Exercising Investor**”) of any other 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 Investors were entitled to subscribe but that were not subscribed for by the 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 Series A Preferred Stock, Series B Preferred Stock and any other 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 Series A Preferred Stock, the Series B Preferred Stock and any other 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(c) 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).

(d) 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 ninety (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 Investors in accordance with this Subsection 4.1.

(e) Waiver of Preemptive Rights. If, in connection with any proposed issuance of New Securities by the Company, the holders of a majority of the Registrable Securities then outstanding, including Perceptive and RTW, waive the rights of the Investors pursuant to this Section 4 and an Investor nevertheless subsequently purchases any portion of the New Securities issued in the applicable transaction (such purchasing Investor, a “**Participating Holder**”), then Perceptive, Osage and RTW shall have the right to purchase a proportional number of the New Securities to be issued by the Company in such transaction based on the pro rata purchase right of each Investor set forth in Section 4, assuming a transaction size determined based upon the amount purchased by the Participating Holder that invested the largest percentage in such transaction. The rights granted pursuant to this Subsection 4.1(e) shall not include the right to the notice periods specified in the other provisions of this Section 4, and the waiver of such notice periods by the holders of a majority of the Registrable Securities then outstanding, including Perceptive and RTW, shall be effective with respect to all Investors. Notwithstanding anything herein to the contrary, the Company shall give prompt notice of any waiver hereunder to any party that did not consent in writing to such amendment or waiver, which notice shall include the anticipated closing date and instructions on how to participate in the proposed sale of New Securities.

(f) The right of first offer in this Subsection 4.1 shall not be applicable to (i) Exempted Securities (as defined in the Company’s Certificate of Incorporation) and (ii) shares of Common Stock issued in the IPO.

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, or (ii) upon a Deemed Liquidation Event, as such term is defined in the Company’s Certificate of Incorporation, whichever event occurs first.

5. Right of First Negotiation. Perceptive Life Sciences Master Fund, Ltd. and its Affiliates (“**Perceptive Master Fund**”), and RTW will each have a Right of First Negotiation (“**ROFN**”) with respect to any future debt financings by the Company. Accordingly, before entering into a debt financing transaction (a “**Debt Financing**”) with any third party, the Company shall promptly notify Perceptive Master Fund and RTW in writing that it may pursue such a potential Debt Financing and Perceptive Master Fund and RTW shall each have five (5) days from the receipt of such notice to provide the Company written notice that it desires to enter into good faith negotiations with the Company regarding the Debt Financing (the “**ROFN Option**”). If Perceptive Master Fund and RTW do not provide written notice that it is exercising its ROFN Option within such five (5) day period, then the Company shall have no further obligation with respect to the ROFN Option and shall be free to negotiate and enter into any Debt Financing with any third party. If Perceptive Master Fund or RTW properly exercises the ROFN Option as described above, then the Parties shall negotiate exclusively, reasonably and in

good faith concerning the terms of the Debt Financing for a period of thirty (30) days. If the parties do not execute and deliver an agreement with respect to the Debt Financing within such thirty (30) day period, then the Company shall be free to negotiate and enter into any Debt Financing with any third party; provided that if such third party transaction is, when taken as a whole, materially and substantially less favorable to the Company than the terms last offered to the Company by Perceptive Master Fund or RTW, then the Company will provide written notice describing and offering Perceptive Master Fund and RTW such Debt Financing for a period of five (5) days (after Perceptive Master Fund's and RTW's receipt of such notice) before entering such Debt Financing with a third party. If Perceptive Master Fund or RTW elects to pursue such Debt Financing, it shall deliver written notice to the Company within such 5-day period, and the parties will proceed to negotiate and finalize definitive agreements. This Subsection 5 shall automatically terminate and be of no further force or effect (a) upon the earlier of (i) the consummation of any Deemed Liquidation Event (as defined in the Restated Certificate) or (ii) the consummation of the Company's first underwritten public offering of its Common Stock, or (b) with respect to a Purchaser, if such Purchaser no longer qualifies as a Major Investor (as defined in the Investor's Rights Agreement).

6. Additional Covenants.

6.1 Insurance. The Company shall use its commercially reasonable efforts to maintain a Directors and Officers liability insurance and obtain, within ninety (90) days of the date hereof, term "key-person" insurance on Josep Bassaganya-Riera, from financially sound and reputable insurers each in an amount and on terms and conditions satisfactory to the Board of Directors, and will use commercially reasonable efforts to cause such insurance policies to be maintained until such time as the Board of Directors, including the Series B Director and at least one (1) Series A Director, determines that such insurance should be discontinued. The key-person policy shall name the Company as loss payee, and neither policy shall be cancelable by the Company without prior approval by the Board of Directors including the Series B Director and at least one (1) Series A Director. Notwithstanding any other provision of this Section 6.1 to the contrary, for so long as a Series A Director or a Series B Director is serving on the Board of Directors, the Company shall not cease to maintain a Directors and Officers liability insurance policy in an amount of at least three (3) million dollars unless approved by the Series B Director and at least one (1) Series A Director, or if there is no Series B Director serving on the board, then by at least one (1) Series A Director, and the Company shall annually, within one hundred twenty (120) days after the end of each fiscal year of the Company, deliver to RTW and Perceptive a certification that such a Directors and Officers liability insurance policy remains in effect.

6.2 Employee Agreements. Unless otherwise agreed by the board of directors of the Company, including the Series B Director and at least one Series A Director, 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 a one (1) year noncompetition and nonsolicitation agreement, substantially in the form approved by the Board of Directors; and (ii) the Company shall negotiate in good faith with Josep Bassaganya-Riera to enter into a two (2) year employment

agreement with such customary terms as the Company, RTW and Perceptive approve, for Josep Bassaganya-Riera to serve as the Chairman of the Board, President and Chief Executive Officer of the Company. 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 at least one Series A Director and the Series B Director.

6.3 Employee Stock. Unless otherwise approved by the Board of Directors, including the Series B Director and at least one Series A Director, 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 date hereof 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, 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. In addition, unless otherwise approved by the Board of Directors, including the Series B Director and at least one (1) Series A Director, the Company shall retain 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.

6.4 Matters Requiring Investor Director Approval. So long as the holders of Series A Preferred Stock are entitled to elect a Series A Director or the holders of Series B Preferred Stock are entitled to elect a Series B Director, 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 the Series B Director and at least one (1) Series A Director:

(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 in excess of \$100,000, 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, in accordance with this Section 6.4;

(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 indebtedness in excess of \$500,000 that is not already included in the Budget approved by the Board of Directors, other than trade credit incurred in the ordinary course of business and a line of credit for working capital;

(f) enter into any transaction with any director, officer, or employee of the Company or an “associate” (as defined in Rule 12b-2 promulgated under the Exchange Act) of any such Person, including without limitation any “management bonus” or similar plan providing payments to employees in connection with a Deemed Liquidation Event, as such term is defined in the Company’s Certificate of Incorporation, except for transactions contemplated by this Agreement, or the Purchase Agreement;

(g) hire, terminate, or change the compensation of the executive officers (namely the CEO, CBO, CSO, CFO, COO and CMO), 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 permit any subsidiary to sell, assign, license, pledge or encumber material technology or intellectual property of such subsidiary, other than licenses granted in the ordinary course of business;

(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;

(k) make any capital expenditure in excess of \$500,000 that is not already included in the Budget, other than trade credit incurred in the ordinary course of business;

(l) grant any stock option or stock equivalent providing for vesting provisions that differ from the vesting schedule described in Subsection 6.3 or acceleration of vesting upon a change of control of the Company, sale of all or substantially all of the assets of the Company, termination or similar event;

(m) increase the number of shares reserved for issuance under the Company’s equity incentive plans, except for such equity incentive plan to be adopted following the date hereof pursuant to which the Company will reserve an aggregate number of shares of Common Stock for issuance in an amount equal to ten percent (10%) of the fully-diluted capital of the Company as of immediately following the consummation of the transactions contemplated by the Purchase Agreement;

(n) create or dissolve any committee of the Board of Directors;

- (o) make any change to the Company's independent accountants;
- (p) acquire any corporation, partnership, or other entity (whether by stock or asset purchase, merger, consolidation or otherwise) or any equity or securities therein;
- (q) approve the Budget; or
- (r) change the location of the Company's executive offices.

6.5 Board Matters. Unless otherwise determined by the vote of a majority of the directors then in office, the Board of Directors shall meet at least quarterly in accordance with an agreed-upon schedule. The Company shall reimburse the nonemployee directors and observers for all reasonable out-of-pocket travel expenses incurred, including airfare (consistent with the Company's travel policy), when acting on behalf of and with the approval of the Company, including in connection with attending meetings of the Board of Directors. The Company shall cause to be established, as soon as practicable after such request, and will maintain, an audit and compensation committee, each of which shall consist solely of non-management directors. The Series B Director and at least one Series A Director shall each have the right to be members of the audit and compensation committees of the Board. The Series B Director, at least one Series A Director and the Common Stock Director shall each have the right to be members of all other committees of the Board as may be established from time to time.

6.6 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 Certificate of Incorporation, or elsewhere, as the case may be.

6.7 Expenses of Counsel. In the event of a transaction which is a Sale of the Company (as defined in the Amended and Restated Voting Agreement of even date herewith among the Investors and the Company), the reasonable fees and disbursements of one counsel for the Major Investors ("**Investor Counsel**"), in their capacities as stockholders, shall be borne and paid by the Company. At the outset of considering a transaction which, if consummated would constitute a Sale of the Company, the Company shall obtain the ability to share with the Investor Counsel (and such counsel's clients) and shall share the confidential information (including, without limitation, the initial and all subsequent drafts of memoranda of understanding, letters of intent and other transaction documents and related noncompete, employment, consulting and other compensation agreements and plans) pertaining to and memorializing any of the transactions which, individually or when aggregated with others would constitute the Sale of the Company. The Company shall be obligated to share (and cause the

Company's counsel and investment bankers to share) such materials when distributed to the Company's executives and/or any one or more of the other parties to such transaction(s). In the event that Investor Counsel deems it appropriate, in its reasonable discretion, to enter into a joint defense agreement or other arrangement to enhance the ability of the parties to protect their communications and other reviewed materials under the attorney client privilege, the Company shall, and shall direct its counsel to, execute and deliver to Investor Counsel and its clients such an agreement in form and substance reasonably acceptable to Investor Counsel. In the event that one or more of the other party or parties to such transactions require the clients of Investor Counsel to enter into a confidentiality agreement and/or joint defense agreement in order to receive such information, then the Company shall share whatever information can be shared without entry into such agreement and shall, at the same time, in good faith work expeditiously to enable Investor Counsel and its clients to negotiate and enter into the appropriate agreement(s) without undue burden to the clients of Investor Counsel

6.8 Indemnification Matters. The Company shall enter into and use its best efforts at all times to maintain an indemnification agreement with each member of the Board in a form mutually acceptable to the Company and to such director in order to indemnify such director to the maximum extent permissible under applicable law. 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 Company's Certificate of Incorporation 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 6.8 and shall have the right, power and authority to enforce the provisions of this Subsection 6.8 as though they were a party to this Agreement.

6.9 Right to Conduct Activities. The Company hereby agrees and acknowledges that each Investor (together with each of their respective Affiliates) is a professional investment fund, and as such invest in numerous portfolio companies, some of which may be deemed competitive with the Company's business (as currently conducted or as currently propose to be conducted). Nothing in this Agreement shall preclude or in any way restrict such Investors 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 enterprise has products or services which compete with those of the Company; and the Company hereby agrees that, to the extent permitted under applicable law, none of the Investors nor any of their respective Affiliates shall be liable to the Company for any claim arising out of, or based upon, (i) the investment by any of the Investors or any of their respective Affiliates in any entity competitive with the Company, or (ii) actions taken by any partner, officer or other representative of any of the Investors or any of their respective Affiliates 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; 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.

6.10 FCPA. The Company represents that it shall not (and shall not permit any of its subsidiaries or affiliates or any of its or their respective directors, officers, managers, employees, independent contractors, representatives or agents to) promise, authorize or make any payment to, or otherwise contribute any item of value to, directly or indirectly, to any third party, including any Non-U.S. Official (as (as such term is defined in the U.S. Foreign Corrupt Practices Act of 1977, as amended (the "FCPA")), in each case, in violation of the FCPA, the U.K. Bribery Act, or any other applicable anti-bribery or anti-corruption law. The Company further represents that it shall (and shall cause each of its subsidiaries and affiliates to) cease all of its or their respective activities, as well as remediate any actions taken by the Company, its subsidiaries or affiliates, or any of their respective directors, officers, managers, employees, independent contractors, representatives or agents in violation of the FCPA, the U.K. Bribery Act, or any other applicable anti-bribery or anti-corruption law. The Company further represents that it shall (and shall cause each of its subsidiaries and affiliates to) maintain systems of internal controls (including, but not limited to, accounting systems, purchasing systems and billing systems) to ensure compliance with the FCPA, the U.K. Bribery Act, or any other applicable anti-bribery or anti-corruption law. Upon request, the Company agrees to provide responsive information and/or certifications concerning its compliance with applicable anti-corruption laws. The Company shall promptly notify each Investor if the Company becomes aware of any Enforcement Action (as defined in the Purchase Agreement). The Company shall, and shall cause any direct or indirect subsidiary or entity controlled by it, whether now in existence or formed in the future, to comply with the FCPA. The Company shall use its best efforts to cause any direct or indirect subsidiary, whether now in existence or formed in the future, to comply in all material respects with all applicable laws.

6.11 Termination of Covenants. The covenants set forth in this Section 5, except for Subsections 6.6-6.9, 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 Company's Certificate of Incorporation, whichever event occurs first.

7. Miscellaneous.

7.1 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 2% of the total Registrable Securities (subject to appropriate adjustment for stock splits, stock dividends, combinations, and other recapitalizations); provided, however, that (x) the rights pursuant to sections 3, 4, 5, and 6 of this Agreement shall only be assigned pursuant to clause (i) and (ii), (y) 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 (z) 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 have 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.

7.2 Governing Law. This Agreement shall be governed by the internal law 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.

7.3 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.

7.4 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.

7.5 Notices. 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 respective parties at their addresses as set forth on Schedule A hereto, or to the principal office of the Company and to the attention of the Chief Executive Officer, in the case of the Company, or to such email address, facsimile number, or address as subsequently modified by written notice given in accordance with this Subsection 7.5. If notice is given to the Company, a copy shall also be sent to Covington & Burling, 620 Eighth Avenue, New York, New York 10018, Attn: Eric Blanchard, Esq. and Joseph Gangitano, Esq. and if notice is given to the Investors, a copy shall also be sent to Tannenbaum Helpen Syracuse & Hirschtritt LLP, 900 Third Avenue, New York, NY 10022, Attn: David R. Lallouz, Esq. and Wilson Sonsini Goodrich & Rosati, 28 State Street, 37th Floor, Boston, Massachusetts 02109-5703, Attn: Jennifer Fang, Esq.

7.6 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 a majority of the Registrable Securities then outstanding, including Perceptive and RTW; provided 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, 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). 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 7.6 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.

7.7 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.

7.8 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.

7.9 Additional Investors. Notwithstanding anything to the contrary contained herein, if the Company issues additional shares of the Company's Series B Preferred Stock after the date hereof, any purchaser of such shares of Series B 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 and the Company shall update Schedule A to reflect the name and address of such purchaser. 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.

7.10 Entire Agreement. This Agreement (including any Schedules and Exhibits hereto), together with the other Transaction Documents, 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.

7.11 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.

Each party will bear its own costs in respect of any disputes arising under this Agreement. 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. Each of the parties to this Agreement consents to personal jurisdiction for any equitable action sought in the U.S. District Court for the District of Delaware or any court of the State of Delaware having subject matter jurisdiction.

7.12 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.

7.13 Acknowledgement. The Company acknowledges that the Investors are in the business of venture capital investing and therefore review the business plans and the related proprietary information of many enterprises, including enterprises which may have products or services which compete directly or indirectly with those of the Company. Nothing in this Agreement shall preclude or in any way restrict the Investors from investing or participating in any particular enterprise whether or not such enterprise has products or services which compete with those of the Company.

7.14 Further Assurances. At any time or from time to time after the date hereof, the parties agree to cooperate with each other, and at the request of any other party, to execute and deliver any further instruments or documents and to take all such further action as the other party may reasonably request in order to evidence or effectuate the consummation of the transactions contemplated hereby and to otherwise carry out the intent of the parties hereunder.

[Remainder of Page Intentionally Left Blank]

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

LANDOS BIOPHARMA, INC.

By: _____
Name: _____
Title: _____

SCHEDULE A
Investors

Perceptive Life Sciences Master Fund, Ltd.
c/o Perceptive Advisors, LLC
51 Astor Place, 10th Floor
New York, NY 10003

Perceptive Xontogeny Venture Fund, L.P.
c/o Perceptive Advisors, LLC
51 Astor Place, 10th Floor
New York, NY 10003

RTW Master Fund, Ltd.
412 West 15th Street, Floor 9
New York, NY 10011

RTW Innovation Master Fund, Ltd.
412 West 15th Street, Floor 9
New York, NY 10011

RTW Special Purpose Fund I, LLC
412 West 15th Street, Floor 9
New York, NY 10011

Osage University Partners III, LP
50 Monument Road, Suite 201
Bala Cynwyd, PA 19004

PX Venture (A), LLC
c/o Perceptive Advisors
51 Astor Place, 10th Floor
New York, NY 10003

Helicase Venture Fund I, L.P.
c/o Helicase Venture
One Beacon Street, 15th Floor
Boston, MA 02108

BKB Growth Investments, LLC
c/o Tiger Lily Capital, LLC
200 Garrett Street, Suite O
Charlottesville, VA 22902

PD Joint Holdings, LLC Series 2016-A
c/o Tiger Lily Capital, LLC
200 Garrett Street, Suite O
Charlottesville, VA 22902

LANDOS BIOPHARMA, INC.

2019 EQUITY INCENTIVE PLAN

1. **Purposes of the Plan.** The purposes of the Plan are to attract and retain the best available personnel, to provide additional incentives to Employees, Directors, and Consultants and to promote the success of the business of the Company.

2. **Definitions.** The following definitions shall apply as used herein and, except as defined otherwise in an Award Agreement, in the Award Agreements.

“**Administrator**” means the Board and any Committee or individual appointed to administer the Plan under Section 4.

“**Award**” means an award described in Section 6.

“**Award Agreement**” means the written agreement evidencing the grant of an Award, including any amendments and attachments thereto.

“**Award Cycle**” means a period of consecutive fiscal years, or portions thereof, over which Performance Awards are to be earned.

“**Board**” means the Board of Directors of the Company.

“**Cause**” means, with respect to the termination of employment or service, the term “Cause” (or similar term) that is expressly defined in either the applicable Award Agreement or a then-effective written agreement between the Grantee and the Company or any Subsidiary or Parent, or in the absence of such a definition, “Cause” shall be determined in the discretion of the Administrator to mean the Grantee’s: (i) performance of any act or failure to perform any act in bad faith and to the material detriment of the Company or any Subsidiary or Parent, as determined by the Administrator; (ii) act of dishonesty, intentional misconduct or material breach of any agreement with the Company or any Subsidiary or Parent; or (iii) commission of a crime involving dishonesty, breach of trust, or physical or emotional harm to any person.

“**Code**” means the Internal Revenue Code of 1986, as amended.

“**Committee**” means any committee of the Board that is composed of at least two members of the Board.

“**Common Stock**” means the common stock, \$0.01 par value, of the Company.

“**Company**” means Landos Biopharma, Inc., a Delaware corporation, or any successor entity.

“**Consultant**” means any person other than an Employee or a Director (solely with respect to rendering services in such person’s capacity as a Director) who is engaged by the Company or any Subsidiary or Parent to render consulting or advisory services to the Company or such Subsidiary or Parent.

“**Corporate Transaction**” means any of the following:

- (i) a transaction or series of related transactions in which any person (within the meaning of Section 13(d)(3) or 14(d)(2) of the Exchange Act), other than any person who currently owns more than a majority of the Company’s Common Stock, becomes the beneficial owner (within the meaning of Rule 13d-3 promulgated under the Exchange Act) of more than 50% of the combined voting power of the then outstanding voting securities of the Company, except that any change in the ownership of the stock of the Company as a result of either an Initial Public Offering or a private financing of the Company that is approved by the Board will not be considered a Corporate Transaction;
- (ii) a consolidation or merger of the Company with or into another entity, unless the stockholders of the Company immediately before such consolidation or merger own, directly or indirectly, a majority of the combined voting power of the outstanding voting securities of the corporation or other entity resulting from such consolidation or merger; or
- (iii) the sale of all or substantially all of the assets of the Company.

Notwithstanding the foregoing, to the extent necessarily to avoid a violation of Section 409A of the Code, a transaction will not be deemed a Corporate Transaction unless the transaction qualifies as a change in control event within the meaning of Section 409A of the Code, as it has been and may be amended from time to time, and any proposed or final Treasury Regulations and Internal Revenue Service guidance that has been promulgated or may be promulgated thereunder from time to time.

For the avoidance of doubt, a transaction will not constitute a Corporate Transaction if: (1) its sole purpose is to change the jurisdiction of the Company’s incorporation, or (2) its sole purpose is to create a holding company that will be owned in substantially the same proportions by the persons who held the Company’s securities immediately before such transaction.

“**Director**” means a member of the Board or the board of directors of any Subsidiary or Parent.

“**Employee**” means an employee of the Company or any Subsidiary or Parent (including a Director who is also an employee).

“**Exchange Act**” means the Securities Exchange Act of 1934, as amended.

“**Fair Market Value**” means, as of any date, the value of Common Stock determined as follows:

- (i) if the Common Stock is listed on one or more established stock exchanges or national market systems, its Fair Market Value shall be the closing sale price for such stock (or the closing bid, if no sales were reported) as quoted on the principal exchange or system on which the Common Stock is listed (as determined by the Administrator) on the date of determination (or, if no closing sale price or closing bid (as applicable) was reported on that date, on the last trading date that such closing sale price or closing bid was reported), as reported in The Wall Street Journal or such other source as the Administrator deems reliable;

- (ii) if the Common Stock is regularly quoted on an automated quotation system (including the OTC Bulletin Board) or by a recognized securities dealer, its Fair Market Value shall be the closing sales price for such stock as quoted on such system or by such securities dealer on the date of determination, but if selling prices are not reported, the Fair Market Value of a share of Common Stock shall be the mean between the high bid and low asked prices for the Common Stock on the date of determination (or, if no such prices were reported on that date, on the last date such prices were reported), as reported in The Wall Street Journal or such other source as the Administrator deems reliable; or
- (iii) if neither (i) nor (ii) above applies, its Fair Market Value shall be the fair market value determined by the Board using any measure of value that the Board determines to be appropriate (including, as it considers appropriate, relying on appraisals), and with respect to Options and SARs, in a manner consistent with the valuation principles under Section 409A of the Code, except as the Board may expressly determine otherwise.

“**Grantee**” means an individual who holds an Award.

“**Incentive Stock Option**” means an Option intended to qualify as an incentive stock option within the meaning of Section 422 of the Code.

“**Initial Public Offering**” means the consummation of the first Public Offering.

“**Non-Qualified Stock Option**” means an Option not intended to qualify as an Incentive Stock Option.

“**Option**” means an option to purchase Shares.

“**Parent**” means a “parent corporation” of the Company, whether now or hereafter existing, as defined in Section 424(e) of the Code.

“**Performance Awards**” means Awards granted under Section 9.

“**Performance Goals**” means the performance goals established in connection with the grant of Performance Awards.

“**Plan**” means this 2019 Equity Incentive Plan, as may be amended or restated from time to time.

“**Public Offering**” means the consummation of a 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.

“**Restricted Stock**” means Shares issued under the Plan subject to restrictions determined by the Administrator and set forth in the applicable Award Agreement.

“**Restricted Stock Units**” means an Award based on the value of Common Stock that is an unfunded and unsecured promise to deliver Shares, cash, or other property upon the attainment of specified vesting or performance conditions, as determined by the Administrator and set forth in the applicable Award Agreement.

“**SAR**” means a stock appreciation right entitling the Grantee to Shares or cash compensation, as determined by the Administrator and set forth in the applicable Award Agreement, measured by appreciation in the value of Common Stock.

“**Securities Act**” means the Securities Act of 1933, as amended.

“**Service Provider**” means an Employee, Director, or Consultant.

“**Share**” means a share of Common Stock.

“**Subsidiary**” means a “subsidiary corporation” of the Company, whether now or hereafter existing, as defined in Section 424(f) of the Code.

“**Unrestricted Stock**” means Shares issued under the Plan that are not subject to vesting, forfeiture or similar restrictions pursuant to the applicable Award Agreement. For the sake of clarity, Shares that are only subject to restrictions on transfer, right of first refusal, market stand-off and other similar restrictions shall not, by virtue of such restrictions, be deemed to be Restricted Stock.

3. Stock Subject to the Plan.

(a) **Reserved Shares.** Subject to the provisions of Sections 13 and 14 of the Plan, (i) the maximum aggregate number of Shares which may be issued pursuant to all Awards is 2,003,956 Shares, and (ii) the maximum aggregate number of Shares which may be issued pursuant to Incentive Stock Options is 2,003,956 Shares. The Shares may be authorized but unissued or reacquired Common Stock.

(b) **Automatic Reserved Share Increase.** Subject to the provisions of Sections 13 and 14 of the Plan, the maximum aggregate number of Shares which may be issued pursuant to all Awards and the maximum aggregate number of Shares which may be issued pursuant to Incentive Stock Options each shall be cumulatively increased on January 1, 2020 and each subsequent January 1 in an amount equal to the least of (i) 5% of the number of Shares issued and outstanding on the December 31 immediately preceding each such January 1, (ii) 1,000,000, or (iii) the number of shares determined by the Administrator.

(c) **Shares Returned to Plan.** Any Shares covered by an Award (or portion of an Award) that is forfeited, canceled, reacquired by the Company prior to vesting, expired (whether voluntarily or involuntarily), satisfied without the issuance of Shares, or withheld upon exercise of an Option or settlement of an Award to cover the exercise price or tax withholding, or otherwise terminated (other than by exercise) shall be deemed not to have been issued for purposes of

determining the maximum aggregate number of Shares which may be issued under the Plan. Shares that actually have been issued under the Plan pursuant to an Award shall not be returned to the Plan and shall not become available for future issuance under the Plan, except that if Shares are forfeited or repurchased by the Company at or less than the original value, such Shares shall become available for future grant under the Plan for all purposes other than the grant of Incentive Stock Options.

4. Administration of the Plan.

(a) Administration by the Board. Subject to Sections 4(b), 4(c), and 4(g) the Plan will be administered by the Board.

(b) Appointment of Committees. To the extent permitted by applicable law, the Board may delegate any or all of its powers under the Plan to one or more Committees. All references in the Plan to the “*Administrator*” shall mean the Board or a Committee of the Board or the officers referred to in Section 4(c) to the extent that the Board’s powers or authority under the Plan have been delegated to such Committee or officers.

(c) Delegation to Officers. To the extent permitted by applicable law, the Board or a Committee may delegate to one or more officers of the Company the power to grant Awards, subject to any limitations under the Plan, to Employees, and to exercise such other powers under the Plan as the Board or a Committee may determine, *provided*, that the Board or a Committee shall fix certain material terms of the Awards to be granted by such officers (including the exercise price of such Awards, if applicable, which may include a formula or method by which the exercise price will be determined) and the maximum number of Shares subject to Awards that the officers may grant; *provided further; however*, that no officer shall be authorized to grant Awards to himself or herself.

(d) Powers of the Administrator. The Administrator shall have such powers and authority as may be necessary or appropriate for the Administrator to carry out its functions as described in the Plan, including without limitation the authority (i) to grant Awards and determine recipients and terms thereof, including vesting criteria, any forfeiture events, any vesting acceleration or waiver of forfeiture restrictions, and any restriction or limitation regarding any Award or the Shares relating thereto, (ii) to determine Fair Market Value, (iii) to determine and measure Performance Goals, (iv) to amend, modify or terminate any outstanding Award pursuant to Section 11(c), and (v) to adopt, amend and repeal such administrative rules, guidelines and practices relating to the Plan as it shall deem advisable. The Administrator shall have full discretionary authority to construe and interpret the terms of the Plan and any Award Agreements entered into under the Plan and to determine all facts necessary to administer the Plan and any Award Agreements. All decisions by the Administrator shall be made in the Administrator’s sole discretion and shall be final and binding on all persons having or claiming any interest in the Plan or in any Award.

(e) Indemnification. The Administrator shall not be liable for any act, omission, interpretation, construction or determination made in good faith in connection with the Plan. In addition to such other rights of indemnification as they may have, members of the Board and any Committee (and any individuals to whom authority to act for the Board is delegated in accordance with the Plan) shall be defended and indemnified by the Company to the extent permitted by law

against all reasonable expenses, including attorneys' fees, actually and necessarily incurred in connection with the defense of any claim, investigation, action, suit or proceeding, or in connection with any appeal therein, to which they or any of them may be a party by reason of any action taken or failure to act under or in connection with the Plan, or any Award granted hereunder, and against all amounts paid by them in settlement thereof (*provided* such settlement is approved by the Company) or paid by them in satisfaction of a judgment in any such claim, investigation, action, suit or proceeding, except in relation to matters as to which it shall be adjudged in such claim, investigation, action, suit or proceeding that such person is liable for gross negligence, bad faith or intentional misconduct. Upon the institution of any such action, suit, or proceeding, any such indemnified person against whom a claim is made shall notify the Company in writing and give the Company the opportunity, within thirty (30) days after such notice and at its own expense, to handle and defend the same before such indemnified person undertakes to handle it on his or her own behalf.

(f) 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 Parent or Subsidiary operate or have employees or other individuals eligible for Awards, the Administrator, 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 and regulations; (iv) establish subplans and modify exercise procedures and other terms and procedures, to the extent the Administrator 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 hereof; and (v) take any action, before or after an Award is made, that the Administrator determines to be necessary or advisable to obtain approval or comply with any local governmental regulatory exemptions or approvals.

(g) Plan Administration When Shares are Publicly Traded. At any time that any class of equity security of the Company is registered pursuant to Section 12 of the Exchange Act: (i) the Plan shall be administered so that any Award or transaction will not become subject to (or lose an exemption under) the short-swing profit recovery provisions of Section 16 of the Exchange Act, and (ii) Awards to Directors who are independent, "non-employee directors" within the meaning of Rule 16b-3 of the Exchange Act shall be made only in accordance with the terms, conditions, and parameters of a plan, program, or policy for the compensation of such Directors as in effect from time to time.

5. Eligibility for Awards. Awards other than Incentive Stock Options may be granted to Employees, Directors, and Consultants. Incentive Stock Options may be granted only to Employees.

6. Types and Terms of Awards.

(a) General. Awards may be made under the Plan in the form of (i) Options, (ii) SARs, (iii) Restricted Stock, (iv) Restricted Stock Units, (v) Unrestricted Stock, (vi) Performance Awards, and (vii) other stock-based awards or cash incentives that the Administrator determines are consistent with the purpose of the Plan and the interests of the Company.

(b) Conditions of Awards. Subject to the terms of the Plan, the Administrator shall determine the provisions, terms, and conditions of each Award including, but not limited to, the Award vesting schedule, restrictions and restriction periods, repurchase provisions, rights of first refusal, forfeiture provisions, form of payment (cash, Shares, or other consideration) upon exercise or settlement of the Award, payment contingencies, and satisfaction of any performance criteria. Subject to the terms of the Plan, the Administrator may determine the effect on an Award of the disability, death, termination or other cessation of employment or service, authorized leave of absence or other change in the employment or service relationship of the Grantee. All of the terms and conditions of an Award shall be as set forth in the applicable Award Agreement or in the Plan.

(c) Discretion of Administrator. Except as otherwise provided by the Plan, each Award may be made alone or in addition or in relation to any other Award. The terms of each Award need not be identical, and the Administrator need not treat Grantees uniformly. In selecting persons to receive Awards under the Plan and in determining the type and amount of Awards to be granted under the Plan, the Administrator shall consider any and all factors that it deems relevant or appropriate.

(d) Substitute Awards in Corporate Transactions. Nothing contained in the Plan shall be construed to limit the right of the Administrator to grant Awards under the Plan in connection with the acquisition by the Company, whether by purchase, merger, consolidation or other corporate transaction, of the business or assets of any corporation or other entity. Without limiting the foregoing, the Administrator may grant Awards under the Plan to an employee or director of another corporation who becomes eligible to participate in the Plan by reason of any such corporate transaction in substitution for awards previously granted by such corporation or entity to such person. The terms and conditions of the substitute Awards may vary from the terms and conditions that would otherwise be required by the Plan solely to the extent the Administrator deems necessary for such purpose. Any Shares subject to these substitute Awards shall not be counted against any of the maximum share limitations set forth in Section 3.

(e) Fractional Shares. In the case of any fractional share resulting from the grant, vesting, payment or crediting of dividends under an Award, the Administrator shall have the discretionary authority to (i) disregard such fractional share, (ii) round such fractional share to the nearest lower or higher whole share, or (iii) convert such fractional share into a right to receive a cash payment.

7. Options and SARs.

(a) General. The Administrator may grant Options and SARs under the Plan and determine the number of Shares to be covered by each Option and/or SAR, the exercise price and such other terms, conditions and limitations applicable to the exercise of each Option and/or SAR, as it deems necessary or advisable. Subject to Section 7(g), Options granted under the Plan may be either Incentive Stock Options or Non-Qualified Stock Options. To the extent that any Option does not qualify as an Incentive Stock Option, it shall be deemed a Non-Qualified Stock Option.

(b) Exercise Price. The exercise price per Share subject to an Option or SAR shall be determined by the Administrator at the time of grant but shall not be less than 100% of the Fair Market Value on the date of grant. If an Employee owns or is deemed to own (by reason of the attribution rules of Section 424(d) of the Code) more than 10% of the combined voting power of

all classes of stock of the Company or any Subsidiary or Parent of the Company, and an Incentive Stock Option is granted to such Employee, the exercise price of such Incentive Stock Option shall not be less than 110% of the Fair Market Value on the grant date. Notwithstanding the foregoing, Options may be granted with a per Share exercise price other than as required above as a substitution for a stock option or stock appreciation right in accordance with and pursuant to Section 424 of the Code, in the case of an Incentive Stock Option, and pursuant to Section 409A of the Code, in the case of a Non-Qualified Stock Option.

(c) Term of Options and SARs. The term of each Option and SAR shall be fixed by the Administrator and set forth in the Award Agreement; *provided, however*, that no Option or SAR shall be exercisable more than ten (10) years after the date of grant. If an Employee owns or is deemed to own (by reason of the attribution rules of Section 424(d) of the Code) more than 10% of the combined voting power of all classes of stock of the Company or any Subsidiary or Parent of the Company, and an Incentive Stock Option is granted to such Employee, the term of such Option shall be no more than five (5) years from the date of grant. In accordance with Section 422 of the Code, any Incentive Stock Option exercised later than three (3) months after the Employee ceases to be employed by the Company or any Subsidiary, except in the case of death or disability (as defined in Section 422 of the Code), will be deemed a Non-Qualified Stock Option.

(d) Exercisability; Rights of a Stockholder. Options and SARs shall become vested and/or exercisable at such time or times, whether or not in installments, as shall be determined by the Administrator and set forth in the applicable Award Agreement; *provided, however*, that the Administrator may at any time accelerate the vesting and/or exercisability of all or any portion of any Option or SAR. A Grantee shall have the rights of a stockholder only as to Shares acquired upon the exercise of an Option or SAR in accordance with the Plan and applicable Award Agreement (and not as to Shares underlying an unexercised Option or SAR) and the entry of such Grantee's name as a stockholder in the books of the Company.

(e) Exercise of Options and SARs. Options and SARs may be exercised in whole or in part by delivery to the Company of a written notice of exercise in such form of notice (including electronic notice) and manner of delivery as is specified by the Administrator, together with payment in full as specified in Section 7(f) for the number of Shares for which the Option or SAR is exercised. Shares subject to the Option or SAR will be delivered by the Company as soon as practicable following exercise. Neither an Option nor SAR may be exercised for a fraction of a Share.

(f) Payment Upon Exercise. No Shares shall be delivered pursuant to any exercise of an Option or SAR until payment in full of all required tax withholding, and in the case of an Option, the aggregate exercise price. Payment may be made by one or more of the following methods (or any combination thereof), as determined by the Administrator in its sole discretion, and subject to any additional requirements in the applicable Award Agreement:

- (i) In cash, by either certified or bank check, or by wire transfer of immediately available funds;
- (ii) In the form of previously acquired Shares based on the Fair Market Value on the date of exercise;

- (iii) By surrendering to the Company Shares otherwise receivable on exercise of the Option or SAR; and/or
- (iv) By such other means as is included in the Award Agreement or that the Administrator may accept.

Options may be exercised pursuant to such cashless exercise procedures as may be approved and implemented by the Administrator from time to time, including without limitation pursuant to broker-assisted exercise transactions and/or net exercise procedures; *provided* that, notwithstanding anything to the contrary herein, unless the Administrator gives prior written approval, a Grantee shall not be entitled to satisfy the requirement of payment in full of any tax withholding, as set forth in the first sentence of this Section 7(f), through any “cashless” or “net exercise” arrangement. Payment instruments will be received subject to collection. No certificates for Shares so purchased will be issued to the Grantee 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 Grantee at the time of exercise of the Option that the Grantee is purchasing the Shares for the Grantee’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 representing the Shares to evidence the foregoing restrictions, and (iii) obtaining from the Grantee payment or provision for all withholding taxes due as a result of the exercise of the Option, consistent with Section 11(b). The delivery of certificates representing the Shares to be purchased pursuant to the exercise of an Option will be contingent upon (A) receipt from the Grantee (or a purchaser acting in his or her stead in accordance with the provisions of the Option) by the Company of the full purchase price for such Shares and the fulfillment of any other requirements contained in the Plan, the Award Agreement or applicable provisions of laws and (B) if required by the Company, the Grantee 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 Shares.

(g) Annual Limit on Incentive Stock Options. Each Option shall be designated in the Award Agreement as either an Incentive Stock Option or a Non-Qualified Stock Option. However, notwithstanding such designation, to the extent that the aggregate Fair Market Value of the Shares with respect to which Incentive Stock Options are exercisable for the first time by the Grantee during any calendar year (under all plans of the Company and any Subsidiary or Parent) exceeds \$100,000, such Options shall be treated as Non-Qualified Stock Options. For purposes of this Section 7(g), Incentive Stock Options shall be taken into account in the order in which they were granted. The Fair Market Value of the Shares shall be determined as of the time the Option with respect to such Shares is granted.

(h) Early Exercise. The Award Agreement for an Option may, but need not, include a provision whereby the Grantee may elect at any time while an Employee, Director or Consultant to exercise any part or all of the Option prior to full vesting or the vesting of such portion. Any unvested Shares received pursuant to such exercise may be subject to a repurchase right in favor of the Company or any Subsidiary or Parent or to any other restriction the Administrator determines to be appropriate.

8. Restricted Stock, Restricted Stock Units and Unrestricted Stock.

(a) General. The Administrator shall determine the terms and conditions of each Award Agreement for Restricted Stock, Restricted Stock Units and Unrestricted Stock. Award Agreements for Restricted Stock and Restricted Stock Units shall include such restrictions as the Administrator may impose, which restrictions may lapse separately or in combination at such time or times, in such installments or otherwise, as the Administrator may deem appropriate.

(b) Stock Certificates. The Company may require that any stock certificates issued in respect of Shares of Restricted Stock shall be deposited in escrow by the Grantee, together with a stock power endorsed in blank, with the Company (or its designee). Following the expiration of the applicable restriction periods, the Company (or such designee) shall deliver the certificates no longer subject to such restrictions to the Grantee or if the Grantee has died, to the beneficiary designated by the Grantee in the manner determined by the Administrator. In the absence of an effective designation by a Grantee, the designated beneficiary shall be the Grantee's estate.

(c) Forfeiture and the Option to Purchase. Except as otherwise determined by the Administrator, upon a Grantee's termination of employment or service (as determined under criteria established by the Administrator) for any reason during the applicable restriction period, the Company (or its designee) shall have the right, but shall not be obligated, (i) to repurchase from the Grantee all or part of the Shares of Restricted Stock still subject to restriction at their issue price or other stated or formula price or (ii) to require forfeiture of such Shares, if issued at no cost.

(d) Rights as a Stockholder. Upon (i) the grant of an Award for Restricted Stock or for Unrestricted Stock or the settlement in Shares of Restricted Stock Units and (ii) payment of any applicable purchase price, the Grantee of such Award shall be entered as a stockholder on the books of the Company and considered the record owner of such Shares. Without limiting the foregoing, Grantee shall be entitled to (1) vote such Shares if, and to the extent, such Shares are entitled to voting rights and (2) receive all dividends and any other distributions declared on such Shares; *provided, however*, that the Company is under no duty to declare any such dividends or to make any such distribution.

9. Performance Awards. Performance Awards subject to vesting or payment based on the achievement of Performance Goals may be granted under the Plan. The Administrator shall determine the terms and conditions of the Performance Awards, including the number of Shares covered by the Award, the duration of the Award Cycle, whether the Performance Award will be paid in Shares, cash or a combination, and any other terms and conditions. In all cases, the Administrator may condition the vesting or value of an Award upon the achievement of Performance Goals; any such Award shall constitute a Performance Award for purpose of this Plan. At the expiration of the Award Cycle, the Administrator shall evaluate the Performance Award holder's and/or the Company's performance in light of any Performance Goals for such Performance Award, and shall determine the number of Shares (or other applicable payment measures) which have been earned. Each Performance Award shall be subject to an Award Agreement

10. Other Awards.

(a) Other Stock-Based Awards. Subject to the provisions of the Plan, the Administrator may grant other Awards that are valued in whole or in part by reference to, or are otherwise based upon, Common Stock. Such Awards may be granted either alone or in conjunction with other Awards granted under the Plan. Each such Award shall be confirmed by, and be subject to, the terms of an Award Agreement.

(a) Cash Incentive Awards. Subject to the provisions of the Plan, the Administrator may grant cash incentive awards.

11. General Provisions Applicable to Awards.

(a) Transferability of Awards. Awards shall not be sold, assigned, transferred, pledged or otherwise encumbered by the person to whom they are granted, either voluntarily or by operation of law, and may be exercised, during the lifetime of the Grantee, only by the Grantee. Notwithstanding the foregoing, the Administrator may provide in an Award Agreement that the Award is transferable by will, by the laws of descent and distribution, or as permitted by Rule 701 promulgated under the Securities Act. References to a Grantee, to the extent relevant in the context, shall include references to authorized transferees.

(b) Withholding. The Grantee must satisfy all applicable federal, state, and local or other income and employment tax withholding obligations before the Company will deliver stock certificates or otherwise recognize ownership of Shares under an Award. The Company may decide to satisfy the withholding obligations through additional withholding on salary or wages. If the Company elects not to or cannot withhold from other compensation, the Grantee must pay the Company the full amount, if any, required for withholding or, if permitted by the Administrator in its discretion, have a broker tender to the Company cash equal to the withholding obligations. If provided for in an Award or approved by the Administrator in its sole discretion, a Grantee may satisfy such tax obligations in whole or in part by delivery of Shares, including Shares retained from the Award creating the tax obligation, valued at their Fair Market Value; *provided, however*, that except as otherwise provided by the Administrator, the total tax withholding where stock is being used to satisfy such tax obligations cannot exceed the Company's minimum statutory withholding obligations (based on minimum statutory withholding rates for federal and state tax purposes, including payroll taxes, that are applicable to such supplemental taxable income). Shares surrendered to satisfy tax withholding requirements must not be subject to any repurchase, forfeiture, unfulfilled vesting or other similar requirements.

(c) Amendment of Awards and Award Agreements. The Administrator may amend, modify or terminate any outstanding Award and Award Agreement, including but not limited to, substituting therefor another Award of the same or a different type, changing the date of exercise or realization, and converting an Incentive Stock Option to a Non-Qualified Stock Option. The Grantee's consent to such action shall be required unless (A) the Administrator determines that the action, taking into account any related action, would not materially and adversely affect the Grantee's rights under the Plan or (B) the change is permitted under Section 13 or 14 hereof. For the avoidance of doubt, the Grantee's consent shall not be required if an Option intended to be an Incentive Stock Option is deemed a Non-Qualified Stock Option pursuant to Section 7(a).

(d) No Distribution; Compliance with Legal Requirements. The Administrator 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 Administrator may require the placing of such stop-orders and restrictive legends on certificates for Shares and Awards as it deems appropriate.

(e) Delivery of Stock Certificates. Stock certificates to Grantees 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 8 of the Plan shall be deemed delivered when the Company shall have recorded the issuance in its records.

(f) Uncertificated Shares. To the extent any Shares are uncertificated: (i) such Shares shall be deemed delivered by the Company for all purposes when the Company or a stock transfer agent of the Company shall have given to the Grantee, by electronic mail or by United States mail, addressed to the Grantee at the Grantee's last known address on file with the Company, notice of the issuance and recorded the issuance in its records (which may include electronic "book entry" records); (ii) any reference in this Plan or any Award Agreement to the legending of certificates shall be interpreted to mean the notation in the Company's records (which may include electronic "book entry" records); (iii) any provision requiring deposit of stock certificates shall not be deemed breached solely by virtue of the fact that there is no stock certificate representing such Shares; and (iv) the rights of an individual or entity that is entitled to retain possession of a stock certificate (e.g., as security for performance, as escrowed property, or for similar purposes) shall not be prejudiced solely by virtue of the fact that such Shares are not represented by a stock certificate.

(g) Trading Policy Restrictions. Option exercises and other Awards under the Plan shall be subject to the Company's insider trading policy, and such related restrictions, terms and conditions or other policies as may be established by the Administrator from time to time.

12. Conditions Upon Issuance of Shares.

(a) General. If at any time the Administrator determines that the delivery of Shares pursuant to the exercise, vesting or any other provision of an Award Agreement is or may be unlawful under applicable law, the vesting or right to exercise an Award or to otherwise receive Shares pursuant to the terms of an Award Agreement shall be suspended until the Administrator determines that such delivery is lawful, and shall be further subject to the approval of counsel for the Company with respect to such compliance. The Company shall have no obligation to effect any registration or qualification of the Shares under federal, state or other laws.

(b) Transferability of Shares. Prior to when the applicable Shares are covered by an effective registration statement under the Securities Act, Shares received pursuant to the exercise, vesting or any other provision of an Award shall not be sold, assigned, transferred, pledged or otherwise encumbered by the Grantee, except by the laws of descent and distribution or upon approval of the Administrator in its sole discretion. References to a Grantee, to the extent relevant in the context, shall include references to authorized transferees. The transfer restrictions in this Section 12(b) shall apply in addition to the transfer restrictions, if any, that are generally applicable to Shares under the Company's bylaws, as may be amended from time to time and in effect at a given time, or under any notice of exercise or similar agreement under which a Grantee acquires Shares in connection with an Award.

(c) Securities Law Compliance. As a condition to the exercise of an Award or the receipt of Shares pursuant to an Award, the Company may require (i) the person exercising such Award (A) to make such representations and agreements as the Company may consider appropriate to avoid violation of the Securities Act or comparable state law, and (B) to agree to market standoff obligations in connection with any public offering of Shares of the Company, and (ii) that the certificates evidencing such Shares bear appropriate legends restricting transfer.

13. **Adjustments.** In the event of any stock split, reverse stock split, stock dividend, reorganization, recapitalization, combination or exchange of shares, reclassification of shares, spin-off or other similar change in capitalization or event, or any dividend or distribution to holders of Shares other than an ordinary cash dividend, (i) the number and class of securities available under the Plan, (ii) the number and class of securities and exercise price per Share of each outstanding Option and SAR, (iii) the number of Shares subject to and the repurchase price per Share subject to each outstanding Restricted Stock Award and Restricted Stock Unit Award, and (iv) the terms of each other outstanding Award shall be equitably adjusted by the Company (or substituted Awards may be made, if applicable) in the manner determined by the Administrator; *provided, however*, that each adjustment to Non-Qualified Stock Options or SARs shall satisfy the requirements of Treas. Reg. § 1.409A-1(b)(5)(v)(D) (or any successor regulation) and each adjustment to Incentive Stock Options shall satisfy the requirements of Treas. Reg. § 1.424-1 (or any successor regulation); *provided, further*, that the Administrator will make any adjustment to an Award as is required by Section 25102(o) of the California Corporations Code to the extent that the Company is relying upon the exemption afforded thereby with respect to the Award.

14. **Corporate Transaction.** The Administrator may provide, in its discretion, with respect to the treatment of each outstanding Award (either separately for each Award or uniformly for all Awards), upon the date of a Corporate Transaction, for any combination of the following:

- (a) any Option or SAR shall become vested and immediately exercisable, in whole or in part;
- (b) any Restricted Stock or Restricted Stock Unit shall become vested and non-forfeitable, in whole or in part;
- (c) any Option or SAR shall be assumed by the successor corporation or cancelled in exchange for substitute stock options in a manner consistent with the requirements of Treas. Reg. § 1.409A-1(b)(5)(v)(D) (or any successor regulation), in the case of a Non-Qualified Stock Option or SAR, and Treas. Reg. § 1.424-1(a) (or any successor regulations), in the case of an Incentive Stock Option;
- (d) any Option or SAR that is not exercised as of the date of the Corporate Transaction shall be cancelled for no consideration;

(e) any Option or SAR shall be cancelled in exchange for cash and/or other substitute consideration with a value equal to (A) the number of Shares subject thereto, multiplied by (B) the difference, if any, between the Fair Market Value per Share on the date of the Corporate Transaction or the per share consideration payable to the Company's stockholders in the Corporate Transaction (such per share consideration, the "**Transaction Consideration**") and the exercise price subject to such Option or SAR; provided, that if the Fair Market Value per Share on the date of the Corporate Transaction or the Transaction Consideration does not exceed such exercise price, the Administrator may cancel that Option or SAR without any payment of consideration therefor;

(f) any Restricted Stock or Restricted Stock Unit shall be assumed by the successor corporation or cancelled in exchange for restricted stock or restricted stock units in respect of the capital stock of any successor corporation;

(g) any Restricted Stock shall be redeemed for cash and/or other substitute consideration with a value equal to (i) the Fair Market Value of an unrestricted Share on the date of the Corporate Transaction or (ii) the Transaction Consideration;

(h) any Restricted Stock Unit shall, subject to Section 18 hereof, be cancelled in exchange for cash and/or other substitute consideration with a value equal to (i) the Fair Market Value per Share on the date of the Corporate Transaction or (ii) the Transaction Consideration; and/or

(i) such other modifications, substitutions, adjustments or amendments to outstanding awards or the Plan as the Administrator deems necessary or appropriate.

In taking any of the actions permitted under this Section 14, the Administrator shall not be obligated to treat all Grantees, all Awards, all Awards held by a Grantee, or all Awards of the same type identically. Any substitute consideration issued to a Grantee pursuant to this Section 14 may include, to the extent determined by the Administrator, the right to receive consideration payable in the Corporate Transaction after the closing (e.g., in respect of an earn-out or escrow release).

15. Effective Date and Term of Plan; Stockholder Approval.

(a) Adoption of Plan. The Plan shall become effective upon its adoption by the Board. It shall continue in effect for a term of ten (10) years from the date of adoption unless sooner terminated.

(b) Stockholder Approval. No Option or SAR granted under the Plan may be exercised, no Shares shall be issued under the Plan, and no Restricted Stock Unit shall be settled, until the Plan is approved by stockholders of the Company holding a majority of the outstanding securities of the Company entitled to vote (determined on an as-converted basis). If such stockholder approval is not obtained within twelve (12) months after the date of the Board's adoption of the Plan, then all Awards previously granted under the Plan shall immediately and automatically terminate and cease to be outstanding, and no further Awards shall be granted under the Plan.

16. Amendment, Suspension or Termination of the Plan.

(a) General. Subject to the terms of the Plan, the Board may at any time and from time to time, alter, amend, suspend or terminate the Plan, in whole or in part; *provided* that the Board shall obtain stockholder approval of any Plan amendment to the extent necessary to comply with applicable law, rule or regulation. In addition, in no event shall an amendment increase the maximum number of shares of Common Stock with respect to which Awards may be granted under the Plan without stockholder approval.

(b) Limitation on Grants of Awards. No Award may be granted during any suspension of the Plan or after termination of the Plan.

(c) No Effect on Outstanding Awards. Except as set forth in Section 16(b) no suspension or termination of the Plan shall materially and adversely affect any rights under Awards outstanding at the time of such suspension or termination.

17. No Employment or Services Rights; Other Compensation and Benefits.

(a) The Plan shall not confer upon any Grantee any right to employment or service with the Company or any Subsidiary or Parent, nor shall it interfere in any way with the right of the Company or any Subsidiary or Parent to terminate the Grantee's employment or service at any time.

(b) The amount of any compensation deemed to be received by a Grantee pursuant to an Award shall not constitute includable compensation for purposes of determining the amount of benefits to which the Grantee is entitled under any other compensation or benefit plan or program of the Company or any Subsidiary or Parent, including, without limitation, under any bonus, pension, profit-sharing, life insurance, salary continuation or severance benefits plan, except to the extent specifically provided by the terms of any such plan.

18. Section 409A.

(a) It is intended that the provisions of the Plan avoid the adverse consequences under Section 409A of the Code, and all provisions of the Plan and Award agreements shall be construed and interpreted in a manner consistent with that intent.

(b) No Grantee, or creditors or beneficiaries of a Grantee, shall have the right to subject any deferred compensation (within the meaning of Section 409A of the Code) payable under the Plan to any anticipation, alienation, sale, transfer, assignment, pledge, encumbrance, attachment or garnishment, except as required by applicable law. Except as permitted under Section 409A of the Code, any deferred compensation (within the meaning of Section 409A of the Code) payable to any Grantee or for the benefit of any Grantee under the Plan may not be reduced by, or offset against, any amount owing by any such Grantee to the Company or any Subsidiary or Parent.

(c) If an Award is subject to Section 409A of the Code and payment is due upon a termination of employment, payment shall be made upon a separation from service within the meaning of Section 409A of the Code.

(d) If, at the time of a Grantee's separation from service (within the meaning of Section 409A of the Code), (A) such Grantee is a specified employee (within the meaning of Section 409A of the Code) and (B) an amount payable pursuant to an Award constitutes nonqualified deferred compensation (within the meaning of Section 409A of the Code) the payment of which is required to be delayed pursuant to the six-month delay rule set forth in Section 409A of the Code in order to avoid taxes or penalties under Section 409A of the Code, then the Company shall not pay such amount on the otherwise scheduled payment date but shall instead pay it, without interest, on the first day of the seventh month following such separation from service.

(e) Notwithstanding any provision of the Plan to the contrary, the Company reserves the right to make amendments to any Award as the Company deems necessary or desirable to avoid the imposition of taxes or penalties under Section 409A of the Code. In any case, a Grantee shall be solely responsible and liable for the satisfaction of all taxes and penalties that may be imposed on a Grantee or for a Grantee's account in connection with an Award (including any taxes and penalties under Section 409A of the Code), and neither the Company nor any Subsidiary or Parent, or any other person or entity, shall have any obligation to indemnify or otherwise hold such Grantee harmless from any or all of such taxes or penalties.

19. **Recoupment of Awards.** The Administrator may establish such policies and procedures as it deems appropriate to provide for clawback or recoupment of Awards (or proceeds therefrom). Pursuant to such policies and procedures, among other things, the Administrator may require forfeiture of an Award, repayment of an Award (or proceeds therefrom), or recoupment from other payments otherwise due to a Grantee or a Grantee's beneficiary. All Awards under the Plan shall be subject to such compensation clawback or recoupment policy (or policies) that the Company may have in effect from time to time.

20. **Status of Plan.** With respect to the portion of any Award that has not been exercised and any payments in cash, Shares 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 Administrator shall otherwise expressly so determine in connection with any Award.

21. **Construction.** Captions and titles contained herein are for convenience only and shall not affect the meaning or interpretation of any provision of the Plan. Except when otherwise indicated by the context, the singular shall include the plural and the plural shall include the singular. Use of the term "or" is not intended to be exclusive, unless the context clearly requires otherwise.

22. **Severability.** If any provision of the Plan or any Award is, becomes, or is deemed to be invalid, illegal, or unenforceable in any jurisdiction or as to any Grantee, such provision shall be construed or deemed amended to conform with applicable law, or if the provision cannot be so construed or deemed amended without, in the sole discretion of the Administrator, materially altering the intent of the Plan or the Award, such provision shall be severed as to the jurisdiction or Grantee and the remainder of the Plan and any such Award shall remain in full force and effect.

23. **Governing Law.** The validity and construction of the Plan and any Award Agreements thereunder shall be governed by the laws of the State of Delaware, excluding any conflicts or choice of law rules or principles that might otherwise refer construction or interpretation of any provision of the Plan or an Award Agreement to the substantive law of another jurisdiction.

* * *

ADOPTED BY THE BOARD ON _____, 2019

APPROVED BY THE STOCKHOLDERS ON _____, 2019

LANDOS BIOPHARMA, INC.

STOCK OPTION GRANT NOTICE
(2019 EQUITY INCENTIVE PLAN)

Landos Biopharma, Inc. (the “*Company*”), pursuant to its 2019 Equity Incentive Plan (as amended and/or restated as of the Date of Grant set forth below, the “*Plan*”), has granted to Grantee an option to purchase the number of shares of the Common Stock set forth below (the “*Option*”). The Option is subject to all of the terms and conditions as set forth in this Stock Option Grant Notice (the “*Grant Notice*”) and in the Plan, the Option Agreement, and the Notice of Exercise, all of which are attached to this Grant Notice and incorporated into this Grant Notice in their entirety. Capitalized terms not explicitly defined in this Grant Notice but defined in the Plan or the Option Agreement will have the meanings set forth in the Plan or the Option Agreement, as applicable. If the Company uses an electronic capitalization table system (such as Carta or Shareworks) and the fields below are blank or the information is otherwise provided in a different format electronically, the blank fields and other information (such as exercise schedule and type of grant) will be deemed to come from the electronic capitalization system and is considered part of this Grant Notice.

Grantee: _____
Date of Grant: _____
Vesting Commencement Date: _____
Number of Shares Subject to Option: _____
Exercise Price (Per Share):¹ _____
Total Exercise Price: _____
Expiration Date: _____
Exercise Schedule: [Same as Vesting Schedule] [Early Exercise Permitted]
Type of Grant:² [Incentive Stock Option] [Non-Qualified Stock Option]

Vesting Schedule: [Sample Vesting: The Option shall vest as to one-fourth (1/4th) of the shares subject to the Option on the one-year anniversary of the Vesting Commencement Date, and thereafter shall vest in a series of thirty-six (36) successive equal monthly installments (in each case rounded down to the nearest whole share, except for the last scheduled vesting installment which may be rounded up), measured from the one-year anniversary of the Vesting Commencement Date, subject to the Grantee’s Continuous Service (as defined in the Stock Option Agreement) through each such vesting date.]

¹ The exercise price may be paid by one or a combination of the methods permitted in the Option Agreement.
² If this is an Incentive Stock Option, it (plus other outstanding Incentive Stock Options) cannot be first *exercisable* for more than \$100,000 in value (measured by exercise price) in any calendar year. Any excess over \$100,000 is a Non-Qualified Stock Option.

Grantee Acknowledgements: By Grantee's signature below or by electronic acceptance or authentication in a form authorized by the Company, Grantee understands and agrees that the Option is governed by this Grant Notice, and the provisions of the Plan and the Option Agreement and the Notice of Exercise, all of which are made a part of this document.

By accepting this Option, Grantee consents to receive this Grant Notice, the Option Agreement, the Plan, and any other Plan-related documents by electronic delivery and to participate in the Plan through an on-line or electronic system established and maintained by the Company or another third party designated by the Company. Grantee represents that he or she has read and is familiar with the provisions of the Plan and the Option Agreement. Grantee acknowledges and agrees that this Grant Notice and the Option Agreement may not be modified, amended or revised except in writing signed by Grantee and a duly authorized officer of the Company.

Grantee further acknowledges that in the event of any conflict between the provisions in this Grant Notice, the Option Agreement, the Notice of Exercise and the terms of the Plan, the terms of the Plan will control. Grantee further acknowledges that the Option Agreement sets forth the entire understanding between Grantee and the Company regarding the acquisition of Common Stock and supersedes all prior oral and written agreements, promises and/or representations on that subject with the exception of other equity awards previously granted to Grantee and any written employment agreement, offer letter, severance agreement, written severance plan or policy, or other written agreement between the Company and Grantee in each case that specifies the terms that should govern this Option.

Grantee further acknowledges that this Grant Notice has been prepared on behalf of the Company by Cooley LLP, counsel to the Company and that Cooley LLP does not represent, and is not acting on behalf of, Grantee in any capacity. Grantee has been provided with an opportunity to consult with Grantee's own counsel with respect to this Grant Notice.

This Grant Notice may be executed in one or more counterparts, each of which will be deemed an original, but all of which together will 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, Uniform Electronic Transactions Act or other applicable law) or other transmission method and any counterpart so delivered will be deemed to have been duly and validly delivered and be valid and effective for all purposes.

Landos Biopharma, Inc.

By: _____
(Signature)
Title: _____
Date: _____

Grantee:

By: _____
(Signature)
Email: _____
Date: _____

Attachments: Option Agreement, 2019 Equity Incentive Plan and Notice of Exercise

LANDOS BIOPHARMA, INC.

2019 Equity Incentive Plan

OPTION AGREEMENT
(INCENTIVE STOCK OPTION OR NON-QUALIFIED STOCK OPTION)

Pursuant to your Stock Option Grant Notice (“*Grant Notice*”) and this Option Agreement, **Landos Biopharma, Inc.** (the “*Company*”) has granted you an option (the “*Option*”) under its 2019 Equity Incentive Plan (the “*Plan*”) to purchase the number of shares of the Company’s Common Stock indicated in your Grant Notice at the exercise price indicated in your Grant Notice. The Option is granted to you effective as of the date of grant set forth in the Grant Notice (the “*Date of Grant*”). If there is any conflict between the terms in this Option Agreement and the Plan, the terms of the Plan will control. Capitalized terms not explicitly defined in this Option Agreement or in the Grant Notice but defined in the Plan will have the same definitions as in the Plan.

The details of your Option, in addition to those set forth in the Grant Notice and the Plan, are as follows:

- 1. Vesting.** Your Option will vest as provided in your Grant Notice. Vesting will cease upon the termination of your Continuous Service.
- 2. Number of Shares and Exercise Price.** The number of shares of Common Stock subject to your Option and your exercise price per share in your Grant Notice will be adjusted for capitalization adjustments as described in Section 13 of the Plan.
- 3. Exercise Restriction for Non-Exempt Employees.** If you are an Employee eligible for overtime compensation under the Fair Labor Standards Act of 1938, as amended (that is, a “*Non-Exempt Employee*”), and except as otherwise provided in the Plan, you may not exercise your Option until you have completed at least six months of Continuous Service measured from the Date of Grant, even if you have already been an employee for more than six months. Consistent with the provisions of the Worker Economic Opportunity Act, you may exercise your Option as to any vested portion prior to such six month anniversary in the case of (i) your death or disability, (ii) a Change in Control in which your Option is not assumed, continued or substituted, or (iii) your termination of Continuous Service on your “retirement” (as defined in the Company’s benefit plans).
- 4. Exercise prior to Vesting (“Early Exercise”).** If permitted in your Grant Notice (*i.e.*, the “Exercise Schedule” indicates “Early Exercise Permitted”) and subject to the provisions of your Option, you may elect at any time that is both (i) during the period of your Continuous Service and (ii) during the term of your Option, to exercise all or part of your Option, including the unvested portion of your Option; *provided, however*, that:
 - (a) a partial exercise of your Option will be deemed to cover first vested shares of Common Stock and then the earliest vesting installment of unvested shares of Common Stock;
 - (b) any shares of Common Stock so purchased from installments that have not vested as of the date of exercise will be subject to the purchase option in favor of the Company as described in the Company’s form of Early Exercise Stock Purchase Agreement;

(c) you will enter into the Company's form of Early Exercise Stock Purchase Agreement with a vesting schedule that will result in the same vesting as if no early exercise had occurred; and

(d) if your Option is an Incentive Stock Option, then, to the extent that the aggregate Fair Market Value (determined at the Date of Grant) of the shares of Common Stock with respect to which your Option plus all other Incentive Stock Options you hold are exercisable for the first time by you during any calendar year (under all plans of the Company and Affiliates) exceeds \$100,000, your Option(s) or portions thereof that exceed such limit (according to the order in which they were granted) will be treated as Non-Qualified Stock Options.

5. Method of Payment. You must pay the full amount of the exercise price for the shares you wish to exercise. The permitted methods of payment are as follows:

(a) by cash, check, bank draft, electronic funds transfer or money order payable to the Company;

(b) subject to Company and/or Board consent at the time of exercise and provided that at the time of exercise the Common Stock is publicly traded, pursuant to a program developed under Regulation T as promulgated by the Federal Reserve Board that, prior to the issuance of Common Stock, results in either the receipt of cash (or check) by the Company or the receipt of irrevocable instructions to pay the aggregate exercise price to the Company from the sales proceeds. This manner of payment is also known as a "broker-assisted exercise", "same day sale", or "sell to cover";

(c) subject to Company and/or Board consent at the time of exercise and provided that at the time of exercise the Common Stock is publicly traded, by delivery to the Company (either by actual delivery or attestation) of already-owned shares of Common Stock that are owned free and clear of any liens, claims, encumbrances or security interests, and that are valued at Fair Market Value on the date of exercise. "Delivery" for these purposes, in the sole discretion of the Company at the time you exercise your Option, will include delivery to the Company of your attestation of ownership of such shares of Common Stock in a form approved by the Company. You may not exercise your Option by delivery to the Company of Common Stock if doing so would violate the provisions of any law, regulation or agreement restricting the redemption of the Company's stock;

(d) subject to Company and/or Board consent at the time of exercise, and provided that the Option is a Non-Qualified Stock Option, by a "net exercise" arrangement pursuant to which the Company will reduce the number of shares of Common Stock issued upon exercise of the Option by the largest whole number of shares with a Fair Market Value that does not exceed the aggregate exercise price plus, to the extent permitted by the Company and/or Board at the time of exercise, the aggregate withholding obligations in respect of the Option exercise; provided, further that you must pay any remaining balance of the aggregate exercise price not satisfied by the "net exercise" in cash or other permitted form of payment. Shares of Common Stock will no longer be subject to the Option and will not be exercisable thereafter to the extent that (A) shares issuable upon exercise are used to pay the exercise price pursuant to the "net exercise," (B) shares are delivered to you as a result of such exercise, and (C) shares are withheld to satisfy tax withholding obligations;

(e) subject to the consent of the Company and/or Board at the time of exercise, according to a deferred payment or similar arrangement with you; *provided, however*, that interest will compound at least annually and will be charged at the minimum rate of interest necessary to avoid (A) the imputation of interest income to the Company and compensation income to the Grantee under any applicable provisions of the Code, and (B) the classification of the Option as a liability for financial accounting purposes; or

(f) in any other form of legal consideration that may be acceptable to the Board.

6. Whole Shares. You may exercise your Option only for whole shares of Common Stock.

7. Securities Law Compliance. In no event may you exercise your Option unless the shares of Common Stock issuable upon exercise are then registered under the Securities Act or, if not registered, the Company has determined that your exercise and the issuance of the shares would be exempt from the registration requirements of the Securities Act. The exercise of your Option also must comply with all other applicable laws and regulations governing your Option, and you may not exercise your Option if the Company determines that such exercise would not be in material compliance with such laws and regulations (including any restrictions on exercise required for compliance with Treas. Reg. 1.401(k)-1(d)(3), if applicable).

8. Term. You may not exercise your Option before the Date of Grant or after the expiration of the Option's term. Except as set forth in your Grant Notice, the term of your Option expires upon the earliest of the following:

(a) immediately upon the termination of your Continuous Service for Cause;

(b) three months after the termination of your Continuous Service for any reason other than Cause, your Disability or your death (except as otherwise provided in Section 8(d) below); *provided, however*, that if during any part of such three month period your Option is not exercisable solely because of the condition set forth in the section above relating to "Securities Law Compliance," your Option will not expire until the earlier of the Expiration Date (as described on the Option's Grant Notice) or until it has been exercisable for an aggregate period of three months after the termination of your Continuous Service; *provided further*, that if (i) you are a Non-Exempt Employee, (ii) your Continuous Service terminates within six months after the Date of Grant, and (iii) you have vested in a portion of your Option at the time of your termination of Continuous Service, your Option will not expire until the earlier of (x) the later of (A) the date that is seven months after the Date of Grant, and (B) the date that is three months after the termination of your Continuous Service, and (y) the Expiration Date;

(c) 12 months after the termination of your Continuous Service due to your Disability (except as otherwise provided in Section 8(d)) below;

(d) 18 months after your death if you die either during your Continuous Service or within three (3) months after your Continuous Service terminates for any reason other than Cause;

- (e) the Expiration Date indicated in your Grant Notice; or
- (f) the day before the 10th anniversary of the Date of Grant.

If your Option is an Incentive Stock Option, note that to obtain the federal income tax advantages associated with an Incentive Stock Option, the Code requires that at all times beginning on the Date of Grant and ending on the day three months before the date of your Option's exercise, you must be an employee of the Company or an Affiliate, except in the event of your death or Disability. The Company has provided for extended exercisability of your Option under certain circumstances for your benefit but cannot guarantee that your Option will necessarily be treated as an Incentive Stock Option if you continue to provide services to the Company or an Affiliate as a Consultant or Director after your employment terminates or if you otherwise exercise your Option more than three months after the date your employment with the Company or an Affiliate terminates.

9. Exercise.

(a) You may exercise the vested portion of your Option (and the unvested portion of your Option if your Grant Notice so permits) during its term by delivering a Notice of Exercise (in a form designated by the Company) together with the exercise price to the Secretary of the Company, or to such other person as the Company may designate, during regular business hours. If required by the Company, your exercise may be made contingent on your execution of any additional documents specified by the Company (including, without limitation, any voting agreement or other agreement between the Company and some or all of its stockholders).

(b) By exercising your Option you agree that, as a condition to any exercise of your Option, the Company may require you to enter into an arrangement providing for the payment by you to the Company of any tax withholding obligation of the Company arising by reason of (i) the exercise of your Option, (ii) the lapse of any substantial risk of forfeiture to which the shares of Common Stock are subject at the time of exercise, or (iii) the disposition of shares of Common Stock acquired upon such exercise.

(c) If your Option is an Incentive Stock Option, by exercising your Option you agree that you will notify the Company in writing within 15 days after the date of any disposition of any of the shares of the Common Stock issued upon exercise of your Option that occurs within two years after the Date of Grant or within one year after such shares of Common Stock are transferred upon exercise of your Option.

(d) By exercising your Option you agree that you will not sell, dispose of, transfer, make any short sale of, grant any option for the purchase of, or enter into any hedging or similar transaction with the same economic effect as a sale with respect to any shares of Common Stock or other securities of the Company held by you, for a period of 180 days following the effective date of a registration statement of the Company filed under the Securities Act or such longer period as the underwriters or the Company will request to facilitate compliance with applicable FINRA rules (the "**Lock-Up Period**"); *provided, however*, that nothing contained in this section will prevent the exercise of a repurchase option, if any, in favor of the Company during the Lock-Up Period. You further agree to execute and deliver such other agreements as may be reasonably requested by the Company or the underwriters that are consistent with the foregoing or

that are necessary to give further effect thereto. In order to enforce the foregoing covenant, the Company may impose stop-transfer instructions with respect to your shares of Common Stock until the end of such period. You also agree that any transferee of any shares of Common Stock (or other securities) of the Company held by you will be bound by this Section 9(d). The underwriters of the Company's stock are intended third party beneficiaries of this Section 9(d) and will have the right, power and authority to enforce the provisions hereof as though they were a party hereto. You further agree that the obligations contained in this Section 9(d) will also, if so determined by the Company's Board of Directors, apply in the Company's initial listing of its Common Stock on a national securities exchange by means of a registration statement on Form S-1 under the Securities Act (or any successor registration form under the Securities Act subsequently adopted by the Securities and Exchange Commission) filed by the Company with the Securities and Exchange Commission that registers shares of existing capital stock of the Company for resale (a "**Direct Listing**"), provided that all holders of at least 5% of the Company's outstanding Common Stock (after giving effect to the conversion into Common Stock of any outstanding preferred stock of the Company) are subject to substantially similar obligations with respect to such Direct Listing.

10. Transferability. Except as otherwise provided in this Section 10, your Option is not transferable, except by will or by the laws of descent and distribution, and is exercisable during your life only by you.

(a) Certain Trusts. Upon receiving written permission from the Board or its duly authorized designee, you may transfer your Option to a trust if you are considered to be the sole beneficial owner (determined under Section 671 of the Code and applicable state law) while the Option is held in the trust. You and the trustee must enter into transfer and other agreements required by the Company.

(b) Domestic Relations Orders. Upon receiving written permission from the Board or its duly authorized designee, and provided that you and the designated transferee enter into transfer and other agreements required by the Company, you may transfer your Option pursuant to the terms of a domestic relations order, official marital settlement agreement or other divorce or separation instrument as permitted by Treasury Regulation 1.421-1(b)(2) that contains the information required by the Company to effectuate the transfer. You are encouraged to discuss the proposed terms of any division of this Option with the Company prior to finalizing the domestic relations order or marital settlement agreement to help ensure the required information is contained within the domestic relations order or marital settlement agreement. If this Option is an Incentive Stock Option, this Option may be deemed to be a Non-Qualified Stock Option as a result of such transfer.

(c) Beneficiary Designation. Upon receiving written permission from the Board or its duly authorized designee, you may, by delivering written notice to the Company, in a form approved by the Company and any broker designated by the Company to handle option exercises, designate a third party who, on your death, will thereafter be entitled to exercise this Option and receive the Common Stock or other consideration resulting from such exercise. In the absence of such a designation, your executor or administrator of your estate will be entitled to exercise this Option and receive, on behalf of your estate, the Common Stock or other consideration resulting from such exercise.

11. Transfer Restrictions. You may not Transfer (defined below) any shares of Common Stock that you acquire upon exercise of your Option without the advance approval and written consent of the Board allowing such Transfer, where such consent may or may not be granted in the Board's sole and absolute discretion.

(a) If the Board authorizes a Transfer of the shares, such Transfer will be subject to, and may only occur after satisfying, any right of first refusal as described in Section 12. The term "**Transfer**" means any sale, encumbrance, pledge, gift or other form of disposition or transfer of shares of Common Stock or any legal or equitable interest therein.

(b) In the case of a Transfer, the transferee or other recipient will receive and hold the shares of Common Stock so transferred subject to the provisions of this Option Agreement, the Plan and the Company's bylaws and other corporate governance documents to the extent applicable to the Common Stock (and to which the transferee or other recipient may be required to become a signatory), and there will be no further transfer of such shares except in accordance with the terms of those documents and agreements.

(c) None of the shares of Common Stock purchased on exercise of your Option will be transferred on the Company's books nor will the Company recognize any such Transfer of any such shares or any interest therein unless and until all applicable provisions of this Section 11 have been complied with in all respects. The certificates of stock evidencing shares of Common Stock purchased on exercise of your Option will bear an appropriate legend referring to the transfer restrictions imposed by this Section 11.

12. Right of First Refusal. Shares of Common Stock that you acquire upon exercise of your Option are subject to any right of first refusal that may be described in the Company's bylaws in effect at such time the Company elects to exercise its right; *provided, however*, that if there is no right of first refusal described in the Company's bylaws at such time, the right of first refusal described below will apply. The Company's right of first refusal will expire on the first date upon which any security of the Company is listed (or approved for listing) upon notice of issuance on a national securities exchange or quotation system (the "**Listing Date**").

(a) Prior to the Listing Date, you may not validly Transfer any shares of Common Stock acquired upon exercise of your Option, or any interest in such shares, unless such Transfer is approved by the Board and made in compliance with the following provisions:

(i) Before there can be a valid Transfer of any shares of Common Stock or any interest therein, the record holder of the shares of Common Stock to be transferred (the "**Offered Shares**") will give written notice (by registered or certified mail) to the Company. Such notice will specify the identity of the proposed transferee, the cash price offered for the Offered Shares by the proposed transferee (or, if the proposed Transfer is one in which the holder will not receive cash, such as an involuntary transfer, gift, donation or pledge, the holder will state that no purchase price is being proposed), and the other terms and conditions of the proposed Transfer. The date such notice is mailed will be hereinafter referred to as the "**Notice Date**" and the record holder of the Offered Shares will be hereinafter referred to as the "**Offeror**." If, from time to time, there is any stock dividend, stock split or other change in the character or amount of any of the outstanding Common Stock which is subject to the provisions of your Option, then in such event any and all new, substituted or additional securities to which you are entitled by reason of your ownership of the shares of Common Stock acquired upon exercise of your Option will be immediately subject to the Company's Right of First Refusal (as defined below) with the same force and effect as the shares subject to the Right of First Refusal immediately before such event.

(ii) For a period of 30 calendar days after the Notice Date, or such longer period as may be required to avoid the classification of your Option as a liability for financial accounting purposes, the Company will have the option to purchase all (but not less than all) of the Offered Shares at the purchase price and on the terms set forth in Section 12(a)(iii) (the Company's "**Right of First Refusal**"). In the event that the proposed Transfer is one involving no payment of a purchase price, the purchase price will be deemed to be the Fair Market Value of the Offered Shares as determined in good faith by the Board in its discretion. The Company may exercise its Right of First Refusal by mailing (by registered or certified mail) written notice of exercise of its Right of First Refusal to the Offeror prior to the end of said 30 days (including any extension required to avoid classification of the Option as a liability for financial accounting purposes).

(iii) The price at which the Company may purchase the Offered Shares pursuant to the exercise of its Right of First Refusal will be the cash price offered for the Offered Shares by the proposed transferee (as set forth in the notice required under Section 12(a)(i)), or the Fair Market Value as determined by the Board in the event no purchase price is involved. To the extent consideration other than cash is offered by the proposed transferee, the Company will not be required to pay any additional amounts to the Offeror other than the cash price offered (or the Fair Market Value, if applicable). The Company's notice of exercise of its Right of First Refusal will be accompanied by full payment for the Offered Shares and, upon such payment by the Company, the Company will acquire full right, title and interest to all of the Offered Shares.

(iv) If, and only if, the option given pursuant to Section 12(a)(ii) is not exercised, the Transfer proposed in the notice given pursuant to Section 12(a)(i) may take place; *provided, however*, that such Transfer must, in all respects, be exactly as proposed in said notice except that such Transfer may not take place either before the 10th calendar day after the expiration of the 30 day Option exercise period or after the ninetieth 90th calendar day after the expiration of the 30 day Option exercise period, and if such Transfer has not taken place prior to said 90th day, such Transfer may not take place without once again complying with this Section 12(a). The Option exercise periods in this Section 12(a)(iv) will be adjusted to include any extension required to avoid the classification of your Option as a liability for financial accounting purposes.

(b) To ensure that the shares subject to the Company's Right of First Refusal will be available for repurchase by the Company, the Company may require you to deposit the certificates evidencing the shares that you purchase upon exercise of your Option with an escrow agent designated by the Company under the terms and conditions of an escrow agreement approved by the Company. If the Company does not require such deposit as a condition of exercise of your Option, the Company reserves the right at any time to require you to so deposit the certificates in escrow. As soon as practicable after the expiration of the Company's Right of First Refusal, the agent will deliver to you the shares and any other property no longer subject to such restriction. In the event the shares and any other property held in escrow are subject to the Company's exercise of its Right of First Refusal, the notices required to be given to you will be given to the escrow agent, and any payment required to be given to you will be given to the escrow agent. Within 30 days after payment by the Company for the Offered Shares, the escrow agent will deliver the Offered Shares that the Company has repurchased to the Company and will deliver the payment received from the Company to you.

13. Option not a Service Contract. Your Option is not an employment or service contract, and nothing in your Option will be deemed to create in any way whatsoever any obligation on your part to continue in the employ of the Company or an Affiliate, or of the Company or an Affiliate to continue your employment. In addition, nothing in your Option will obligate the Company or an Affiliate, their respective stockholders, boards of directors, officers or employees to continue any relationship that you might have as a Director or Consultant for the Company or an Affiliate.

14. Withholding Obligations.

(a) At the time you exercise your Option, in whole or in part, and at any time thereafter as requested by the Company, you hereby authorize withholding from payroll and any other amounts payable to you, and otherwise agree to make adequate provision for (including by means of a "same day sale" pursuant to a program developed under Regulation T as promulgated by the Federal Reserve Board to the extent permitted by the Company), any sums required to satisfy the federal, state, local and foreign tax withholding obligations of the Company or an Affiliate, if any, which arise in connection with the exercise of your Option.

(b) If this Option is a Non-Qualified Stock Option, then upon your request and subject to approval by the Company, and compliance with any applicable legal conditions or restrictions, the Company may withhold from fully vested shares of Common Stock otherwise issuable to you upon the exercise of your Option a number of whole shares of Common Stock having a Fair Market Value, determined by the Company as of the date of exercise, not in excess of the minimum amount of tax required to be withheld by law (or such lower amount as may be necessary to avoid classification of your Option as a liability for financial accounting purposes). If the date of determination of any tax withholding obligation is deferred to a date later than the date of exercise of your Option, share withholding pursuant to the preceding sentence will not be permitted unless you make a proper and timely election under Section 83(b) of the Code, covering the aggregate number of shares of Common Stock acquired upon such exercise with respect to which such determination is otherwise deferred, to accelerate the determination of such tax withholding obligation to the date of exercise of your Option. Notwithstanding the filing of such election, shares of Common Stock will be withheld solely from fully vested shares of Common Stock determined as of the date of exercise of your Option that are otherwise issuable to you upon such exercise. Any adverse consequences to you arising in connection with such share withholding procedure will be your sole responsibility.

(c) You may not exercise your Option unless the tax withholding obligations of the Company and/or any Affiliate are satisfied. Accordingly, you may not be able to exercise your Option when desired even though your Option is vested, and the Company will have no obligation to issue a certificate for such shares of Common Stock or release such shares of Common Stock from any escrow provided for herein, if applicable, unless such obligations are satisfied.

15. Tax Consequences. You hereby agree that the Company does not have a duty to design or administer the Plan or its other compensation programs in a manner that minimizes your tax liabilities. You will not make any claim against the Company, or any of its Officers, Directors, Employees or Affiliates related to tax liabilities arising from your Option or your other compensation. In particular, you acknowledge that this Option is exempt from Section 409A of the Code only if the exercise price per share specified in the Grant Notice is at least equal to the “fair market value” per share of the Common Stock on the Date of Grant and there is no other impermissible deferral of compensation associated with the Option. Because the Common Stock is not traded on an established securities market, the Fair Market Value is determined by the Board, perhaps in consultation with an independent valuation firm retained by the Company. You acknowledge that there is no guarantee that the Internal Revenue Service will agree with the valuation as determined by the Board, and you will not make any claim against the Company, or any of its Officers, Directors, Employees or Affiliates in the event that the Internal Revenue Service asserts that the valuation determined by the Board is less than the “fair market value” as subsequently determined by the Internal Revenue Service.

16. Company Policies. Option exercises will be subject to the Company’s insider trading policy, and other such related restrictions as may be established by the Board from time to time. In addition, this Option will be subject to any compensation clawback or recoupment policies that the Company may have in effect from time to time.

17. Notices. Any notices provided for in your Option or the Plan will be given in writing (including electronically) and will be deemed effectively given upon receipt or, in the case of notices delivered by mail by the Company to you, five days after deposit in the United States mail, postage prepaid, addressed to you at the last address you provided to the Company. The Company may, in its sole discretion, decide to deliver any documents related to participation in the Plan and this Option by electronic means or to request your consent to participate in the Plan by electronic means. By accepting this Option, you consent to receive such documents by electronic delivery and to participate in the Plan through an on-line or electronic system established and maintained by the Company or another third party designated by the Company.

18. Governing Plan Document. Your Option is subject to all the provisions of the Plan, the provisions of which are hereby made a part of your Option, and is further subject to all interpretations, amendments, rules and regulations, which may from time to time be promulgated and adopted pursuant to the Plan. If there is any conflict between the provisions of your Option and those of the Plan, the provisions of the Plan will control.

19. Defined Terms.

(a) “*Affiliate*” means, at the time of determination, any “parent” or “majority-owned subsidiary” of the Company, as such terms are defined in Rule 405. The Board will have the authority to determine the time or times at which “parent” or “majority-owned subsidiary” status is determined within the foregoing definition.

(b) “*Continuous Service*” means that the Grantee’s service with the Company or an Affiliate, whether as an Employee, Director or Consultant, is not interrupted or terminated. A change in the capacity in which the Grantee renders service to the Company or an Affiliate as an Employee, Director or Consultant or a change in the entity for which the Grantee renders such service, provided that there is no interruption or termination of the Grantee’s service with the Company or an Affiliate, will not terminate a Grantee’s Continuous Service; *provided, however*, that if the entity for which a Grantee is rendering services ceases to qualify as an Affiliate, as

determined by the Board in its sole discretion, such Grantee's Continuous Service will be considered to have terminated on the date such entity ceases to qualify as an Affiliate. For example, a change in status from an Employee of the Company to a Consultant of an Affiliate or to a Director will not constitute an interruption of Continuous Service. To the extent permitted by law, the Board or the chief executive officer of the Company, in that party's sole discretion, may determine whether Continuous Service will be considered interrupted in the case of (i) any leave of absence approved by the Board or chief executive officer, including sick leave, military leave or any other personal leave, or (ii) transfers between the Company, an Affiliate, or their successors. Notwithstanding the foregoing, a leave of absence will be treated as Continuous Service for purposes of vesting in an Award only to such extent as may be provided in the Company's leave of absence policy, in the written terms of any leave of absence agreement or policy applicable to the Grantee, or as otherwise required by law.

"Disability" means, with respect to a Grantee, the inability of such Grantee to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment that can be expected to result in death or that has lasted or can be expected to last for a continuous period of not less than twelve (12) months as provided in Sections 22(e)(3) and 409A(a)(2)(c)(i) of the Code, and will be determined by the Board on the basis of such medical evidence as the Board deems warranted under the circumstances.

LANDOS BIOPHARMA, INC.
NOTICE OF EXERCISE

This constitutes notice to **Landos Biopharma, Inc.** (the "**Company**") under my stock option that I elect to purchase the below number of shares of Common Stock of the Company (the "**Shares**") for the price set forth below. Use of certain payment methods is subject to Company and/or Board consent and certain additional requirements set forth in the Option Agreement and the Plan. If the Company uses an electronic capitalization table system (such as Carta or Shareworks) and the fields below are blank, the blank fields will be deemed to come from the electronic capitalization system and is considered part of this Notice of Exercise.

Option Information

Type of Option (check one): Incentive Non-Qualified
Stock Option dated: _____
Number of Shares as to which Option is exercised: _____
Certificates to be issued in name of:³ _____

Exercise Information

Date of Exercise: _____
Total exercise price: _____
Cash:⁴ _____
Regulation T Program (cashless exercise):⁵ _____
Value of _____ Shares delivered with this notice:⁶ _____
Value of _____ Shares pursuant to net exercise:⁷ _____

By this exercise, I agree (i) to provide such additional documents as you may require pursuant to the terms of the 2019 Equity Incentive Plan, (ii) to provide for the payment by me to you (in the manner designated by you) of your withholding obligation, if any, relating to the exercise of this Option, and (iii) if this exercise relates to an incentive stock option, to notify you in writing within 15 days after the date of any disposition of any of the Shares issued upon exercise of this Option that occurs within two years after the date of grant of this Option or within one year after such Shares are issued upon exercise of this Option. I further agree that this Notice of Exercise may be delivered via facsimile, electronic mail (including pdf or any electronic signature complying with the U.S. federal ESIGN Act of 2000, Uniform Electronic Transactions Act or other applicable law) or other transmission method and will be deemed to have been duly and validly delivered and be valid and effective for all purposes.

I hereby make the following certifications and representations with respect to the number of Shares listed above, which are being acquired by me for my own account upon exercise of the Option as set forth above:

- ³ If left blank, will be issued in the name of the option holder.
- ⁴ Cash may be in the form of cash, check, bank draft, electronic funds transfer or money order payment.
- ⁵ Subject to Company and/or Board consent and must meet the public trading and other requirements set forth in the Option Agreement.
- ⁶ Subject to Company and/or Board consent and must meet the public trading and other requirements set forth in the Option Agreement. Shares must be valued in accordance with the terms of the option being exercised, and must be owned free and clear of any liens, claims, encumbrances or security interests. Certificates must be endorsed or accompanied by an executed assignment separate from certificate.
- ⁷ Subject to Company and/or Board consent and must be a Non-Qualified Stock Option.

I acknowledge that the Shares have not been registered under the Securities Act of 1933, as amended (the “**Securities Act**”), and are deemed to constitute “restricted securities” under Rule 701 and Rule 144 promulgated under the Securities Act. I warrant and represent to the Company that I have no present intention of distributing or selling said Shares, except as permitted under the Securities Act and any applicable state securities laws.

I further acknowledge and agree that, except for such information as required to be delivered to me by the Company pursuant to the Option or the Plan (if any), I will have no right to receive any information from the Company by virtue of the grant of the Option or the purchase of shares of Common Stock through exercise of the Option, ownership of such shares of Common Stock, or as a result of my being a holder of record of stock of the Company. Without limiting the foregoing, to the fullest extent permitted by law, I hereby waive all inspection rights under Section 220 of the Delaware General Corporation Law and all such similar information and/or inspection rights that may be provided under the law of any jurisdiction, or any federal, state or foreign regulation, that are, or may become, applicable to the Company or the Company’s capital stock (the “**Inspection Rights**”). I hereby covenant and agree 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.

I further acknowledge that I will not be able to resell the Shares for at least 90 days after the stock of the Company becomes publicly traded (*i.e.*, subject to the reporting requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934) under Rule 701 and that more restrictive conditions apply to affiliates of the Company under Rule 144.

I further acknowledge that all certificates representing any of the Shares subject to the provisions of the Option will have endorsed thereon appropriate legends reflecting the foregoing limitations, as well as any legends reflecting restrictions pursuant to the Company’s Certificate of Incorporation, Bylaws and/or applicable securities laws.

I further agree that, if required by the Company (or a representative of the underwriters) in connection with the first underwritten registration of the offering of any securities of the Company under the Securities Act, I will not sell, dispose of, transfer, make any short sale of, grant any option for the purchase of, or enter into any hedging or similar transaction with the same economic effect as a sale with respect to any shares of Common Stock or other securities of the Company for a period of 180 days following the effective date of a registration statement of the Company filed under the Securities Act (or such longer period as the underwriters or the Company will request to facilitate compliance with applicable FINRA rules) (the “**Lock-Up Period**”). I further agree to execute and deliver such other agreements as may be reasonably requested by the Company or the underwriters that are consistent with the foregoing or that are necessary to give further effect thereto. In order to enforce the foregoing covenant, the Company may impose stop-transfer instructions with respect to securities subject to the foregoing restrictions until the end of such period. I further agree that the obligations contained in this paragraph will also, if so determined by the Company’s Board of Directors, apply in the Company’s initial listing of its Common Stock on a national securities exchange by means of a registration statement on Form S-1 under the Securities Act (or any successor registration form under the Securities Act subsequently adopted by the Securities and Exchange Commission) filed by the Company with the Securities and Exchange Commission that registers shares of existing capital stock of the Company for resale (a “**Direct Listing**”), provided that all holders of at least 5% of the Company’s outstanding Common Stock (after giving effect to the conversion into Common Stock of any outstanding preferred stock of the Company) are subject to substantially similar obligations with respect to such Direct Listing.

Very truly yours,

(Signature)

Name (Please Print)

Address of Record:

Email:

EMPLOYMENT AGREEMENT

This Employment Agreement (the "Agreement"), made effective as of January 1, 2020 ("Effective Date"), by and between Landos Biopharma, Inc. (the "Company"), and Dr. Josep Bassaganya-Riera ("Employee") provides:

Employee founded the Company on January 6th of 2017 and has been serving as the Chairman of the Board, President, and Chief Executive Officer ("CEO") of the Company since January 6th, 2017, and the parties agree that it is in the best interest of the Employee and the Company to now enter into this Employment Agreement which will supersede any and all other agreements previously made relating to Employee's employment other than the Assignment of Inventions, Confidentiality, Non-Competition and Non-Solicitation letter dated September 19th, 2017 (the "Letter").

Employee has certain valuable and unique experience and expertise in matters related to the Company's business, and the Company desires to employ Employee under the following terms and conditions.

NOW, THEREFORE, in consideration of the mutual promises and covenants set forth herein, the receipt and sufficiency of which are acknowledged, the Company and Employee agree as follows:

1. Job Title and Duties. Employee will continue to be employed as the, President, and Chief Executive Officer ("CEO") of the Company, reporting to the Board of Directors of the Company (the "Board") and also will serve as the Chairman of the Board as described below. During Employee's employment, Employee shall perform the duties consistent with his job title or as otherwise instructed by the Board. Employee shall devote substantially all of his business time and attention to the affairs of the Company and shall not engage in any other business without the written consent of the Board, except for the Outside Interests outlined and approved by the Company in Section 9. The Company and Employee acknowledge that the Employee is currently the Common Stock Director (as such term is defined in the Voting Agreement, dated September 2019, among the Company and certain stockholders of the Company ("Voting Agreement")). As required by the Voting Agreement, Employee shall serve as the Chairman of the Board for at least as long as Employee is the Common Stock Director. Additionally, as long as the Employee remains the Chief Executive Officer of the Company, the Company will use its best efforts to cause Employee to be elected to serve as a member of the Board. Immediately upon termination of Employee's employment with the Company for any reason, if so requested by the Board, Employee will resign any and all positions held by him, whether as an officer of the Company or director on the Board or on the board of directors of any subsidiary or affiliate of the Company or as a member of any committees thereof; provided, that Employee shall not be required to resign his position as a director on the Board pursuant to this Section 1 so long as he serves on the Board as the Common Stock Director, as such term is defined in the Voting Agreement.

2. Term. This Agreement will commence on the Effective Date and, subject to Section 4, will continue until the second anniversary of the Effective Date (the "Initial Term").

Following the Initial Term, the employment period will be automatically renewed for successive one-year periods (each, a "Subsequent Term"), unless (i) otherwise terminated as set forth in Section 4 of this Agreement, or (ii) the Company or Employee, as the case may be, sends the other party a written notice of non-renewal at least 90 days prior to the expiration of the Initial Term or any Subsequent Term, as applicable. The Initial Term of this Agreement, as it may be extended by any Subsequent Term, is herein referred to as the "Term."

3. Compensation. The Company agrees to provide Employee, and Employee agrees to accept, as compensation for all services rendered to the Company, the following compensation:

(a) Employee is a salaried, exempt employee. The Company will pay Employee a base salary at an annual rate of Five Hundred Two Thousand and Five Hundred Dollars (\$502,500) ("Base Salary"), payable in regular monthly installments or on such other schedule as the Company may adopt in the future for its employees. The Company will withhold state and federal income taxes, social security taxes and will make other withholdings and deductions required by law or mutually agreed upon in writing by Employee and the Company. The Company will review Employee's performance on a yearly basis and, in its discretion, may increase Employee's Base Salary during the Term of this Agreement.

(b) Employee shall be eligible for cash bonuses as awarded by the Board to senior management from time to time. For each calendar year, Employee shall have an annual cash bonus target equal to forty five (45) percent of his then-current Base Salary ("Annual Bonus"). The Annual Bonus is discretionary and will be subject to the Board's assessment of Employee's performance against written personal and Company goals, as well as business conditions at the Company. The Annual Bonus will be subject to Employee remaining employed at the time that the Annual Bonus is paid, which shall occur no later than March 15 of the calendar year immediately following the calendar year for which the Annual Bonus is being determined. In addition, the Annual Bonus will be subject to the terms of any applicable bonus plan. All bonuses awarded hereunder shall be subject to state and federal income taxes, social security taxes and other required or customary withholdings and deductions.

(c) The Company will reimburse Employee for reasonable expenses and out-of-pocket costs incurred by Employee in the proper performance of Employee's duties, subject to submission of receipts and other documentation reasonably acceptable to the Company and in accordance with other Company policies and procedures with respect to expense reimbursement, as may be adopted and revised from time to time by the Company.

(d) During Employee's employment with the Company, he shall be eligible to accrue up to four (4) weeks of vacation and five days of sick leave per calendar year in accordance with the Company's vacation and sick leave policies in effect from time to time. Vacation and sick leave shall accrue on a monthly basis on the first day of the month. Upon termination of employment for any reason, Employee shall be entitled to payment for all accrued, but unused, vacation. Employee shall not be entitled to accrued but unused sick leave upon termination of employment. Employee cannot carry over sick leave from year to year.

(e) During Employee's employment with the Company, Employee shall be entitled to participate in all employee benefit plans, practices, and programs maintained by the Company, as in effect from time to time (collectively, "Employee Benefit Plans"), to the extent consistent with applicable law and the terms of the applicable Employee Benefit Plans. The Company reserves the right to amend or cancel any Employee Benefit Plans at any time in its sole discretion, subject to the terms of such Employee Benefit Plan and applicable law.

(f) As soon as practicable after the date hereof, Employee will receive a grant of an incentive stock option (to the extent allowable under Section 422 of the Internal Revenue Code and the remainder shall be a nonqualified stock option) to purchase 300,000 shares of the Company's common stock at the fair market value of such common stock on the date of grant of the stock option ("Initial Stock Option"). The Initial Stock Option shall become vested and exercisable over a three-year period, commencing January 1, 2020, with 25% of the Initial Stock Option vesting immediately and 25% vesting twelve months following January 1, 2020, then the remaining 50% of the Initial Stock Option vesting in equal installments over the twenty-four (24) months thereafter. If, during the Initial Term of this Agreement, an initial public offering of the Company (the "IPO") is priced at a "pre-money" valuation of \$1,000,000,000 or greater (not including the proceeds of the IPO), Employee will receive a grant, as of the date of pricing of the IPO, of an option to purchase 150,000 shares of the Company's common stock at the IPO price or, if greater, the fair market value of the Company's common stock as determined by the Board ("IPO Option"). The IPO Option shall become vested and exercisable over a four-year period, commencing on the date of pricing of the IPO, with 25% of the IPO Option vesting twelve months following the date of grant, then the remaining 75% of the IPO Option vesting in equal installments over the thirty-six (36) months thereafter. If, subsequent to the IPO and prior to September 1, 2022, the market capitalization of the Company (determined by multiplying the daily volume weighted average stock price of the Company by the number of shares of common stock then outstanding) exceeds \$2,000,000,000 over a consecutive 10 calendar day period or over 15 calendar days within a 30 calendar day period, as soon as practicable thereafter, Employee will receive a grant of an option to purchase 150,000 shares of the Company's common stock at the fair market value of such common stock on the date of grant of the stock option (the "Performance Stock Option"). The Performance Stock Option shall become vested and exercisable over a four-year period, commencing on the date of grant, with 25% of the Performance Stock Option vesting twelve months following the date of grant, then the remaining 75% of the Performance Stock Option vesting in equal installments over the thirty-six (36) months thereafter. Subject to the provisions of 4(c) below, vesting of all of the stock options above is contingent on Employee remaining in continuous service with the Company through each of the applicable vesting dates. Notwithstanding the foregoing, in the event Employee's employment is terminated without Cause or Employee resigns for Good Reason and the termination date occurs within the twelve (12) month period on or immediately following a Change in Control (as defined in the Company's 2019 Equity Incentive Plan or any successor plan under which a stock option is awarded) in which the outstanding stock options held by Employee are continued, assumed or substituted for by the Company or the acquiring or surviving entity, then all unvested shares underlying any options granted to Employee during the Term of this Agreement, including but not limited to the Initial Stock Option, shall become fully vested and exercisable upon such termination. Except as otherwise set forth above, the Initial Stock Option shall be evidenced by the Company's form of stock option agreement previously approved by the Board pursuant to the Company's 2019 Equity Incentive Plan.

4. Termination. Subject to other provisions of this Section 4, the Term of this Agreement shall commence on the Effective Date, and shall continue in accordance with the provisions of Paragraph 2, above, unless terminated in accordance with the following provisions:

(a) Termination at the election of the Company for Cause. The Company may, subject to the terms of this Agreement, immediately and unilaterally terminate Employee's employment hereunder "*for Cause*". In the event of any such termination "*for Cause*", Employee shall be entitled solely to (i) accrued and unpaid Base Salary through the date of termination; (ii) accrued but unused vacation and sick leave through the date of termination in accordance with the Company's vacation and sick leave policies, as then in effect; (iii) reimbursement for unreimbursed business expenses properly incurred by Employee; and (iv) no severance or other compensation benefits, other than payments which are required by law (the foregoing items (i), (ii) and (iii) are hereinafter referred to, collectively, as the "Accrued Amounts"). For purposes of this Agreement, Accrued Amounts will be paid in accordance with the Company's customary payroll policies and procedures. As used herein, "*for Cause*" shall include: (i) material misrepresentation made by Employee in the scope of or concerning his employment with the Company; (ii) insubordination, which is the failure to comply with any valid and legal written directive of the Board; (iii) substantial malfeasance or nonfeasance of duty; (iv) unauthorized disclosure of confidential information that is likely to cause harm to the Company; (v) Employee's breach of any material provision of this Agreement, the Letter and any other employment, consulting, advisory, non-disclosure, invention assignment, non-competition, or similar agreement between Employee and the Company; (vi) Employee's violation of a material Company policy; (vii) Employee's conviction of or plea of guilty or nolo contendere to a crime that constitutes a felony (or state law equivalent) or a crime that constitutes a misdemeanor involving moral turpitude; or (viii) conduct materially prejudicial or injurious to the business of the Company. The Board shall have sole discretion to determine the existence of "*Cause*," and its determination will be conclusive on Employee and the Company. For purposes of this Agreement, there shall be no termination *for Cause* unless a written notice containing a detailed description of the grounds constituting Cause is delivered to the Employee stating the basis for the termination, and the Employee fails to cure, if curable, the violation, neglect or conduct that is the basis of such claim within thirty (30) days of receiving such notice. If, in the Board's good faith opinion, cure has not been accomplished by the Employee at the conclusion of such thirty (30) day cure period, the Employee will be given a reasonable opportunity to be heard by the Board before termination. Notwithstanding the foregoing, the Company shall not be obligated to give advance notice of termination *for Cause* pursuant to subsection (vii) above, or to provide Employee with a period to fully cure such violation.

(b) Voluntary Termination by Employee. Employee may voluntarily terminate his employment at any time during the term of this Agreement by providing the Company with ninety (90) days prior written notice of termination (the "Notice Period"). In the event of any such voluntary termination, Employee shall solely be entitled to the Accrued Amounts. In lieu of providing service pursuant to this Agreement during the Notice Period, the Company may elect, at its sole discretion, for Employee to cease performing or perform at a reduced schedule work on

behalf of the Company, provided that if the Employee continues to abide by the terms of this Agreement the Company shall pay Employee his full salary during the Notice Period, payable in accordance with the Company's standard payroll schedule and subject to applicable deductions and withholdings.

(c) At the Election of the Company for Reasons Other Than Cause.

(1) The Company may terminate Employee's employment hereunder at any time without Cause by giving ninety (90) days prior written notice to Employee of the Company's election to terminate. During such period, Employee will be available for the benefit of the Company to assist the Company in matters relating to a transition or as otherwise directed by the Board. Notwithstanding the foregoing, the Company shall have the option, in its sole discretion, to direct Employee to cease performing or perform at a reduced schedule work on behalf of the Company. Moreover, in lieu of providing the ninety (90) days prior written notice, the Company may elect to terminate Employee effective immediately; provided, however, in all such cases, that the Company pays Employee his full salary during the ninety (90) day notice period, payable in accordance with the Company's standard payroll schedule and subject to applicable deductions and withholdings.

(2) If the Company terminates Employee under this Section 4(c), provided that Employee has satisfied the Release Conditions, the unvested shares of the Initial Stock Option that would have become vested during the twelve (12) months following the termination date shall become fully vested and exercisable upon such termination date. Further, the Company shall also pay to Employee the Accrued Amounts, and if elected by Employee, the Company shall continue to extend to Employee all group health plan benefits to the extent authorized by and consistent with 29 U.S.C. § 1161 et seq. (commonly known as "COBRA"), with the cost of the regular premium for such benefits shared in the same relative proportion by the Company and Employee as in effect on the termination date until the earlier of (i) the end of the Severance Period (as defined below) or (ii) the date Employee becomes eligible for health benefits through another employer or otherwise becomes ineligible for COBRA.

(3) In the event the Company exercises its right to terminate Employee under this Section 4(c), provided that Employee executes, delivers to the Company and does not revoke a general release in favor of the Company and its affiliates, parents, subsidiaries, officers, directors, employees and any other releasees as the Company may determine in a form acceptable to the Company and agreed to by Employee (the "Release") within the consideration period plus the revocation period provided in the Release (which shall in no event be greater than fifty-two (52) days from Employee's receipt of the Release) (the "Release Conditions"), the Company shall pay Employee severance as follows: (i) if during the Initial Term, the Employee's Base Salary at the then current rate for the remainder of the Initial Term or 12 months, whichever is longer (the "Severance Period"); or (ii) following the Initial Term, the Employee's Base Salary at the then current rate for a period of twelve (12) months ("Severance Payments"). The Severance Payments shall be subject to all applicable taxes and other withholdings and deductions as required by law. The Severance Payments shall be paid in equal monthly installments beginning on the first day of the first month after Employee has satisfied the Release Conditions.

(4) In the event the Company exercises its right to terminate Employee under this Section 4(c), provided Employee has satisfied the Release Conditions, Employee shall also be entitled to payout of the target Annual Bonus, prorated based on the actual number of days worked in the calendar year in which termination occurs

(5) Employee's ability to receive Severance Payments pursuant to Section 4(c) is further conditioned upon him: returning all Company property per Company policy, but in no event later than ten (10) days after the termination date; complying with any post-termination obligations under this Agreement or any other agreement mutually executed between Employee and the Company; and complying with the Release including without limitation any non-disparagement and confidentiality provisions contained therein.

(d) Resignation for Good Reason.

(1) Employee may resign from his employment with the Company at any time for "Good Reason", provided he has not been previously notified by the Company of its intent to terminate his employment for Cause. In the case of a resignation for Good Reason, Employee shall provide thirty (30) days' advance written notice to the Board of Employee's intention to resign for Good Reason, which notice shall specify all of the acts or omissions of the Company that allegedly constitute Good Reason. Such notice must be provided to the Board within thirty (30) days of discovery of the first act or omission that allegedly constitutes "Good Reason" for Employee's resignation. For the avoidance of doubt, Good Reason cannot be established if Employee fails to comply with both of the foregoing 30-day deadlines. During any notice period provided by Employee in connection with his resignation, the Company may, in its sole discretion, direct Employee not to perform any work or report to the office for part or all of the notice period, although Employee's compensation and benefits shall continue during such notice period regardless. For purposes of this Section 4(d), "Good Reason" means the occurrence, without the Employee's consent, of any one of the following events: (i) a material diminution in Employee's roles, duties and responsibilities (other than by reason of a physical or mental incapacity), or a change in Employee's position within the Company which constitutes a material demotion; (ii) a material reduction (more than 10%) of Employee's then existing Base Salary; or (iii) a change in the principal workplace of Employee to a location outside of a 35 mile radius from Blacksburg, Virginia; provided, however, that none of the foregoing events shall constitute Good Reason unless the Company has failed to remedy or cure the event(s) allegedly constituting Good Reason within the 30-day notice period provided herein.

(2) In the event of a resignation for Good Reason, the Company shall pay to Employee the Accrued Amounts, and if elected by Employee, the Company shall continue to extend to Employee all group health plan benefits to the extent authorized by and consistent with 29 U.S.C. § 1161 et seq. (commonly known as "COBRA"), with the cost of the regular premium for such benefits shared in the same relative proportion by the Company and Employee as in effect on the termination date until the earlier of (i) the end of the Severance Period or (ii) the date Employee becomes eligible for health benefits through another employer or otherwise become ineligible for COBRA.

(3) In the event of Resignation for Good Reason, provided Employee has satisfied the Release Conditions, (i) the Company shall pay to Employee the Severance Payments, in accordance with Section 4(c)(3) of this Agreement and prorated bonus in accordance with Section 4(c)(4) of this Agreement and (ii) Employee's options shall vest in accordance with Section 4(c)(2) of this Agreement.

(4) Employee's ability to receive Severance Payments, prorated bonus and accelerated vesting of options pursuant to this Section 4(d) is further conditioned upon him: returning all Company property; complying with any post-termination obligations under this Agreement or any other agreement between Employee and the Company; and complying with the Release including without limitation any non-disparagement and confidentiality provisions contained therein.

(e) Termination Due to Death or Disability. Employee's employment with the Company shall automatically terminate upon Employee's death or Disability (as defined below). In the event that Employee's employment is terminated due to Employee's death or Disability, the Company shall pay to Employee, or his heirs as applicable, solely the Accrued Amounts and any accrued bonus amount to the extent it is earned (as determined by the Board in good faith). "Disability" shall mean the Employee's inability, due to physical or mental incapacity, to substantially perform his essential duties and responsibilities with or without a reasonable accommodation under this Agreement for either (i) 90 consecutive days, or (ii) any 120 days out of any 180-day period, as reasonably determined by the Board. In addition, the Employee or his estate, as the case may be, will have the right to exercise any vested stock options within thirty (30) days after Employee's death or Disability.

(f) Upon termination of Employee's employment for any reason, Employee shall have no right to any compensation, payments, benefits or other remuneration from the Company, except as expressly provided in this Agreement or as required by applicable law.

5. Construction. This Agreement will be governed by and construed in accordance with the laws of the State of Delaware, without regard to its conflict of laws principles.

6. Invalidity. It is the desire and intent of the parties that the provisions of this Agreement be enforced to the fullest extent permissible under the law and public policies applied in each jurisdiction in which enforcement is sought. In the event that any one or more of the provisions of this Agreement is held by a court of competent jurisdiction to be invalid, prohibited, illegal or unenforceable for any reason, in any respect, that provision or instrument will be ineffective, without invalidating the remaining provisions of this Agreement.

7. Indemnification. Employee is hereby entitled to indemnification for Employee's acts or omissions in Employee's capacity as an executive or officer of the Company or member of the Company's Board to the same extent as other senior executives of the Company and in the manner provided by the Company's bylaws.

8. Novation and Entire Agreement. This Agreement terminates, replaces and novates any earlier agreement, whether in writing or oral, relating to this subject matter, except for the Letter, which shall remain in full force and effect. Other than the Letter, this Agreement constitutes the entire agreement among the parties pertaining to the subject matter and supersedes all prior agreements (including, without limitation, all prior employment agreements or other agreements

regarding employee's compensation, stock ownership or otherwise), understandings, representations, negotiations and discussions, whether oral or written, of the parties. To the extent there is any conflict or inconsistency between this Agreement and the Letter, then this Agreement shall control. No supplement, modification or waiver of this Agreement will be binding unless executed in writing by both parties. The parties expressly waive their right to orally modify the Agreement, including, without limitation, the right to modify the provisions of this Section 8. No waiver of any other provisions of this Agreement will be deemed or will constitute a waiver of any other provision (whether or not similar), nor will such waiver constitute a continuing waiver unless otherwise provided.

9. Outside Interests. The Company acknowledges that Employee is Chairman of the Board, President and CEO of two other business interests, BioTherapeutics, Inc. ("BTI") and Nutrition Therapeutics, Inc. d/b/a Pervida ("Pervida"), and is also a Professor and Director of the NIMML at Virginia Tech ("Virginia Tech") and Founder of the NIMML Institute (the "Institute") (BTI, Pervida, Virginia Tech and the Institute collectively mean the "Outside Interests"). The Company hereby consents to Employee's continued involvement with the Outside Interests, including Employee's continued involvement as President and Chairman of the Board of BTI and Pervida, and Founding Member of the NIMML Institute (a 501(c)(3) organization). The parties agree that Employee will step down in his role of CEO of BTI and Pervida by June 30, 2020. Employee will also resign his roles of Professor and Director with Virginia Tech by no later than September 30, 2020. The Company specifically represents that Employee's work for these Outside Interests will not serve as the basis for termination of Employee's employment with the Company "for Cause" under this Agreement nor will it constitute a breach of the terms of the Letter or this Employment Agreement. The majority voting power of the Board shall have the right to withdraw its consent in the event the Board reasonably determines that Employee's continued involvement with such Outside Interests is interfering with Employee's responsibilities to the Company.

10. Binding Effect. This Agreement shall inure to the benefit of and be binding upon the parties, their representatives, heirs, permitted assigns and successors in interest.

11. Assignment. This Agreement provides for the performance of personal services by Employee and, accordingly, Employee may not assign this Agreement or any of Employee's interests under this Agreement or delegate any duty or responsibility incurred by him to another. The Company, at any time and without the consent of Employee, may assign or transfer, for such consideration and on such terms and conditions as it may deem appropriate, this Agreement to a corporation, partnership or other entity which acquires or otherwise will conduct all or part of the business or operations of the Company; provided, however, that no such assignment or transfer by the Company may in any manner restrict, limit or modify the interest, duties and responsibilities of Employee or the Company under this Agreement.

12. Consent to Service and Jurisdiction. Any action or proceeding by either of the parties to enforce this Agreement shall be brought only in a state or federal court located in the state of Delaware. The parties hereby irrevocably submit to the exclusive jurisdiction of such courts and waive the defense of inconvenient forum to the maintenance of any such action or proceeding in such venue. Employee expressly submits and consents in advance to such jurisdiction in any action or proceeding commenced in any such court, waiving personal service of process or other papers issued and agreeing that service of such process or other papers may be made by registered or certified mail to Employee.

13. Notices. Any notices, request, demands and other communications provided for by this Agreement will be sufficient if in writing and delivered in person or sent by certified mail, postage prepaid (in which case notice will be deemed to have been given on the third day after mailing), or by overnight delivery by a reliable overnight courier service (in which case notice shall be deemed to have been given on the day after delivery to such courier service) to the Employee at the last address the Employee has filed in writing with the Company, with a copy to Eric Blanchard or, in the case of the Company, at its address specified on the signature page or at such other address as the Company may elect in writing from time to time, attention of its Board .

14. Miscellaneous.

(a) Representations of Employee. Employee represents and warrants to the Company that: (i) Employee's acceptance of employment with the Company on the terms and conditions set forth herein and the performance of his duties hereunder will not conflict with or result in a violation of, a breach of, or a default under any contract, agreement, or understanding to which he is a party or is otherwise bound; and (ii) Employee's acceptance of employment with the Company and the full performance of his duties hereunder will not violate any non-solicitation, non-competition, or other similar covenant or agreement of a prior or other employer.

(b) Mutual Non-Disparagement. Employee agrees and covenants that he will not at any time make, publish or communicate to any person or entity or in any public forum any defamatory or disparaging remarks, comments, or statements concerning the Company, its businesses, or any of its affiliates, parents, subsidiaries, employees, officers, and existing and prospective customers, suppliers, investors and other associated third parties. The Company agrees that it will instruct its officers and directors not to make, publish, or do or say anything to any person or entity or in any public forum, directly or indirectly, that reasonably may be expected to have the effect of criticizing Employee, or diminishing or impairing his goodwill and reputation.

(c) Cooperation. The parties agree that certain matters in which Employee will be involved during his employment with the Company may necessitate Employee's cooperation now and/or in the future. Accordingly, during the course of Employee's employment with the Company and following the termination of Employee's employment for any reason, to the extent reasonably requested by the Board, Employee shall cooperate with the Company in connection with matters arising out of Employee's service to the Company. Except as specified in Section 4(b) and 4(c)(1), the parties agree that Employee's cooperation after Employee's employment with the Company ends shall be at the Company's sole expense, including a reasonable hourly rate to compensate Employee for his time and effort.

(d) Survival. Upon the termination of this Agreement or Employee's employment with the Company, the respective rights and obligations of the parties hereto shall survive such termination to the extent necessary to carry out the intentions of the parties under this Agreement.

(e) Captions. The captions of the Sections of this Agreement are for convenience of reference only and in no way define, limit or affect the scope or substance of any Section of this Agreement.

(f) Execution. This Agreement may be executed in one or more counterparts, and may be executed on electronically transmitted copies, each of which shall be deemed an original, and all of which together shall constitute one and the same instrument.

(g) Acknowledgement of Full Understanding. **EMPLOYEE ACKNOWLEDGES AND AGREES THAT HE HAS FULLY READ, UNDERSTANDS AND VOLUNTARILY ENTERS INTO THIS AGREEMENT. EMPLOYEE ACKNOWLEDGES AND AGREES THAT HE HAS HAD AN OPPORTUNITY TO ASK QUESTIONS AND CONSULT WITH AN ATTORNEY OF HIS CHOICE BEFORE SIGNING THIS AGREEMENT.**

15. Taxes; Section 409A

(a) All forms of compensation referred to in this Agreement are subject to reduction to reflect applicable withholding and payroll taxes and other deductions required by law. Employee hereby acknowledges that the Company does not have a duty to design its compensation policies in a manner that minimizes your tax liabilities, and Employee will not make any claim against the Company or the Board related to tax liabilities arising from Employee's compensation.

(b) Anything in this Agreement to the contrary notwithstanding, if at the time of Employee's separation from service within the meaning of Section 409A of the Code, the Company determines that Employee is a "specified employee" within the meaning of Section 409A(a)(2)(B)(i) of the Code, then to the extent any payment or benefit that Employee becomes entitled to under this Agreement on account of Employee's separation from service would be considered deferred compensation subject to the 20% additional tax imposed pursuant to Section 409A(a) of the Code as a result of the application of Section 409A(a)(2)(B)(i) of the Code, such payment shall not be payable and such benefit shall not be provided until the date that is the earlier of (A) six months and one day after Employee's separation from service, or (B) Employee's death. If any such delayed cash payment is otherwise payable on an installment basis, the first payment shall include a catch-up payment covering amounts that would otherwise have been paid during the six-month period but for the application of this provision, and the balance of the installments shall be payable in accordance with their original schedule. All in-kind benefits provided and expenses eligible for reimbursement under this Agreement shall be provided by the Company or incurred by Employee during the time periods set forth in this Agreement. All reimbursements shall be paid as soon as administratively practicable, but in no event shall any reimbursement be paid after the last day of the taxable year following the taxable year in which the expense was incurred. The amount of in-kind benefits provided or reimbursable expenses incurred in one taxable year shall not affect the in-kind benefits to be provided or the expenses eligible for reimbursement in any other taxable year. Such right to reimbursement or in-kind benefits is not subject to liquidation or exchange for another benefit. To the extent that any payment or benefit described in this Agreement constitutes "non-qualified

deferred compensation” under Section 409A of the Code, and to the extent that such payment or benefit is payable upon Employee’s termination of employment, then such payments or benefits shall be payable only upon Employee’s “separation from service.” The determination of whether and when a separation from service has occurred shall be made in accordance with the presumptions set forth in Treasury Regulation Section 1.409A-1(h). The Company and Employee intend that this Agreement will be administered in accordance with Section 409A of the Code. To the extent that any provision of this Agreement is ambiguous as to its compliance with Section 409A of the Code, the provision shall be read in such a manner so that all payments hereunder comply with Section 409A of the Code. The Company makes no representation or warranty and shall have no liability to Employee or any other person if any provisions of this Agreement are determined to constitute deferred compensation subject to Section 409A of the Code but do not satisfy an exemption from, or the conditions of, such Section. Each installment of any Severance Payments hereunder is a separate payment for purposes of Section 409A of the Code.

[signature page follows]

IN WITNESS WHEREOF, Employee and Company have caused this Agreement to be executed by their duly authorized representatives as of the date first written above.

FOR: EMPLOYEE

Josep Bassaganya-Riera

Signature

Josep Bassaganya-Riera

Name

1013 McBryde Lane
Blacksburg, VA 24060

FOR: COMPANY

Konstantin Poukalov

Signature

Konstantin Poukalov

Name

Title: Director
1800 Kraft Drive, Suite 216
Blacksburg, VA 24060