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Filed Pursuant to Rule 424(b)(4)
Registration No. 333-234756

2,600,000 Shares

Common Stock

We are offering 2,600,000 shares of our common stock.

Our common stock is listed on the Nasdaq Global Market under the symbol "KRTX". The reported sale price of our common stock, as reported on the Nasdaq Global Market on November 20, 2019, was $108.95 per share.

We are an "emerging growth company" as that term is used in the Jumpstart Our Business Startups Act of 2012 and, as such, have elected to comply with certain reduced public company reporting requirements.

Investing in our common stock involves a high degree of risk. See "Risk Factors" beginning on page 13 to read about factors you should consider before buying shares of our common stock.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities nor passed upon the accuracy or adequacy of this prospectus. Any representation to the contrary is a criminal offense.

	Per Share	Total
Public offering price	$ 96.00	$249,600,000.00
Underwriting discounts(1)	$ 5.76	$ 14,976,000.00
Proceeds, before expenses, to Karuna Therapeutics, Inc.	$ 90.24	$234,624,000.00

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

The underwriters have the option to purchase up to an additional 390,000 shares from us at the public offering price less the underwriting discount.

The underwriters expect to deliver the shares against payment in New York, New York on November 25, 2019.

Goldman Sachs & Co. LLC **Citigroup** **Stifel**

JMP Securities

Prospectus dated November 20, 2019

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Neither we nor the underwriters have authorized anyone to provide you with any information or to make any representations other than those contained in this prospectus, any amendment or supplement to this prospectus or in any free writing prospectus we may authorize to be delivered or made available to you. Neither we nor the underwriters take responsibility for, and can provide no assurance as to the reliability of, any other information that others may give you. We and the underwriters are offering to sell, and seeking offers to buy, shares of our common stock only in jurisdictions where offers and sales are permitted. The information contained in this prospectus is accurate only as of the date on the front cover of this prospectus, or other earlier date stated in this prospectus, regardless of the time of delivery of this prospectus or any sale of shares of our common stock. Our business, financial condition, results of operations and prospects may have changed since that date.

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 in the United States. Persons outside 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 the United States.

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In this prospectus, unless otherwise stated or the context otherwise requires, references to “Karuna,” the “Company,” “we,” “us,” “our” and similar references refer to Karuna Therapeutics, Inc. Karuna and other trademarks or service marks of Karuna appearing in this prospectus are the property of Karuna. The other trademarks, trade names and service marks appearing 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 ® and ™ symbols, 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.

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PROSPECTUS SUMMARY

This summary highlights, and is qualified in its entirety by, the more detailed information and financial statements and the accompanying notes included elsewhere in this prospectus. This summary does not contain all of the information that may be important to you. You should carefully consider, among other things, the matters discussed in "Risk Factors," our financial statements and the accompanying notes, and "Management's Discussion and Analysis of Financial Condition and Results of Operations," in each case included elsewhere in this prospectus.

Overview

We are an innovative clinical-stage biopharmaceutical company primarily focused on developing novel therapies to address disabling neuropsychiatric conditions characterized by significant unmet medical need. Our pipeline is built on the broad therapeutic potential of our lead product candidate, KarXT, an oral modulator of muscarinic receptors that are located both in the central nervous system, or CNS, and various peripheral tissues. KarXT is our proprietary product candidate that combines xanomeline, a novel muscarinic agonist, with trospium, an approved muscarinic antagonist, to preferentially stimulate muscarinic receptors in the CNS. In November 2019, we announced topline results from our Phase 2 clinical trial of KarXT for the treatment of acute psychosis in patients with schizophrenia, in which KarXT met the trial's primary endpoint with a statistically significant ($p<0.0001$) and clinically meaningful reduction in total Positive and Negative Syndrome Scale, or PANSS, scores over placebo and was observed to be well tolerated. We also plan to initiate clinical trials of KarXT to evaluate its potential therapeutic benefit in other CNS disorders, including psychosis in Alzheimer's disease, or AD, as well as pain. We have assembled members of a team who have extensive expertise in the research, development and commercialization of numerous CNS agents, as well as deep familiarity with the biology of neuropsychiatric disorders, such as schizophrenia and AD, including the role of muscarinic receptors in their potential treatment. We plan to leverage this expertise to develop a pipeline of product candidates targeting a broad range of psychiatric and neurological conditions.

Psychosis is a prominent and debilitating symptom that occurs in many neuropsychiatric disorders, including schizophrenia, AD, bipolar disorder, Parkinson's disease, major depressive disorder and inflammatory neurological diseases, such as multiple sclerosis. Patients with schizophrenia experience psychotic symptoms, also known as positive symptoms, such as hallucinations and delusions. Schizophrenia is a chronic disabling disorder that is typically diagnosed in late teenage years or early adulthood and is characterized by recurring episodes of psychosis requiring long-term treatment with antipsychotic drugs in most patients. The World Health Organization ranks psychosis as the third-most disabling medical condition in the world. In 2017, an estimated 2.7 million Americans, or approximately 0.5% to 1.0% of the United States population, had schizophrenia. Additionally, up to 50% of the estimated 5.7 million patients with AD in the United States experience psychosis at some point during the course of their disease, which often leads to institutional care in a hospital or nursing home.

Worldwide sales of antipsychotic drugs exceeded $11 billion in 2015 and are expected to exceed $14 billion by 2025, despite a highly generic market. Several branded market-leading antipsychotic medicines have each achieved worldwide annual sales in excess of $5 billion. Despite the large number of antipsychotic drugs developed over the last 20 years, current medicines have undergone only modest innovation relative to first generation drugs developed in the 1950s. In many patients, current antipsychotics are hampered by modest efficacy and significant side effects. At least half of patients fail to adequately respond to antipsychotic drugs. Additionally, in many patients, these treatments are associated with severe side effects including sedation, extrapyramidal side effects, such

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as motor rigidity, tremors and slurred speech, and significant weight gain resulting in the complications of diabetes, hyperlipidemia, hypertension and cardiovascular disease. The clinical benefit of current antipsychotics is further limited by poor adherence. In a 1,493-patient clinical study funded by the National Institutes of Health, approximately 75% of patients reported discontinuing their antipsychotic medication within 18 months of starting treatment.

Current antipsychotic treatments work primarily by inhibiting D2 dopamine receptors and are often used by physicians to address a wide range of disorders in addition to schizophrenia, including bipolar disorder and psychotic depression, as well as psychosis and agitation in elderly patients with dementia. Muscarinic receptor agonists emerged in the 1990s as a potential alternative approach for treating psychosis. There are five distinct muscarinic receptors, M1 through M5, which are found in the brain as well as various peripheral tissues. The link between muscarinic receptor stimulation in the CNS, particularly stimulation of M1 and M4 receptors, and the reduction of psychotic symptoms and cognitive impairment, has been well studied and is supported by data from preclinical studies and two third-party clinical trials published in peer reviewed journals. However, the successful development of a therapeutic agent targeting muscarinic receptors has been limited by undesirable side effects that are believed to arise primarily as a result of stimulation of muscarinic receptors in peripheral tissues. We believe a therapeutic agent that can preferentially target and stimulate muscarinic receptors in the CNS, but not in peripheral tissues, has the potential to treat psychosis in schizophrenia and AD, including the associated agitation in patients with AD. We also believe the preferential stimulation of M1 and M4 muscarinic receptors in the CNS may address the negative symptoms of schizophrenia, such as apathy, reduced social drive and loss of motivation, as well as cognitive deficits in working memory and attention, all of which currently lack any approved treatments. This approach has the potential to produce a differentiated therapy relative to current D2 dopamine receptor-based antipsychotic drugs and to beneficially impact the lives of millions of patients with schizophrenia and other psychotic and cognitive disorders.

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Pipeline Overview

We are advancing a pipeline of therapeutic programs to address the positive, negative and cognitive symptoms associated with schizophrenia and psychosis associated with AD, as well as various forms of pain. In addition, we are leveraging our expertise and experience to explore the development of KarXT for additional CNS disorders, as well as advance other muscarinic-targeted drug candidates.

We are initially developing our lead product candidate, KarXT, for the treatment of acute psychosis in patients with schizophrenia. KarXT combines xanomeline, a muscarinic receptor agonist that preferentially stimulates M1 and M4 muscarinic receptors, and trospium, an approved muscarinic receptor antagonist that does not measurably cross the blood-brain barrier, confining its effects to peripheral tissues. M1 and M4 muscarinic receptors are the receptor subtypes believed to mediate the antipsychotic, procognitive and analgesic effects of xanomeline and other muscarinic agonists. Results from preclinical studies and clinical trials conducted by third parties support the hypothesis that xanomeline can reduce psychosis and improve cognition. Like all muscarinic receptor agonists studied to date, however, xanomeline's tolerability has been limited by side effects arising from muscarinic receptor stimulation in peripheral tissues, leading to nausea, vomiting, diarrhea and increased salivation and sweating, collectively referred to as cholinergic adverse events. Trospium is a muscarinic receptor antagonist approved in the United States and Europe for the treatment of overactive bladder that inhibits all five muscarinic receptor subtypes in peripheral tissues. We believe that a combination therapy of xanomeline and trospium has the potential to preferentially stimulate M1 and M4 muscarinic receptors in the brain without stimulating muscarinic receptors in peripheral tissues in order to achieve meaningful therapeutic benefit in patients with psychotic and cognitive disorders.

Third-Party Clinical Trials Support Xanomeline's Development

Xanomeline as a treatment for psychosis and related neuropsychiatric disorders has been examined in clinical trials enrolling over 1,000 subjects or patients conducted by us and third parties, with 68 patients being dosed for at least one year and a maximum treatment duration of almost four years. We believe that the results from these clinical trials, as well as results from numerous preclinical

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studies, supports the further development of xanomeline, in the form of KarXT, as an antipsychotic and procognitive therapeutic agent.

Eli Lilly and Company, or Eli Lilly, conducted a 343-patient, randomized, double-blind, placebo-controlled Phase 2 clinical trial of xanomeline in patients with mild to moderate AD, administering up to 225 mg of xanomeline daily (75 mg three times a day, or TID), for 24 weeks. In this trial, patients on xanomeline were observed to have dose-dependent decreases in multiple psychotic symptoms and related behaviors, including hallucinations, delusions and agitation, as compared to patients on placebo. These responses were seen as early as two to three weeks after commencement of dosing with xanomeline. Xanomeline was also observed to reduce the emergence of psychotic symptoms over the course of the six-month trial in patients who did not have psychotic symptoms at the initiation of the trial. In this same trial, cognitive symptoms of patients with AD treated with xanomeline also showed improvements compared to placebo as measured by both the ADAS-Cog and the CIBIC+, suggesting that xanomeline may also improve cognition. The Alzheimer's Disease Assessment Scale-Cognitive Subscale, or ADAS-Cog, is one of the most frequently used tests to measure cognition while the Clinician Interview-Based Impression of Change plus caregiver interview, or CIBIC+, examines disease severity and changes in behavior, cognition and overall function. There was a 48% and 59% rate of discontinuation in the mid- and high-dose xanomeline cohorts, respectively, leading to a substantial reduction of statistical power in this trial. Despite this reduction in statistical power, patients in the mid-dose cohort showed a statistically significant benefit on the CIBIC+ as compared to placebo ($p=0.02$, 4.11 vs. 4.34, respectively). An analysis of patients who completed the trial identified a mean benefit of 2.84 units on the ADAS-Cog for the 225 mg xanomeline arm over placebo ($p<0.05$), which is similar to the effect seen with donepezil, an approved treatment for cognitive impairment associated with AD.

A randomized, double-blind, placebo-controlled, small Phase 2 trial of xanomeline was conducted in 20 patients with schizophrenia with acute psychosis, as a collaboration between Eli Lilly and the Indiana University School of Medicine. This monotherapy trial used PANSS as a primary endpoint. The PANSS is a set of measurements used for evaluating symptom severity in patients with schizophrenia and the change in PANSS score has been used as the primary endpoint in many registrational trials of antipsychotic medicines. A clinically meaningful and statistically significant 24-point PANSS score difference was observed between xanomeline and placebo was observed after 18 days of treatment which was the pre-specified analysis time point. By comparison, meta-analyses of published clinicals trials of currently approved antipsychotic medicines report an average difference of nine to ten points in PANSS score versus placebo. Historically, changes as small as five points have supported the approval of current antipsychotics.

Our Clinical Trials

In our initial Phase 1 clinical trial, we observed that in healthy volunteers the combination of xanomeline and trospium was associated with 46% fewer cholinergic adverse events as compared to xanomeline administered with placebo. Additionally, we have completed a randomized, double-blind, placebo-controlled multiple ascending dose Phase 1 clinical trial in healthy volunteers, in which we optimized the dosing of our proprietary KarXT co-formulation.

In September 2018, we initiated a multi-site, double-blind, placebo-controlled, five week, inpatient Phase 2 clinical trial of KarXT in patients with schizophrenia with acute psychosis. The primary endpoint in this trial was the change from baseline in PANSS total scores for KarXT versus placebo treated patients at week five. This trial had the same fundamental design and primary endpoint as

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the previous xanomeline trial in psychosis in schizophrenia. Additional endpoints of our trial included changes in PANSS Marder Factor score (including the negative symptom factor), a cognitive battery and the clinical global impression (CGI-S).

In November 2019, we announced topline results from our Phase 2 clinical trial of KarXT for the treatment of acute psychosis in patients with schizophrenia, in which KarXT met the trial's primary endpoint with a statistically significant and clinically meaningful 11.6 point ($p<0.0001$) mean reduction in total PANSS scores over placebo at week 5. We also observed a statistically significant 3.2 point mean reduction from baseline in the PANSS-positive subscale and a statistically significant 2.3 point mean reduction from baseline in the PANSS-negative subscale in KarXT treated patients as compared to placebo at week five ($p<0.0001$ and $p<0.001$, respectively). The total PANSS, PANSS-positive subscale, and the PANSS-negative subscale had statistically significant separation at every assessment throughout the trial. KarXT was observed to be well tolerated in the trial. The overall discontinuation rate in the KarXT treatment arm was similar to placebo (20% on KarXT vs. 21% on placebo) and the number of discontinuations due to treatment emergent adverse events was equal in the two arms (n=2 on KarXT and n=2 on placebo). 91% of patients treated with KarXT escalated to the high dose of KarXT as part of the flexible dose design. Occurrences of drowsiness, extrapyramidal side effects, such as tremors or slurred speech, or weight gain were similar to placebo. All observed drug-related cholinergic and anticholinergic adverse events were mild or moderate in severity and resolved without discontinuation. We intend to hold an End-of-Phase 2 meeting with the FDA to discuss our Phase 3 clinical trial development plan in the second quarter of 2020 and, subject to FDA feedback, anticipate initiating a Phase 3 clinical trial for the treatment of psychosis in patients with schizophrenia before the end of 2020.

Based on our clinical data with KarXT and third-party published clinical data with xanomeline, we believe that KarXT has potential therapeutic benefit in multiple CNS disorders, including the treatment of positive, negative and cognitive symptoms of schizophrenia and psychosis, as well as agitation associated with AD and other forms of dementia. We remain on track to initiate a Phase 1b clinical trial in healthy elderly volunteers to assess the safety and tolerability of KarXT before the end of 2019 for the treatment of psychosis in patients with AD and expect topline results from this trial in the second half of 2020. In addition, we believe published third-party preclinical data support the development of KarXT as a novel non-opioid therapeutic for various forms of post-operative, inflammatory and neuropathic pain. We remain on track to initiate a Phase 1b clinical trial in healthy volunteers for the treatment of experimentally induced pain in health volunteers before the end of 2019 and anticipate topline results from this trial in mid-2020.

We plan to utilize the data from our Phase 2 clinical trial of KarXT for the treatment of psychosis to help us guide KarXT's future development for negative and cognitive symptoms of schizophrenia, for which there are currently no approved treatments. We anticipate initiating a Phase 1b clinical trial to assess the safety and tolerability of KarXT for the treatment of the cognitive symptoms in the first half of 2020 and a Phase 1b clinical trial to assess the safety and tolerability of KarXT for the treatment of the negative symptoms in the first half of 2020.

Our Strategy

Our goal is to become a leading biopharmaceutical company focused on the development and commercialization of novel therapies for the treatment of CNS disorders. To achieve this, we are focused on the following key strategies:

- *Advance KarXT in our initial indications of psychosis in patients with schizophrenia and AD, as well as pain;*
- *Apply our expertise in muscarinic receptor biology to expand into other indications for KarXT;*

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- *Advance the development of additional KarXT formulations;*
- *Develop and advance our early-stage pipeline; and*
- *Selectively collaborate to realize the potential of our product candidates.*

Our Leadership Team

Our co-founder and Chief Operating Officer, Andrew Miller, Ph.D., was responsible for identifying, developing and testing the initial hypothesis supporting a combination of xanomeline and trospium. We have since assembled a team of employees and advisors who have expertise and extensive experience in developing psychiatric and neurological drugs, including several former scientists at Eli Lilly, who were actively involved in xanomeline's initial development. Steven Paul, M.D., our Chief Executive Officer and Chairman, was formerly the Executive Vice President for Science and Technology and President of the Lilly Research Laboratories at Eli Lilly, where he helped develop the antipsychotic drug Zyprexa and the antidepressant Cymbalta. Dr. Paul was the senior author of the initial publication evaluating xanomeline's effects in treating psychosis and agitation in patients with AD. Stephen Brannan, M.D., our Chief Medical Officer, was previously the Therapeutic Head of Neuroscience at Takeda Pharmaceutical Company Ltd. Alan Breier, M.D., our Chief Clinical Advisor and Chair of our Scientific Advisory Board, was previously Chief Medical Officer at Eli Lilly.

Risks Associated with Our Business

Our business is subject to a number of risks of which you should be aware before making an investment decision. These risks are discussed more fully in the "Risk Factors" section of this prospectus immediately following this prospectus summary. These risks include the following, among others:

- We are a clinical-stage biopharmaceutical company and we have incurred significant losses since our inception. We anticipate that we will continue to incur significant losses for the foreseeable future.
- Even if we consummate this offering, we will need substantial additional funding, and if we are unable to raise capital when needed, we could be forced to delay, reduce or eliminate our product discovery and development programs or commercialization efforts.
- Our business substantially depends upon the successful development of KarXT. If we are unable to obtain regulatory approval for or successfully commercialize KarXT, our business may be materially harmed.
- The regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time-consuming and inherently unpredictable, and if we are ultimately unable to obtain regulatory approval for our product candidates, our business will be substantially harmed.
- The results of early-stage clinical trials and preclinical studies may not be predictive of future results. Initial data in our clinical trials may not be indicative of results obtained when these trials are completed or in later stage trials.
- Our product candidates may cause undesirable side effects or have other properties that could delay or prevent their regulatory approval, limit the commercial profile of an approved label, or result in significant negative consequences following regulatory approval, if obtained.

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- We may seek to establish collaborations and, if we are not able to establish them on commercially reasonable terms, we may have to alter our development and commercialization plans.
- Our commercial success depends on our ability to protect our intellectual property and proprietary technology.
- If we fail to comply with our obligations in our current and future intellectual property licenses with third parties, we could lose rights that are important to our business.

Corporate Information

We were incorporated under the laws of the State of Delaware in July 2009 under the name Karuna Pharmaceuticals, Inc. and changed our name to Karuna Therapeutics, Inc. in March 2019. Our executive offices are located at 33 Arch Street, Suite 3110, Boston, Massachusetts 02110, and our telephone number is (857) 449-2244. Our website address is www.karunatx.com. The information contained on, or that can be accessed through, our website is not a part of this prospectus. We have included our website address in this prospectus solely as an inactive textual reference.

Implications of Being an Emerging Growth Company

As a company with less than $1.07 billion of revenue during our last fiscal year, we qualify as an “emerging growth company” as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. We may remain an emerging growth company until December 31, 2024, or until such earlier time as we have more than $1.07 billion in annual revenue, the last day of the fiscal year in which we are deemed to be a “large accelerated filer” as defined in Rule 12b-2 under the Securities Exchange Act of 1934, as amended, or the Exchange Act, which would occur if the market value of our common stock held by non-affiliates exceeded $700 million as of the last business day of the second fiscal quarter of such year or we issue more than $1 billion of non-convertible debt over a three-year period. For so long as we remain an emerging growth company, we are permitted to rely on exemptions from certain disclosure and other requirements that are applicable to other public companies that are not emerging growth companies. These exemptions include:

- only two years of audited financial statements in addition to any required unaudited interim financial statements with correspondingly reduced “Management’s Discussion and Analysis of Financial Condition and Results of Operations” disclosure;
- reduced disclosure about our executive compensation arrangements;
- no non-binding advisory votes on executive compensation or golden parachute arrangements;
- exemption from the auditor attestation requirement in the assessment of our internal control over financial reporting; and
- an exemption from new or revised financial accounting standards until they would apply to private companies and from compliance with any new requirements adopted by the Public Company Accounting Oversight Board requiring mandatory audit firm rotation.

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. This provision allows an emerging growth company to delay the adoption of some accounting standards until those standards would otherwise apply to private companies. We have elected to use this extended transition period for complying with new or revised accounting standards that have different effective dates for

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

We are also a “smaller reporting company,” meaning that the market value of our stock held by non-affiliates is less than $700 million and our annual revenue was less than $100 million during our most recently completed fiscal year. We may continue to be a smaller reporting company if either (i) the market value of our stock held by non-affiliates is less than $250 million or (ii) our annual revenue was less than $100 million during the most recently completed fiscal year and the market value of our stock held by non-affiliates is less than $700 million. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. For so long as we remain a smaller reporting company, we are permitted and intend to rely on exemptions from certain disclosure and other requirements that are applicable to other public companies that are not smaller reporting companies.

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THE OFFERING

Common stock offered by us	2,600,000 shares
Option to purchase additional shares	390,000 shares
Common stock to be outstanding immediately after this offering	26,012,754 shares (26,402,754 shares if the underwriters exercise their option to purchase additional shares in full).
Use of proceeds	We intend to use the net proceeds from this offering, together with our existing cash, cash equivalents and short-term investments, to fund (i) the completion of a planned Phase 3 clinical trial for the treatment of psychosis in schizophrenia, including, if necessary, a global Phase 3 clinical trial, and an open-label extension trial and the filing of a New Drug Application with the U.S. Food and Drug Administration for KarXT for the treatment of psychosis in schizophrenia, (ii) the development and expansion of our pipeline, including other muscarinic candidates, formulations and derivatives; and (iii) for working capital and other general corporate activities. See the “Use of Proceeds” section in this prospectus for a more complete description of the intended use of proceeds from this offering.
Risk factors	You should read the “Risk Factors” section of this prospectus for a discussion of factors to consider carefully before deciding to invest in shares of our common stock.
Nasdaq Global Market symbol	“KRTX”

The number of shares of our common stock to be outstanding after this offering is based on (i) 23,412,754 shares of our common stock outstanding as of September 30, 2019 and (ii) 105,163 shares of common stock underlying fully vested restricted stock units we issued in May 2019, which we are obligated to deliver no later than March 15, 2020, and excludes:

- 4,671,906 shares of our common stock issuable upon the exercise of stock options outstanding as of September 30, 2019, at a weighted average exercise price of $8.58 per share;
- 772,308 shares of our common stock reserved for future issuance under our 2019 Stock Option and Incentive Plan as of September 30, 2019, as well as any automatic increases in the number of shares of our common stock reserved for future issuance under this plan; and
- 213,729 shares of our common stock reserved for future issuance under our 2019 Employee Stock Purchase Plan as of September 30, 2019, as well as any automatic increases in the number of shares of our common stock reserved for future issuance under this plan.

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Unless otherwise indicated, all information in this prospectus assumes:

- no exercise of the outstanding options described above; and
- no exercise by the underwriters of their option to purchase up to 390,000 additional shares of our common stock.

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SUMMARY FINANCIAL DATA

You should read the following summary financial data together with "Selected Financial Data," "Management's Discussion and Analysis of Financial Condition and Results of Operations" and the financial statements, related notes and other financial information included elsewhere in this prospectus. The summary financial data in this section are not intended to replace the financial statements and are qualified in their entirety by the financial statements and related notes included elsewhere in this prospectus. We have derived the statement of operations data for the years ended December 31, 2017 and 2018 from our audited financial statements appearing at the end of this prospectus. We have derived the statement of operations data for the nine months ended September 30, 2018 and 2019 and the balance sheet data as of September 30, 2019 from our unaudited interim financial statements appearing at the end of this prospectus. The unaudited interim financial statements have been prepared on the same basis as the audited financial statements and reflect, in the opinion of management, all adjustments of a normal, recurring nature that are necessary for a fair statement of the financial information included in those unaudited interim financial statements. Our historical results are not necessarily indicative of the results that may be expected in the future, and the results for the nine months ended September 30, 2019 are not necessarily indicative of results to be expected for the full year or any other period.

	Year Ended December 31,		Nine Months Ended September 30,	
	2017	2018	2018	2019
	(in thousands, except share and per share data)			
Statement of Operations Data:				
Revenue	-	-	-	-
Operating expenses:				
Research and development	$ 3,616	$ 11,536	$ 4,816	$ 19,544
General and administrative	1,190	2,974	1,548	16,995
Total operating expenses	4,806	14,510	6,364	36,539
Loss from operations	(4,806)	(14,510)	(6,364)	(36,539)
Other income (expense):				
Interest income (expense)	(555)	(407)	(396)	11
Interest income	-	25	-	1,425
Accretion of debt discount	(616)	(2,176)	(1,996)	(945)
Change in fair value of derivative	(55)	(444)	(429)	(135)
Total other income (expense), net	(1,226)	(3,002)	(2,821)	356
Net loss before income taxes	$ (6,032)	$ (17,512)	$ (9,185)	$ (36,183)
Net loss per share—basic and diluted(1)		$ (4,378,000)	$ (4,592,500)	$ (4.67)
Weighted-average number of common shares used in net loss per share—basic and diluted(1)		4	2	7,755,137

(1) See Note 2 in the notes to our financial statements appearing at the end of this prospectus for a description of the method used to calculate basic and diluted net loss per share.

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	At September 30, 2019	
	Actual	As Adjusted(1)
	(in thousands)	
Balance Sheet Data:		
Cash, cash equivalents and short term investments	$161,605	$ 395,629
Working capital(2)	162,395	396,419
Total assets	164,227	398,251
Total stockholders' deficit	162,530	396,554

(1) The as adjusted column reflects the receipt of the net proceeds from the sale of shares of our common stock by us in this offering at the public offering price of $96.00 per share, and after deducting underwriting discounts and commissions and estimated offering expenses payable by us.

(2) We define working capital as current assets less current liabilities.

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RISK FACTORS

Investing in our common stock involves a high degree of risk. Before you decide to invest in our common stock, you should consider carefully the risks described below, together with the other information contained in this prospectus, including our financial statements and the related notes and "Management's Discussion and Analysis of Financial Condition and Results of Operations," appearing elsewhere in this prospectus. We believe the risks described below are the risks that are material to us as of the date of this prospectus. If any of the following risks actually occur, our business, financial condition, results of operations and growth prospects could be materially and adversely affected. In these circumstances, the market price of our common stock could decline, and you may lose all or part of your investment.

Risks Related to Our Financial Position and Need for Capital

We are a clinical-stage biopharmaceutical company and we have incurred significant losses since our inception. We anticipate that we will continue to incur significant losses for the foreseeable future.

Investment in biopharmaceutical product development is highly speculative because it entails substantial upfront capital expenditures and significant risk that any potential product candidate will fail to demonstrate adequate effect or an acceptable safety profile, gain regulatory approval and become commercially viable. We have no products approved for commercial sale and have not generated any revenue from product sales to date, and we will continue to incur significant research and development and other expenses related to our clinical development and ongoing operations. As a result, we are not profitable and have incurred losses in each period since our inception. Since our inception, we have devoted substantially all of our financial resources and efforts to research and development, including preclinical studies and our clinical trials. Our financial condition and operating results, including net losses, may fluctuate significantly from quarter to quarter and year to year. Accordingly, you should not rely upon the results of any quarterly or annual periods as indications of future operating performance. Additionally, net losses and negative cash flows have had, and will continue to have, an adverse effect on our stockholders' equity and working capital. Our net losses were $6.0 million and $17.5 million for the years ended December 31, 2017 and 2018, respectively, and $36.2 million for the nine months ended September 30, 2019. As of September 30, 2019, we had an accumulated deficit of $67.7 million. We expect to continue to incur significant losses for the foreseeable future, and we expect these losses to increase as we continue our research and development of, and seek regulatory approvals for KarXT in our initial and potential additional indications as well as for other product candidates.

We anticipate that our expenses will increase substantially if and as we:

- continue to develop and conduct clinical trials for KarXT for our initial and potential additional indications;
- initiate and continue research, preclinical and clinical development efforts for any future product candidates;
- seek to identify additional product candidates;
- seek regulatory approvals for KarXT, or any other product candidates that successfully complete clinical development;
- add operational, financial and management information systems and personnel, including personnel to support our product candidate development and help us comply with our obligations as a public company;
- hire and retain additional personnel, such as clinical, quality control, scientific, commercial and administrative personnel;

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- maintain, expand and protect our intellectual property portfolio;
- establish sales, marketing, distribution, manufacturing, supply chain and other commercial infrastructure in the future to commercialize various products for which we may obtain regulatory approval;
- add equipment and physical infrastructure to support our research and development; and
- acquire or in-license other product candidates and technologies.

Our expenses could increase beyond our expectations if we are required by the U.S. Food and Drug Administration, or FDA, or other regulatory authorities to perform clinical trials in addition to those that we currently expect, or if there are any delays in establishing appropriate manufacturing arrangements for or in completing our clinical trials or the development of any of our product candidates.

We have never generated revenue from product sales and may never be profitable.

Our ability to become and remain profitable depends on our ability to generate revenue. We do not expect to generate significant revenue, if any, unless and until we, either alone or with a collaborator, are able to obtain regulatory approval for, and successfully commercialize, KarXT for our initial and potential additional indications, or any other product candidates we may develop. Successful commercialization will require achievement of many key milestones, including demonstrating safety and efficacy in clinical trials, obtaining regulatory, including marketing, approval for these product candidates, manufacturing, marketing and selling those products for which we, or any of our future collaborators, may obtain regulatory approval, satisfying any post-marketing requirements and obtaining reimbursement for our products from private insurance or government payors. Because of the uncertainties and risks associated with these activities, we are unable to accurately and precisely predict the timing and amount of revenues, the extent of any further losses or if or when we might achieve profitability. We and any future collaborators may never succeed in these activities and, even if we do, or any future collaborators do, we may never generate revenues that are large enough for us to achieve profitability. Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Additionally, our expenses could increase if we are required by the FDA or any comparable foreign regulatory authority to perform clinical trials in addition to those currently expected, or if there are any delays in completing our clinical trials or the development of any of our product candidates.

Our failure to become and remain profitable may depress the market price of our common stock and could impair our ability to raise capital, expand our business, diversify our product offerings or continue our operations. If we continue to suffer losses as we have in the past, investors may not receive any return on their investment and may lose their entire investment.

We have a limited operating history, which may make it difficult to evaluate the prospects for our future viability.

Our operations to date have been limited to organizing, staffing and financing our company, raising capital, in-licensing our technology and conducting research and development activities, including preclinical studies and clinical trials, for our product candidates. We have not yet demonstrated an ability to generate revenues, obtain regulatory approvals, manufacture a commercial-scale product, or arrange for a third party to do so on our behalf, or conduct sales and marketing activities necessary for successful product commercialization. Accordingly, you should consider our prospects in light of the costs, uncertainties, delays and difficulties frequently encountered by companies in clinical development, especially clinical-stage biopharmaceutical companies such as

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ours. 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 pharmaceutical products.

We may encounter unforeseen expenses, difficulties, complications, delays and other known or unknown factors in achieving our business objectives. We will eventually need to transition from a company with a development focus to a company capable of supporting commercial activities. We may not be successful in such a transition.

Even if we consummate this offering, we will need substantial additional funding, and if we are unable to raise capital when needed, we could be forced to delay, reduce or eliminate our product discovery and development programs or commercialization efforts.

Our operations have consumed substantial amounts of cash since inception. We expect to continue to spend substantial amounts to continue the preclinical and clinical development of our current and future programs. If we are able to gain marketing approval for product candidates that we develop, including any indication for which we are developing or may develop KarXT, we will require significant additional amounts of cash in order to launch and commercialize such product candidates to the extent that such launch and commercialization are not the responsibility of a future collaborator that we may contract with in the future. In addition, other unanticipated costs may arise in the course of our development efforts. Because the design and outcome of our planned and anticipated clinical trials is highly uncertain, we cannot reasonably estimate the actual amounts necessary to successfully complete the development and commercialization of any product candidate we develop.

Our future capital requirements depend on many factors, including:

- the scope, progress, results and costs of researching and developing KarXT for our initial and potential additional indications, as well as other product candidates we may develop;
- the timing of, and the costs involved in, obtaining marketing approvals for KarXT for our initial and potential additional indications, and other product candidates we may develop and pursue;
- the number of future product candidates that we may pursue and their development requirements;
- if approved, the costs of commercialization activities for KarXT for any approved indications, or any other product candidate that receives regulatory approval to the extent such costs are not the responsibility of any future collaborators, including the costs and timing of establishing product sales, marketing, distribution and manufacturing capabilities;
- subject to receipt of regulatory approval, revenue, if any, received from commercial sales of KarXT for any approved indications or any other product candidates;
- the extent to which we in-license or acquire rights to other products, product candidates or technologies;
- our headcount growth and associated costs as we expand our research and development, increase our office space, and establish a commercial infrastructure;
- the costs of preparing, filing and prosecuting patent applications, maintaining and protecting our intellectual property rights, including enforcing and defending intellectual property related claims; and
- the ongoing costs of operating as a public company.

We cannot be certain that additional funding will be available on acceptable terms, or at all. We have no committed source of additional capital and if we are unable to raise additional capital in

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sufficient amounts or on terms acceptable to us, we may have to significantly delay, scale back or discontinue the development or commercialization of our product candidates or other research and development initiatives. Any of our current or future license agreements may also be terminated if we are unable to meet the payment or other obligations under the agreements.

We believe that the net proceeds from this offering, together with our existing cash, cash equivalents and short-term investments, will enable us to fund our operating expenses and capital expenditure requirements through the second half of 2021. Our estimate may prove to be wrong, and we could use our available capital resources sooner than we currently expect. Further, changing circumstances, some of which may be beyond our control, could cause us to consume capital significantly faster than we currently anticipate, and we may need to seek additional funds sooner than planned.

Raising additional capital may cause dilution to our stockholders, including purchasers of common stock in this offering, restrict our operations or require us to relinquish rights to our technologies or product candidates.

We expect our expenses to increase in connection with our planned operations. Unless and until we can generate a substantial amount of revenue from our product candidates, we expect to finance our future cash needs through public or private equity offerings, debt financings, collaborations, licensing arrangements or other sources, or any combination of the foregoing. In addition, we may seek additional capital due to favorable market conditions or strategic considerations, even if we believe that we have sufficient funds for our current or future operating plans.

To the extent that we raise additional capital through the sale of common stock, convertible securities or other equity securities, your ownership interest may be diluted, and the terms of these securities could include liquidation or other preferences and anti-dilution protections that could adversely affect your rights as a common stockholder. In addition, debt financing, if available, may result in fixed payment obligations and may involve agreements that include restrictive covenants that limit our ability to take specific actions, such as incurring additional debt, making capital expenditures, creating liens, redeeming stock or declaring dividends, that could adversely impact our ability to conduct our business. In addition, securing financing could require a substantial amount of time and attention from our management and may divert a disproportionate amount of their attention away from day-to-day activities, which may adversely affect our management's ability to oversee the development of our product candidates.

If we raise additional funds through collaborations or marketing, distribution or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams or product candidates or grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds 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.

Our ability to use net operating losses and research and development credits to offset future taxable income may be subject to certain limitations.

As of December 31, 2018, we had federal net operating loss carryforwards totaling $23.0 million of which $9.7 million begin to expire in 2029 and $13.3 million can be carried forward indefinitely. As of December 31, 2018, we had state net operating loss carryforwards totaling $22.9 million which begin to expire in 2029. As of December 31, 2018, we also had federal and state research and development tax credit carryforwards of $0.5 million and less than $0.1 million, respectively, which expire in 2038 and 2033, respectively. We are currently evaluating what portion of these research and development tax

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credit carryforwards remain with us following our deconsolidation from the PureTech Health U.S. federal income tax consolidated group. Our net operating loss and tax credit carryforwards could expire unused and be unavailable to offset future income tax liabilities. In addition, in general, under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, or the Code, a corporation that undergoes an "ownership change" is subject to limitations on its ability to utilize its pre-change net operating losses or tax credits, or NOLs or credits, to offset future taxable income or taxes. For these purposes, an ownership change generally occurs where the aggregate stock ownership of one or more stockholders or groups of stockholders who owns at least 5% of a corporation's stock increases its ownership by more than 50 percentage points over its lowest ownership percentage within a specified testing period. We believe we have undergone at least one ownership change in 2019 and that our existing NOLs or credits may be subject to limitations under Sections 382 and 383 of the Code. In addition, future changes in our stock ownership, many of which are outside of our control, could result in additional ownership changes under Sections 382 and 383 of the Code. Our NOLs or credits may also be impaired under state law. Accordingly, we may not be able to utilize a material portion of our NOLs or credits and as a result it is possible that a limitation on our ability to use our historical NOLs or credits could harm our future operating results by effectively increasing our future tax obligations.

Furthermore, our ability to utilize our NOLs or credits is conditioned upon our attaining profitability and generating U. S. federal and state taxable income. As described above under "—Risks Related to Our Financial Position and Need for Additional Capital," we have incurred significant net losses since our inception and anticipate that we will continue to incur significant losses for the foreseeable future; and therefore, we do not know whether or when we will generate the U.S. federal or state taxable income necessary to utilize our NOL or credit carryforwards that are subject to limitation by Sections 382 and 383 of the Code.

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

The U.S. government has recently enacted comprehensive tax legislation that includes significant changes to the taxation of business entities. These changes include, among others, a permanent reduction to the corporate income tax rate. Notwithstanding the reduction in the corporate income tax rate, the overall impact of this tax reform is uncertain, and our business and financial condition could be adversely affected. This prospectus does not discuss any such tax legislation or the manner in which it might affect purchasers of our common stock. We urge our stockholders to consult with their legal and tax advisors with respect to any such legislation and the potential tax consequences of investing in our common stock.

Risks Related to the Discovery, Development and Commercialization of Our Product Candidates

Our business substantially depends upon the successful development of KarXT. If we are unable to obtain regulatory approval for, and successfully commercialize, KarXT, our business may be materially harmed.

We currently have no products approved for sale and are investing the majority of our efforts and financial resources in the development of our lead product candidate, KarXT for psychosis in patients with schizophrenia and AD as well as pain. Successful continued development and ultimate regulatory approval of KarXT for our initial and potential additional indications is critical to the future success of our business. We will need to raise sufficient funds for, and successfully enroll and complete, our clinical development programs of KarXT for psychosis in patients with schizophrenia and AD as well as pain, and possibly other diseases. The future regulatory and commercial success of KarXT is subject to a number of risks, including the following:

- successful completion of preclinical studies and clinical trials;

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- successful patient enrollment in clinical trials;
- successful data from our clinical program that supports an acceptable risk-benefit profile of our product candidates in the intended populations;
- receipt and maintenance of marketing approvals from applicable regulatory authorities;
- obtaining and maintaining patent and trade secret protection and regulatory exclusivity for our product candidates;
- making arrangements with third-party manufacturers, or establishing manufacturing capabilities, for both clinical and commercial supplies of our product candidates;
- entry into collaborations to further the development of our product candidates;
- establishing sales, marketing and distribution capabilities and launching commercial sales of our products, if and when approved, whether alone or in collaboration with others;
- successfully launching commercial sales of our product candidates, if and when approved;
- acceptance of our products, if and when approved, by patients, the medical community and third-party payors;
- obtaining and maintaining third-party coverage and adequate reimbursement;
- maintaining a continued acceptable safety profile of the products following approval;
- effectively competing with other therapies; and
- enforcing and defending intellectual property rights and claims.

Many of these risks are beyond our control, including the risks related to clinical development, the regulatory submission process, potential threats to our intellectual property rights and the manufacturing, marketing and sales efforts of any future collaborator. If we are unable to develop, receive regulatory approval for, or successfully commercialize KarXT for the indications we are developing it for, or if we experience delays as a result of any of these risks or otherwise, our business could be materially harmed.

In addition, of the large number of drugs in development in the pharmaceutical industry, only a small percentage result in the submission of a new drug application, or NDA, to the FDA and even fewer are approved for commercialization. Furthermore, even if we do receive regulatory approval for KarXT for any indication, any such approval may be subject to limitations on the indications or uses or patient populations for which we may market the product. Accordingly, even if we are able to obtain the requisite financing to continue to fund our development programs, we cannot assure you that we will successfully develop or commercialize KarXT for any indication. If we or any of our future collaborators are unable to develop, or obtain regulatory approval for, or, if approved, successfully commercialize KarXT for our initial or potential additional indications, we may not be able to generate sufficient revenue to continue our business. In addition, our failure to demonstrate positive results in our clinical trials in any indication for which we are developing KarXT could adversely affect our development efforts for KarXT in other indications.

Our company has never commercialized a product candidate and may experience delays or unexpected difficulties in obtaining regulatory approval for KarXT for our initial or potential additional indications.

Our company has never obtained regulatory approval for, or commercialized, a drug. It is possible that the FDA may refuse to accept any or all of our planned NDAs for substantive review or may conclude after review of our data that our application is insufficient to obtain regulatory approval for any

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product candidates. If the FDA does not approve any of our planned NDAs, it may require that we conduct additional costly clinical, nonclinical or manufacturing validation studies before it will reconsider our applications. Depending on the extent of these or any other FDA-required studies, approval of any NDA or other application that we submit may be significantly delayed, possibly for several years, or may require us to expend more resources than we have available. Any failure or delay in obtaining regulatory approvals would prevent us from commercializing KarXT for any indication or any other product candidate, generating revenues and achieving and sustaining profitability. It is also possible that additional studies, if performed and completed, may not be considered sufficient by the FDA to approve any NDA or other application that we submit. If any of these outcomes occur, we may be forced to abandon the development of our product candidates, which would materially adversely affect our business and could potentially cause us to cease operations. We face similar risks for our applications in foreign jurisdictions. In addition, difficulties in obtaining approval of KarXT in any of the initial indications for which we are developing it could adversely affect our efforts to seek approval from regulatory authorities for KarXT in other indications.

The regulatory approval processes of the FDA and comparable foreign authorities are lengthy, time-consuming and inherently unpredictable, and if we are ultimately unable to obtain regulatory approval for our product candidates, our business will be substantially harmed.

We, and any future collaborators, are not permitted to commercialize, market, promote or sell any product candidate in the United States without obtaining regulatory approval from the FDA. Foreign regulatory authorities, such as the European Medicines Agency, or EMA, impose similar requirements. The time required to obtain approval by the FDA and comparable foreign authorities is unpredictable, but typically takes many years following the commencement of clinical trials and depends upon numerous factors, including substantial discretion of the regulatory authorities. In addition, approval policies, regulations, or 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. To date, we have not submitted an NDA to the FDA or similar drug approval submissions to comparable foreign regulatory authorities for KarXT or any other product candidate. We, and any future collaborators, must complete additional preclinical or nonclinical studies and clinical trials to demonstrate the safety and efficacy of our product candidates in humans before we will be able to obtain these approvals.

Clinical testing is expensive, difficult to design and implement, can take many years to complete and is inherently uncertain as to outcome. We cannot guarantee that any clinical trials will be conducted as planned or completed on schedule, if at all. The clinical development of KarXT for our initial and potential additional indications or other product candidates is susceptible to the risk of failure inherent at any stage of development, including failure to demonstrate efficacy in a clinical trial or across a broad population of patients, the occurrence of adverse events that are severe or medically or commercially unacceptable, failure to comply with protocols or applicable regulatory requirements, and determination by the FDA or any comparable foreign regulatory authority that a product candidate may not continue development or is not approvable. It is possible that even if KarXT or any other product candidate has a beneficial effect, that effect will not be detected during clinical evaluation as a result of one or more of a variety of factors, including the size, duration, design, measurements, conduct or analysis of our clinical trials. Conversely, as a result of the same factors, our clinical trials may indicate an apparent positive effect of KarXT or any other product candidate that is greater than the actual positive effect, if any. Similarly, in our clinical trials we may fail to detect toxicity of or intolerability caused by KarXT or any other product candidate, or mistakenly believe that our product candidates are toxic or not well-tolerated when that is not in fact the case.

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Our current and future product candidates could fail to receive regulatory approval for many reasons, including the following:

- the FDA or comparable foreign regulatory authorities may disagree as to the design or implementation of our clinical trials;
- we may be unable to demonstrate to the satisfaction of the FDA or comparable foreign regulatory authorities that a product candidate is safe and effective for its proposed indication;
- the results of clinical trials may not meet the level of statistical significance required by the FDA or comparable foreign regulatory authorities for approval;
- we may be unable to demonstrate that a product candidate's clinical and other benefits outweigh its safety risks;
- the FDA or comparable foreign regulatory authorities may disagree with our interpretation of data from clinical trials or preclinical studies;
- the data collected from clinical trials of our product candidates may not be sufficient to support the submission of a NDA, to the FDA or other submission or to obtain regulatory approval in the United States, the European Union or elsewhere;
- the FDA or comparable foreign regulatory authorities may find deficiencies with or fail to approve the manufacturing processes or facilities of third-party manufacturers with which we contract for clinical and commercial supplies; and
- the approval policies or regulations of the FDA or comparable foreign regulatory authorities may significantly change in a manner rendering our clinical data insufficient for approval.

This lengthy approval process as well as the unpredictability of clinical trial results may result in our failing to obtain regulatory approval to market any product candidate we develop, which would significantly harm our business, results of operations and prospects. There is no assurance that the endpoints and trial designs used for the approval of currently approved CNS drugs will be acceptable for future approvals, including for KarXT. The FDA and other comparable foreign authorities have substantial discretion in the approval process, and determining when or whether regulatory approval will be obtained for any product candidate that we develop. Even if we believe the data collected from future clinical trials of our product candidates are promising, such data may not be sufficient to support approval by the FDA or any other regulatory authority.

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

We may incur unexpected costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of our product candidates.

To obtain the requisite regulatory approvals to commercialize any of our product candidates, we must demonstrate through extensive preclinical studies and clinical trials that our product candidates are safe and effective in humans. Clinical testing is expensive and can take many years to complete, and its outcome is inherently uncertain. Failure can occur at any time during the clinical trial process and our future clinical trial results may not be successful.

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We may experience delays in completing our clinical trials or preclinical studies and initiating or completing additional clinical trials. We may also experience numerous unforeseen events during our clinical trials that could delay or prevent our ability to receive marketing approval or commercialize the product candidates we develop, including:

- regulators, or institutional review boards, or IRBs, or other reviewing bodies may not authorize us or our investigators to commence a clinical trial, or to conduct or continue a clinical trial at a prospective or specific trial site;
- we may not reach agreement on acceptable terms with prospective contract research organizations, or CROs, and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- the number of subjects or patients required for clinical trials of KarXT in an indication or any other product candidate may be larger than we anticipate, enrollment in these clinical trials may be insufficient or slower than we anticipate, and the number of clinical trials being conducted at any given time may be high and result in fewer available patients for any given clinical trial, or patients may drop out of these clinical trials at a higher rate than we anticipate;
- our third-party contractors, including those manufacturing our product candidates or conducting clinical trials on our behalf, may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;
- we may have to amend clinical trial protocol submitted to regulatory authorities or conduct additional studies to reflect changes in regulatory requirements or guidance, which we may be required to resubmit to an IRB and regulatory authorities for re-examination;
- regulators, IRBs or other reviewing bodies may fail to approve or subsequently find fault with the manufacturing processes or facilities of third-party manufacturers with which we enter into agreement for clinical and commercial supplies, or the supply or quality of KarXT or any other product candidate or other materials necessary to conduct clinical trials of our product candidates may be insufficient, inadequate or not available at an acceptable cost, or we may experience interruptions in supply; and
- the potential for approval policies or regulations of the FDA or the applicable foreign regulatory agencies to significantly change in a manner rendering our clinical data insufficient for approval.

Regulators, IRBs of the institutions in which clinical trials are being conducted or data monitoring committees may suspend or terminate a clinical trial due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a drug, changes in governmental regulations or administrative actions or lack of adequate funding to continue the clinical trial. For example, a previous Phase 1 clinical trial of KarXT conducted by us was put on hold by the FDA in April 2017 after one and half days of dosing due to preliminary assessment of preclinical findings. Although this hold was lifted in August 2017 after the FDA's complete review of the preclinical data and our proposed addition of monitoring for potential decreased gastrointestinal motility to the clinical protocol, we face the risk of future clinical holds that may not be lifted in a timely manner, if at all.

Negative or inconclusive results from our planned Phase 3 clinical trial of KarXT for the treatment of psychosis in patients with schizophrenia, or any other clinical trial or preclinical studies in animals that we conduct, could mandate repeated or additional clinical trials and could result in changes to or delays in clinical trials KarXT in other indications. We do not know whether any clinical trials that we

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may conduct will demonstrate adequate efficacy and safety to result in regulatory approval to market KarXT for our initial or potential additional indications, or any other product candidate. If later stage clinical trials do not produce favorable results, our ability to obtain regulatory approval for KarXT for initial or potential additional indications, or any other product candidate, may be adversely impacted.

Our failure to successfully initiate and complete clinical trials of KarXT for our initial or potential additional indications or any other product candidate and to demonstrate the efficacy and safety necessary to obtain regulatory approval to market KarXT or any other product candidate would significantly harm our business. Our product candidate development costs will also increase if we experience delays in testing or regulatory approvals and we may be required to obtain additional funds to complete clinical trials. We cannot assure you that our clinical trials will begin as planned or be completed on schedule, if at all, or that we will not need to restructure our trials after they have begun. Significant clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize our product candidates or allow our competitors to bring products to market before we do and impair our ability to successfully commercialize our product candidates, which may harm our business and results of operations. In addition, many of the factors that cause, or lead to, delays of clinical trials may ultimately lead to the denial of regulatory approval of KarXT or any other product candidate.

Even if we complete the necessary preclinical studies and clinical trials, the marketing approval process is expensive, time-consuming and uncertain and may prevent us or any future collaboration partners from obtaining approvals for the commercialization of KarXT for our initial or potential additional indications as well as for any other product candidate we develop.

Any product candidate we may develop and the activities associated with their development and commercialization, including their design, testing, manufacture, safety, efficacy, recordkeeping, labeling, storage, approval, advertising, promotion, sale, and distribution, are subject to comprehensive regulation by the FDA and other regulatory authorities in the United States and by comparable authorities in other countries. Failure to obtain marketing approval for a product candidate will prevent us from commercializing the product candidate in a given jurisdiction. We have not received approval to market any product candidates from regulatory authorities in any jurisdiction and it is possible that none of the product candidates we may seek to develop in the future will ever obtain regulatory approval. We have no experience in filing and supporting the applications necessary to gain marketing approvals and expect to rely on third-party CROs or regulatory consultants to assist us in this process. Securing regulatory approval requires the submission of extensive preclinical and clinical data and supporting information to the various regulatory authorities for each therapeutic indication to establish the biologic product candidate's safety, purity, efficacy and potency. Securing regulatory approval also requires the submission of information about the product manufacturing process to, and inspection of manufacturing facilities by, the relevant regulatory authority. Any product candidates we develop may not be effective, may be only moderately effective, or may prove to have undesirable or unintended side effects, toxicities or other characteristics that may preclude our obtaining marketing approval or prevent or limit commercial use.

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

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interpretations of the data obtained from preclinical and clinical testing could delay, limit, or prevent marketing approval of a product candidate. Any marketing approval we ultimately obtain may be limited or subject to restrictions or post-approval commitments that render the approved product not commercially viable.

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

Risks associated with the in-licensing or acquisition of product candidates could cause substantial delays in the preclinical and clinical development of our product candidates.

We have relied on Eli Lilly and Company, or Eli Lilly, to have conducted research and development in accordance with the applicable protocol, legal, regulatory and scientific standards, having accurately reported the results of all clinical trials conducted prior to our acquisition of KarXT and having correctly collected and interpreted the data from these trials. If the research and development processes or the results of the development programs prior to our development of KarXT prove to be unreliable, this could result in increased costs and delays in the development of KarXT, which could adversely affect any future revenue from this product candidate.

We may also acquire or in-license additional product candidates for preclinical or clinical development in the future as we continue to build our pipeline. The risks associated with acquiring or in-licensing product candidates could result in delays in the commencement or completion of our preclinical studies and clinical trials, if ever, and our ability to generate revenues from our product candidates may be delayed.

The results of early-stage clinical trials and preclinical studies may not be predictive of future results. Initial data in our clinical trials may not be indicative of results obtained when these trials are completed or in later stage trials.

The results of preclinical studies may not be predictive of the results of clinical trials, and the results of any early-stage clinical trials we commence may not be predictive of the results of the later-stage clinical trials. In addition, initial data in clinical trials may not be indicative of results obtained when such trials are completed. There can be no assurance that any of our clinical trials will ultimately be successful or support further clinical development of any of our product candidates. There is a high failure rate for drugs and biologics proceeding through clinical trials. A number of companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in clinical development even after achieving promising results in earlier studies, and any such setbacks in our clinical development could have a material adverse effect on our business and operating results.

Interim topline and preliminary data 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 topline or preliminary data from our clinical trials. Interim data from clinical trials that we may complete are subject to the risk that one or more of the clinical outcomes may materially change as patient enrollment continues and more patient data become available. Preliminary or topline data also remain subject to audit and verification procedures that may result in the final data being materially different from the preliminary data we previously published. As a result, interim and preliminary data should be viewed with caution until the final data are available. Adverse differences between preliminary or interim data and final data could significantly harm our reputation and business prospects.

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

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

Patient enrollment is affected by many factors, including:

- the patient eligibility criteria defined in the protocol;
- the size of the patient population required for analysis of the trial's primary endpoints;
- the proximity of patients to trial sites;
- the design of the trial;
- our ability to recruit clinical trial investigators with the appropriate competencies and experience;
- competing clinical trials and clinicians' and patients' perceptions as to the potential advantages and risks of the product candidate being studied in relation to other available therapies, including any new drugs that may be approved for the indications that we are investigating;
- our ability to obtain and maintain patient consents; and
- the risk that patients enrolled in clinical trials will drop out of the trials before completion.

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

Our inability to enroll a sufficient number of patients for our clinical trials would result in significant delays or might require us to abandon one or more clinical trials altogether. Delays in patient enrollment may result in increased costs, affect the timing or outcome of the planned clinical trials, product candidate development and approval process and jeopardize our ability to seek and obtain the regulatory approval required to commence product sales and generate revenue, which could prevent completion of these trials, adversely affect our ability to advance the development of our product candidates, cause the value of our company to decline and limit our ability to obtain additional financing if needed.

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 results. For example, we are exploring other formulations and modes of administration for KarXT. Similarly, in our recently completed Phase 2 clinical trial, we used a co-formulation of KarXT, whereas previous clinical data were based on either xanomeline alone or xanomeline co-administered with trospium. 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

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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.

Our product candidates may cause undesirable side effects or have other properties that could delay or prevent their regulatory approval, limit the commercial profile of an approved label, or result in significant negative consequences following regulatory approval, if obtained.

Undesirable side effects caused by KarXT, or any future product candidate, could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or comparable foreign regulatory authorities. Results of our clinical trials could reveal a high and unacceptable severity and prevalence of side effects or unexpected characteristics. In clinical trials of KarXT to date, cholinergic adverse events were generally mild or moderate in severity. However, there can be no guarantee that we would observe a similar tolerability profile of KarXT in our planned Phase 3 clinical trial or in other future clinical trials. Many compounds that initially showed promise in clinical or earlier stage testing are later found to cause undesirable or unexpected side effects that prevented further development of the compound.

If unacceptable side effects arise in the development of our product candidates, we, the FDA or comparable foreign regulatory authorities, the IRBs, or independent ethics committees at the institutions in which our trials are conducted, or the independent safety monitoring committee could suspend or terminate our clinical trials or the FDA or comparable foreign regulatory authorities could order us to cease clinical trials or deny approval of our product candidates for any or all targeted indications. Treatment-emergent side effects that are deemed to be drug-related could also affect subject recruitment or the ability of enrolled subjects to complete the trial or result in potential product liability claims. Undesirable side effects in one of our clinical trials for KarXT in one indication could adversely affect enrollment in clinical trials, regulatory approval and commercialization of KarXT in other indications. In addition, these side effects may not be appropriately recognized or managed by the treating medical staff. We expect to have to train medical personnel using our product candidates to understand the side effect profiles for our clinical trials and upon any commercialization of any of our product candidates. Inadequate training in recognizing or managing the potential side effects of our product candidates could result in patient injury or death. Any of these occurrences may harm our business, financial condition and prospects significantly.

Moreover, clinical trials of our product candidates are conducted in carefully defined sets of patients who have agreed to enter into clinical trials. Consequently, it is possible that our clinical trials, or those of any future collaborator, may indicate an apparent positive effect of a product candidate that is greater than the actual positive effect, if any, or alternatively fail to identify undesirable side effects.

Even if KarXT or any future product candidate of ours receives regulatory approval, it 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, in which case we may not generate significant revenues or become profitable.

We have never commercialized a product, and even if KarXT for the treatment of any indication, or any future product candidate of ours, is approved by the appropriate regulatory authorities for marketing and sale, it may nonetheless fail to gain sufficient market acceptance by physicians,

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patients, third-party payors and others in the medical community. Physicians may be reluctant to take their patients off their current medications and switch their treatment regimen to KarXT. Further, patients often acclimate to the treatment regime that they are currently taking and do not want to switch unless their physicians recommend switching products or they are required to switch due to lack of coverage and adequate reimbursement. In addition, even if we are able to demonstrate our product candidates' safety and efficacy to the FDA and other regulators, safety or efficacy concerns in the medical community may hinder market acceptance.

Efforts to educate the medical community and third-party payors on the benefits of our product candidates may require significant resources, including management time and financial resources, and may not be successful. In particular, we may have difficulty in convincing the medical community that KarXT's preferential targeting and stimulation of certain muscarinic receptors has the potential to avoid the undesirable side effects associated with stimulation of muscarinic receptors in the peripheral tissues. If KarXT or any other product candidate is approved but does not achieve an adequate level of market acceptance, we may not generate significant revenues 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 and safety of the product;
- the potential advantages of the product compared to competitive therapies;
- the prevalence and severity of any side effects;
- whether the product is designated under physician treatment guidelines as a first-, second- or third-line therapy;
- our ability, or the ability of any future collaborators, to offer the product for sale at competitive prices;
- the product's convenience and ease of administration compared to alternative treatments;
- the willingness of the target patient population to try, and of physicians to prescribe, the product;
- limitations or warnings, including distribution or use restrictions contained in the product's approved labeling;
- the strength of sales, marketing and distribution support;
- changes in the standard of care for the targeted indications for the product; and
- availability and adequacy of coverage and reimbursement from government payors, managed care plans and other third-party payors.

Any failure by KarXT or any other potential product candidate of ours that obtains regulatory approval to achieve market acceptance or commercial success would adversely affect our business prospects.

If we fail to develop and commercialize KarXT for additional indications or fail to discover, develop and commercialize other product candidates, we may be unable to grow our business and our ability to achieve our strategic objectives would be impaired.

Although the development and commercialization of KarXT for the treatment of psychosis in patients with schizophrenia and AD as well as pain is our primary focus, as part of our longer-term growth strategy, we plan to evaluate KarXT in other indications and develop other product candidates. We intend to evaluate internal opportunities from KarXT or other potential product candidates, and also

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may choose to in-license or acquire other product candidates as well as commercial products to treat patients suffering from other disorders with significant unmet medical needs and limited treatment options. These other potential product candidates will require additional, time-consuming development efforts prior to commercial sale, including preclinical studies, clinical trials and approval by the FDA and/or applicable foreign regulatory authorities. All product candidates are prone to the risks of failure that are inherent in pharmaceutical product development, including the possibility that the product candidate will not be shown to be sufficiently safe and effective for approval by regulatory authorities. In addition, we cannot assure you that any such products that are approved will be manufactured or produced economically, successfully commercialized or widely accepted in the marketplace or be more effective than other commercially available alternatives.

Research programs to identify product candidates require substantial technical, financial and human resources, whether or not any product candidates are ultimately identified. Our research programs may initially show promise in identifying potential product candidates, yet fail to yield product candidates for clinical development for many reasons, including the following:

- the research methodology used may not be successful in identifying potential product candidates;
- competitors may develop alternatives that render our product candidates obsolete;
- product candidates that we develop may nevertheless be covered by third parties' patents or other exclusive rights;
- a product candidate may, on further study, be shown to have harmful side effects or other characteristics that indicate it is unlikely to be effective or otherwise does not meet applicable regulatory criteria;
- a product candidate may not be capable of being produced in commercial quantities at an acceptable cost, or at all; and
- a product candidate may not be accepted as safe and effective by patients, the medical community or third-party payors.

If we are unsuccessful in identifying and developing additional product candidates, our potential for growth and achieving our strategic objectives may be impaired.

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

Because we have limited financial and managerial resources, we intend to focus on developing product candidates for specific indications that we identify as most likely to succeed, in terms of both their potential for regulatory approval and commercialization. As a result, we may forego or delay pursuit of opportunities with other product candidates or for other indications that may 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 research and development programs and product candidates for specific indications may not yield any commercially viable product candidates. 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 the product candidate.

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The market for KarXT for schizophrenia, AD and pain and any other product candidates we may develop may be smaller than we expect.

Our estimates of the potential market opportunity for KarXT for the treatment of psychosis in patients with schizophrenia and AD and in pain as well as any other product candidates include several key assumptions based on our industry knowledge, industry publications and third-party research reports. There can be no assurance that any of these assumptions are, or will remain, accurate. If the actual market for KarXT for these or other indications, or for any other product candidate 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.

Competitive products may reduce or eliminate the commercial opportunity for KarXT for our current or future indications. If our competitors develop technologies or product candidates more rapidly than we do, or their technologies are more effective or safer than ours, our ability to develop and successfully commercialize KarXT may be adversely affected.

The clinical and commercial landscape for the treatment of psychosis in patients with schizophrenia and AD as well as in pain is highly competitive and subject to rapid and significant technological change. We face competition with respect to our indications for KarXT and will face competition with respect to any other drug candidates that we may seek to develop or commercialize in the future, from major pharmaceutical companies, specialty pharmaceutical companies and biotechnology companies worldwide. There are a number of large pharmaceutical and biotechnology companies that currently market and sell drugs or are pursuing the development of drug candidates for the treatment of the indications that we are pursuing. Potential competitors also include academic institutions, government agencies and other public and private research organizations that conduct research, seek patent protection and establish collaborative arrangements for research, development, manufacturing and commercialization.

Although there are no FDA-approved drugs for the negative and cognitive symptoms of schizophrenia, many large pharmaceutical companies market FDA-approved drugs for the treatment of the psychotic symptoms of schizophrenia. These drugs include: Abilify, marketed by Bristol-Myers Squibb Company, Zyprexa, marketed by Eli Lilly, Vraylar, marketed by Allergan, Clozaril, marketed by Mylan Products Ltd., and Latuda, marketed by Sumitomo Dainippon Pharma Co., Ltd. Similarly, while there are currently no FDA-approved treatments for psychosis related to AD, patients with AD are prescribed drugs for enhancing their cognition, and include acetylcholinesterase inhibitors such as, donepezil, galantamine, rivastigmine and memantine. These medications are available generically although specific dosage forms and combinations are proprietary and marketed by large pharmaceutical companies such as, Allergan, Janssen Pharmaceuticals NV, Novartis International AG and Pfizer Inc. Furthermore, patients with AD may be prescribed antipsychotic medications that are indicated and approved for schizophrenia.

The current standard of care for neuropathic and inflammatory pain include opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), topical agents, anticonvulsants and antidepressants. We are aware of many FDA-approved drugs for the treatment of neuropathic and inflammatory pain, including Lyrica, marketed by Pfizer Inc., Suboxone, marketed by Reckitt Benckiser Group plc, Oxecta, marketed by Pfizer Inc., and OxyContin, manufactured by Purdue Pharma.

We believe that a significant number of product candidates are currently under development for the same indications we are currently pursuing, and may become commercially available in the future, for the treatment of conditions for which we may try to develop product candidates. Our potential competitors include large pharmaceutical and biotechnology companies, specialty pharmaceutical and generic drug companies, academic institutions, government agencies and research institutions.

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Our competitors may have significantly greater financial resources, established presence in the market, expertise in research and development, manufacturing, preclinical and clinical testing, obtaining regulatory approvals and reimbursement and marketing approved products than we do. Accordingly, our competitors may be more successful than we may be in obtaining regulatory approval for therapies and achieving widespread market acceptance. Our competitors' products may be more effective, or more effectively marketed and sold, than any product candidate we may commercialize and may render our therapies obsolete or non-competitive before we can recover development and commercialization expenses. If KarXT is approved for the indications we are currently pursuing, it could compete with a range of therapeutic treatments that are in development. In addition, our competitors may succeed in developing, acquiring or licensing technologies and drug products that are more effective or less costly than KarXT or any other product candidates that we may develop, which could render our product candidates obsolete and noncompetitive.

If we obtain approval for KarXT or any other future product candidate, we may face competition based on many different factors, including the efficacy, safety and tolerability of our products, the ease with which our products can be administered, the timing and scope of regulatory approvals for these products, the availability and cost of manufacturing, marketing and sales capabilities, price, reimbursement coverage and patent position. Existing and future competing products could present superior treatment alternatives, including being more effective, safer, less expensive or marketed and sold more effectively than any products we may develop. Competitive products may make any products we develop obsolete or noncompetitive before we recover the expense of developing and commercializing our product candidates. Such competitors could also recruit our employees, which could negatively impact our level of expertise and our ability to execute our business plan. Mergers and acquisitions in the pharmaceutical and biotechnology industries may result in even more resources being concentrated among a small number of competitors.

In addition, our competitors may obtain patent protection, regulatory exclusivities or FDA approval and commercialize products more rapidly than we do, which may impact future approvals or sales of any of our product candidates that receive regulatory approval. If the FDA approves the commercial sale of KarXT or any other product candidate, we will also be competing with respect to marketing capabilities and manufacturing efficiency. We expect competition among products will be based on product efficacy and safety, the timing and scope of regulatory approvals, availability of supply, marketing and sales capabilities, product price, reimbursement coverage by government and private third-party payers, regulatory exclusivities and patent position. Our profitability and financial position will suffer if our product candidates receive regulatory approval, but cannot compete effectively in the marketplace.

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 and other early stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These third parties compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites, as well as in acquiring technologies complementary to, or necessary for, our programs.

KarXT is a patented combination of xanomeline and trospium, an FDA-approved generic drug, which exposes us to additional risks.

We are developing KarXT as a combination of xanomeline and trospium, which is currently approved by the FDA for the treatment of overactive bladder. Even if KarXT were to receive marketing approval or be commercialized, we would continue to be subject to the risks that the FDA or similar regulatory authorities could revoke approval of trospium or that safety, efficacy, manufacturing or supply issues could arise with trospium. This could result in our own products being removed from the market or being less commercially successful.

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We may be unable to prevent third parties from selling, making, promoting, manufacturing, or distributing alternative combination therapies with xanomeline, or xanomeline as a single therapeutic.

We currently have two issued patents directed to an oral medicament comprising certain doses of xanomeline in combination with certain doses of trospium chloride and two issued patents directed to methods for treating central nervous system disorders using combinations of certain oral doses of xanomeline and certain oral doses of trospium. These patents would not prevent a third-party from creating, making and marketing alternative combination therapies that fall outside the scope of the patent claims. There can be no assurance that any such alternative combination therapies with xanomeline, or xanomeline as a single therapeutic, will not be therapeutically equivalent or commercially feasible. In the event an alternative combination with xanomeline, or xanomeline as a single therapeutic, is developed and approved for use in indications that we may seek approval for, the marketability and commercial success of KarXT, if approved, could be materially harmed.

If the FDA or comparable foreign regulatory authorities approve generic versions of KarXT or any other product candidate of ours that receives regulatory approval, or such authorities do not grant our products appropriate periods of non-patent exclusivity before approving generic versions of such products, the sales of such products could be adversely affected.

Once an NDA is approved, the product covered thereby becomes a "listed drug" in the FDA's publication, "*Approved Drug Products with Therapeutic Equivalence Evaluations*," or the Orange Book. Manufacturers may seek approval of generic versions of reference listed drugs through submission of abbreviated new drug applications, or ANDAs, in the United States. In support of an ANDA, a generic manufacturer generally must show that its product has the same active ingredient(s), dosage form, strength, route of administration, conditions of use and labeling as the reference listed drug and that the generic version is bioequivalent to the reference listed drug, meaning, in part, that it is absorbed in the body at the same rate and to the same extent. Generic products may be significantly less costly to bring to market than the reference listed drug and companies that produce generic products are generally able to offer them at lower prices. Moreover, many states allow or require substitution of therapeutically equivalent generic drugs at the pharmacy level even if the branded drug is prescribed. Thus, following the introduction of a generic drug, a significant percentage of the sales of any branded product or reference listed drug may be lost to the generic product.

The FDA may not approve an ANDA for a generic product until any applicable period of non-patent exclusivity for the reference listed drug has expired. The Federal Food, Drug, and Cosmetic Act, or FDCA, provides a period of five years of non-patent exclusivity for a new drug containing a new chemical entity, or NCE. Specifically, in cases where such exclusivity has been granted, an ANDA may not be filed with the FDA until the expiration of five years unless the submission is accompanied by a Paragraph IV certification that a patent covering the listed drug is invalid, unenforceable or will not be infringed by the generic product, in which case the applicant may submit its application four years following approval of the listed drug. It is unclear whether the FDA will treat the xanomeline in our product candidates as an NCE and, therefore, afford them five years of NCE data exclusivity if approved. If any product we develop does not receive five years of NCE exclusivity, the FDA may approve generic versions of such product three years after its date of approval, subject to the requirement that the ANDA applicant certifies to any patents listed for our products in the Orange Book. Three-year exclusivity is given to a drug if it contains an active moiety that has previously been approved, and the NDA includes reports of one or more new clinical investigations, other than bioavailability or bioequivalence studies, that were conducted by or for the applicant and are essential to the approval of the NDA. If approved, manufacturers may seek to launch these generic products following the expiration of the applicable marketing exclusivity period, even if we still have patent protection for our product.

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Competition that our products, if approved, may face from generic versions of our products could negatively impact our future revenue, profitability and cash flows and substantially limit our ability to obtain a return on our investments in those product candidates.

We currently have no marketing, sales or distribution infrastructure. If we are unable to develop our sales, marketing and distribution capability on our own or through collaborations with marketing partners, we will not be successful in commercializing our product candidates.

We currently have no marketing, sales or distribution capabilities. If KarXT is approved for the treatment of psychosis in patients with schizophrenia and AD, we intend to establish a sales and marketing organization, either on our own or in collaboration with third parties, with technical expertise and supporting distribution capabilities to commercialize the approved product in key territories, which will require substantial additional resources. Some or all of these costs may be incurred in advance of any approval of KarXT. Any failure or delay in the development of our or third parties' internal sales, marketing and distribution capabilities would adversely impact the commercialization of KarXT and other future product candidates.

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

- our inability to recruit and retain adequate numbers of effective sales and marketing personnel;
- the inability of sales personnel to obtain access to or persuade adequate numbers of physicians to prescribe any future products;
- 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.

With respect to our existing and future product candidates, we may choose to collaborate with third parties that have direct sales forces and established distribution systems to serve as an alternative to our own sales force and distribution systems. Our product revenue may be lower than if we directly marketed or sold our products, if approved. In addition, any revenue we receive will depend in whole or in part upon the efforts of these third parties, which may not be successful and are generally not within our control. If we are not successful in commercializing any approved products, our future product revenue will suffer and we may incur significant additional losses.

If we do not establish sales and marketing capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our product candidates.

Any of our current and future product candidates for which we, or any future collaborators, obtain regulatory approval in the future will be subject to ongoing obligations and continued regulatory review, which may result in significant additional expense. If approved, our product candidates could be subject to post-marketing restrictions or withdrawal from the market and we, or any future collaborators, may be subject to substantial penalties if we, or they, fail to comply with regulatory requirements or if we, or they, experience unanticipated problems with our products following approval.

Any of our product candidates for which we, or any future collaborators, obtain regulatory approval, as well as the manufacturing processes, post-approval studies, labeling, advertising and promotional activities for such product, among other things, will be subject to ongoing requirements of and review by the FDA and other regulatory authorities. These requirements include submissions of safety and other post-marketing information and reports, registration and listing requirements,

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requirements relating to manufacturing, quality control, quality assurance and corresponding maintenance of records and documents, requirements regarding the distribution of samples to physicians and recordkeeping. We and our contract manufacturers will also be subject to user fees and periodic inspection by the FDA and other regulatory authorities to monitor compliance with these requirements and the terms of any product approval we may obtain. Even if regulatory approval of a product candidate is granted, the approval may be subject to limitations on the indications or uses for which the product may be marketed or to the conditions of approval, including the requirement to implement a Risk Evaluation and Mitigation Strategy, or REMS.

The FDA and other regulatory authorities may also impose requirements for costly post-marketing studies or clinical trials and surveillance to monitor the safety or efficacy of a product. The FDA and other agencies, including the Department of Justice, closely regulate and monitor the post-approval marketing and promotion of products to ensure that they are manufactured, marketed and distributed only for the approved indications and in accordance with the provisions of the approved labeling. The FDA imposes stringent restrictions on manufacturers' communications regarding off-label use. However, companies may share truthful and not misleading information that is otherwise consistent with a product's FDA approved labeling. If we, or any future collaborators, do not market any of our product candidates for which we, or they, receive regulatory approval for only their approved indications, we, or they, may be subject to warnings or enforcement action for off-label marketing if it is alleged that we are doing so. Violation of the FDCA and other statutes relating to the promotion and advertising of prescription drugs may lead to investigations or allegations of violations of federal and state health care fraud and abuse laws and state consumer protection laws, including the False Claims Act.

In addition, later discovery of previously unknown adverse events or other problems with our products or their manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may yield various results, including:

- restrictions on the manufacturing of such products;
- restrictions on the labeling or marketing of such products;
- restrictions on product distribution or use;
- requirements to conduct post-marketing studies or clinical trials;
- warning letters or untitled letters;
- withdrawal of the products from the market;
- refusal to approve pending applications or supplements to approved applications that we submit;
- recall of products;
- restrictions on coverage by third-party payors;
- fines, restitution or disgorgement of profits or revenues;
- exclusion from federal health care programs such as Medicare and Medicaid;
- suspension or withdrawal of regulatory approvals;
- refusal to permit the import or export of products;
- product seizure; or
- injunctions or the imposition of civil or criminal penalties.

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Obtaining and maintaining marketing approval of our product candidates in one jurisdiction does not mean that we will be successful in obtaining marketing approval of our product candidates in other jurisdictions. Our failure to obtain regulatory approval in foreign jurisdictions would prevent our product candidates from being marketed abroad, and any approval we are granted for KarXT or any of our other product candidates in the United States would not assure approval of product candidates in foreign jurisdictions.

In order to market any products outside of the United States, we must establish and comply with numerous and varying regulatory requirements of other countries regarding clinical trial design, safety and efficacy. Clinical trials conducted in one country may not be accepted by regulatory authorities in other countries, and regulatory approval in one country does not mean that regulatory approval will be obtained in any other country. Approval procedures vary among countries and can involve additional product testing and validation and additional administrative review periods. Seeking foreign regulatory approvals could result in significant delays, difficulties and costs for us and may require additional preclinical studies or clinical trials which would be costly and time consuming and could delay or prevent introduction of KarXT or any of our other product candidates in those countries. We do not have experience in obtaining regulatory approval in international markets. If we or our partners fail to comply with regulatory requirements or to obtain and maintain required approvals, our target market will be reduced and our ability to realize the full market potential of our product candidates will be harmed.

Additionally, on June 23, 2016, the electorate in the United Kingdom voted in favor of leaving the European Union, commonly referred to as Brexit. On March 29, 2017, the country formally notified the European Union of its intention to withdraw pursuant to Article 50 of the Lisbon Treaty, scheduled to be effective March 29, 2019. To date, no formal withdrawal agreement has been reached between the United Kingdom and the European Union, despite the passage of the date on which it was expected that the United Kingdom's membership in the European Union would terminate. Since a significant proportion of the regulatory framework in the United Kingdom is derived from European Union directives and regulations, the referendum could materially impact the regulatory regime with respect to the approval of our product candidates in the United Kingdom or the European Union. Any delay in obtaining, or an inability to obtain, any regulatory approvals, as a result of Brexit or otherwise, would prevent us from commercializing our product candidates in the United Kingdom and/or the European Union and restrict our ability to generate revenue and achieve and sustain profitability. If any of these outcomes occur, we may be forced to restrict or delay efforts to seek regulatory approval in the United Kingdom and/or European Union for our product candidates, which could significantly and materially harm our business.

Even if we, or any future collaborators, are able to commercialize any product candidate that we, or they, develop, the product may become subject to unfavorable pricing regulations or third-party payor coverage and reimbursement policies, any of which could harm our business.

Patients who are provided medical treatment for their conditions generally rely on third party payors to reimburse all or part of the costs associated with their treatment. Therefore, our ability, and the ability of any future collaborators to commercialize any of our product candidates will depend in part on the extent to which coverage and reimbursement for these products and related treatments will be available from third-party payors including government health administration authorities and private health coverage insurers. Third-party payors decide which medications they will cover and establish reimbursement levels. We cannot be certain that coverage will be available and reimbursement will be adequate for KarXT for our initial or potential additional indications or for any other potential product candidates. Also, we cannot be certain that reimbursement policies will not reduce the demand for, or the price paid for, our products.

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If coverage and reimbursement are not available, or reimbursement is available only to limited levels, we, or any future collaborators, may be limited in our ability to successfully commercialize our product candidates. Even if coverage is provided, the approved reimbursement amount may not be high enough to allow us, or any future collaborators, to establish or maintain pricing sufficient to realize a sufficient return on our or their investment. In the United States, no uniform policy of coverage and reimbursement for products exists among third-party payors and coverage and reimbursement for products can differ significantly from payor to payor. As a result, the coverage determination process is often a time-consuming and costly process that will 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 applied consistently or obtained in the first instance.

There is significant uncertainty related to third-party payor coverage and reimbursement of newly approved drugs. Regulatory approvals, pricing and reimbursement for new drug products vary widely from country to country. In the United States, the principal decisions about reimbursement for new medicines are typically made by the Centers for Medicare & Medicaid Services, or CMS, an agency within the U.S. Department of Health and Human Services, as CMS decides whether and to what extent a new medicine will be covered and reimbursed under Medicare. Private payors tend to follow CMS to a substantial degree. It is difficult to predict what CMS will decide with respect to reimbursement for novel products such as ours. Reimbursement agencies in Europe may be more conservative than CMS, but ultimately make their own coverage determinations. Outside the United States, certain countries, including a number of member states of the European Union, set prices and reimbursement for pharmaceutical products, or medicinal products, as they are commonly referred to in the European Union, with limited participation from the marketing authorization holders. We cannot be sure that such prices and reimbursement will be acceptable to us or our collaborators. If the regulatory authorities in these foreign jurisdictions set prices or reimbursement levels that are not commercially attractive for us or our collaborators, our revenues from sales by us or our collaborators, and the potential profitability of our drug products, in those countries would be negatively affected. An increasing number of countries are taking initiatives to attempt to reduce large budget deficits by focusing cost-cutting efforts on pharmaceuticals for their state-run health care systems. These international price control efforts have impacted all regions of the world, but have been most drastic in the European Union. Additionally, some countries require approval of the sale price of a product before it can be marketed. In many countries, the pricing review period begins after marketing or product licensing approval is granted. As a result, we might obtain marketing approval for a product in a particular country, but then may experience delays in the reimbursement approval of our product or be subject to price regulations that would delay our commercial launch of the product, possibly for lengthy time periods, which could negatively impact the revenues we are able to generate from the sale of the product in that particular country.

The healthcare industry is acutely focused on cost containment, both in the United States and elsewhere. Government authorities and other third-party payors have attempted to control costs by limiting coverage and the amount of reimbursement for certain medications, which could affect our ability or that of any future collaborators to sell our product candidates profitably. For example, the Trump administration recently released a “Blueprint,” to reduce the cost of drugs. The Trump administration’s Blueprint contains certain measures that the U.S. Department of Health and Human Services is already working to implement. At the state level, legislatures are increasingly 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. Payors may not view our products, if any, as cost-effective, and coverage and reimbursement may not be available to our customers, or those of any future collaborators, or may not be sufficient to allow our products, if any, to be marketed on a competitive basis. Cost-control initiatives could cause us, or any future collaborators, to decrease

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the price we, or they, might establish for products, which could result in lower than anticipated product revenues. If the prices for our products, if any, decrease or if governmental and other third-party payors do not provide coverage or adequate reimbursement, our prospects for revenue and profitability will suffer.

There may also be delays in obtaining coverage and reimbursement for newly approved drugs, and coverage may be more limited than the indications for which the drug is approved by the FDA or comparable foreign regulatory authorities. Moreover, eligibility for reimbursement does not imply that any drug will be paid for in all cases or at a rate that covers our costs, including research, development, manufacture, sale and distribution. Reimbursement rates may vary, by way of example, according to the use of the product and the clinical setting in which it is used. Reimbursement rates may also be based on reimbursement levels already set for lower cost drugs or may be incorporated into existing payments for other services.

In addition, increasingly, third-party payors are requiring higher levels of evidence of the benefits and clinical outcomes of new technologies and are challenging prices. We cannot be sure that coverage will be available for any product candidate that we, or any future collaborator, commercialize and, if available, that the reimbursement rates will be adequate. Further, the net reimbursement for drug products may be subject to additional reductions if there are changes to laws that presently restrict imports of drugs from one country to another. An inability to promptly obtain coverage and adequate payment rates from both government-funded and private payors for any of our product candidates for which we, or any future collaborator, obtain regulatory approval could significantly harm our operating results, our ability to raise capital needed to commercialize products and our overall financial condition.

We may seek Breakthrough Therapy Designation by the FDA for a product candidate that we develop, and we may be unsuccessful. If we are successful, the designation may not lead to a faster development or regulatory review or approval process, and it does not increase the likelihood that our product candidates will receive marketing approval.

We may seek Breakthrough Therapy Designation for any product candidate that we develop. A breakthrough therapy is defined as a drug that 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 currently approved therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. For drugs that have been designated as breakthrough therapies, interaction and communication between the FDA and the sponsor of the trial can help to identify the most efficient path for clinical development while minimizing the number of patients placed in ineffective control regimens. Drugs designated as breakthrough therapies by the FDA are also eligible for accelerated approval and priority review.

Designation as a breakthrough therapy is within the discretion of the FDA. Accordingly, even if we believe a product candidate we develop meets the criteria for designation as a breakthrough therapy, the FDA may disagree and instead determine not to make such designation. In any event, the receipt of Breakthrough Therapy Designation for a product candidate may not result in a faster development process, review or approval compared to drugs considered for approval under conventional FDA procedures and does not assure ultimate approval by the FDA. In addition, even if the product candidates we develop qualify as breakthrough therapies, the FDA may later decide that the drugs no longer meet the conditions for qualification and rescind the designation.

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We may seek Fast Track Designation by the FDA for a product candidate that we develop, and we may be unsuccessful. If we are successful, the designation may not actually lead to a faster development or regulatory review or approval process.

We may seek Fast Track Designation for the product candidates we develop. If a product is intended for the treatment of a serious or life-threatening condition and preclinical or clinical data demonstrate the potential to address an unmet medical need for this condition, the product sponsor may apply for Fast Track Designation. The FDA has broad discretion whether or not to grant this designation, so even if we believe a particular product candidate is eligible for this designation, we cannot assure you that the FDA would decide to grant it. Even if we do receive Fast Track Designation, we may not experience a faster development process, review or approval compared to conventional FDA procedures. The FDA may rescind the Fast Track Designation if it believes that the designation is no longer supported by data from our clinical development program.

Product liability lawsuits against us or any of our future collaborators could divert our resources and attention, cause us to incur substantial liabilities and limit commercialization of our product candidates.

We are exposed to potential product liability and professional indemnity risks that are inherent in the research, development, manufacturing, marketing and use of pharmaceutical products. Currently, we have no products that have been approved for commercial sale; however, the use of our product candidates by us and any collaborators in clinical trials, and the sale of these product candidates, if approved, in the future, may expose us to liability claims. We face an inherent risk of product liability lawsuits related to the use of our product candidates in elderly patients and will face an even greater risk if product candidates are approved by regulatory authorities and introduced commercially. Product liability claims may be brought against us or our partners by participants enrolled in our clinical trials, patients, health care providers, pharmaceutical companies, our collaborators or others using, administering or selling any of our future approved products. If we cannot successfully defend ourselves against any such claims, we may incur substantial liabilities or be required to limit commercialization of our product candidates. Regardless of the merits or eventual outcome, liability claims may result in:

- decreased demand for any of our future approved products;
- injury to our reputation;
- withdrawal of clinical trial participants;
- termination of clinical trial sites or entire trial programs;
- significant litigation costs;
- substantial monetary awards to, or costly settlements with, patients or other claimants;
- product recalls or a change in the indications for which they may be used;
- loss of revenue;
- diversion of management and scientific resources from our business operations; and
- the inability to commercialize our product candidates.

Although the clinical trial process is designed to identify and assess potential side effects, clinical development does not always fully characterize the safety and efficacy profile of a new medicine, and it is always possible that a drug, even after regulatory approval, may exhibit unforeseen side effects. If our product candidates were to cause adverse side effects during clinical trials or after approval, we may be exposed to substantial liabilities. Physicians and patients may not comply with any warnings

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that identify known potential adverse effects and patients who should not use our product candidates. If any of our product candidates are approved for commercial sale, we will be highly dependent upon consumer perceptions of us and the safety and quality of our products. We could be adversely affected if we are subject to negative publicity associated with illness or other adverse effects resulting from patients' use or misuse of our products or any similar products distributed by other companies.

Although we maintain product liability insurance coverage in the amount of up to $10.0 million in the aggregate, including clinical trial liability, this insurance may not fully cover potential liabilities that we may incur. The cost of any product liability litigation or other proceeding, even if resolved in our favor, could be substantial. We will need to increase our insurance coverage if we commercialize any product that receives regulatory approval. In addition, insurance coverage is becoming increasingly expensive. If we are unable to maintain sufficient insurance coverage at an acceptable cost or to otherwise protect against potential product liability claims, it could prevent or inhibit the development and commercial production and sale of our product candidates, which could harm our business, financial condition, results of operations and prospects.

Even if we, or any future collaborators, obtain regulatory approvals for our product candidates, the terms of approvals and ongoing regulation of our products may limit how we manufacture and market our products, which could impair our ability to generate revenue.

Once regulatory approval has been granted, an approved product and its manufacturer and marketer are subject to ongoing review and extensive regulation. We, and any future collaborators, must therefore comply with requirements concerning advertising and promotion for any of our product candidates for which we or they obtain regulatory approval. Promotional communications with respect to prescription drugs are subject to a variety of legal and regulatory restrictions and must be consistent with the information in the product's approved labeling. Thus, we and any future collaborators will not be able to promote any products we develop for indications or uses for which they are not approved.

In addition, manufacturers of approved products and those manufacturers' facilities are required to comply with extensive FDA requirements, including ensuring that quality control and manufacturing procedures conform to current Good Manufacturing Practices, or cGMPs, which include requirements relating to quality control and quality assurance as well as the corresponding maintenance of records and documentation and reporting requirements. We, our contract manufacturers, any future collaborators and their contract manufacturers could be subject to periodic unannounced inspections by the FDA to monitor and ensure compliance with cGMPs. Despite our efforts to inspect and verify regulatory compliance, one or more of our third-party manufacturing vendors may be found on regulatory inspection by FDA or other authorities to be not in compliance with cGMP regulations, which may result in shutdown of the third-party vendor or invalidation of drug product lots or processes. In some cases, a product recall may be warranted or required, which would materially affect our ability to supply and market our drug products.

Accordingly, assuming we, or any future collaborators, receive regulatory approval for one or more of our product candidates, we, and any future collaborators, and our and their contract manufacturers will continue to expend time, money and effort in all areas of regulatory compliance, including manufacturing, production, product surveillance and quality control.

If we, and any future collaborators, are not able to comply with post-approval regulatory requirements, we, and any future collaborators, could have the regulatory approvals for our products withdrawn by regulatory authorities and our, or any future collaborators', ability to market any future products could be limited, which could adversely affect our ability to achieve or sustain profitability. Further, the cost of compliance with post-approval regulations may have a negative effect on our operating results and financial condition.

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Our relationships with healthcare providers, physicians and third-party payors will be subject to applicable anti-kickback, fraud and abuse, privacy and transparency and other healthcare laws and regulations, which could expose us to criminal sanctions, civil penalties, exclusion from government healthcare programs, contractual damages, reputational harm and diminished profits and future earnings.

Healthcare providers, physicians and third-party payors will play a primary role in the recommendation and prescription of any products for which we obtain regulatory approval. Our arrangements with third party payors, healthcare providers and physicians may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we conduct our operations, including how we research, market, sell and distribute any products for which we obtain regulatory approval. These include the following:

- **Anti-Kickback Statute**—The federal Anti-Kickback Statute prohibits, among other things, persons from knowingly and willfully soliciting, offering, paying, receiving or providing remuneration, directly or indirectly, overtly or covertly, 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 or arranging of, any good or service, for which payment may be made under a federal healthcare program such as Medicare and Medicaid. This statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand, and prescribers, purchasers and formulary managers, among others, on the other. A person or entity can be found guilty of violating the federal Anti-Kickback Statute without actual knowledge of the statute or specific intent to violate it. 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 civil False Claims Act or federal civil money penalties statute;
- **Federal civil and criminal false claims laws and civil monetary penalty laws, including False Claims Laws**—The federal civil and criminal false claims laws, including the federal civil False Claims Act, and federal civil monetary penalties laws which prohibit individuals or entities from, among other things, knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false, fictitious or fraudulent; knowingly making or causing a false statement or record material to a false or fraudulent claim or obligation to pay or transmit money or property to the federal government; or knowingly concealing or knowingly and improperly avoiding or decreasing an obligation to pay money to the federal government A claim that includes items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim under the federal civil False Claims Act. Manufacturers can be held liable under the False Claims Act even when they do not submit claims directly to government payors if they are deemed to “cause” the submission of false or fraudulent claims. The False Claims Act also permits a private individual acting as a “whistleblower” to bring *qui tam* actions on behalf of the federal government alleging violations of the False Claims Act and to share in any monetary recovery;
- **HIPAA**—The federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which created additional federal criminal statutes that prohibit knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program or obtain, by means of false or fraudulent pretenses, representations, or promises, any of the money or property owned by, or under the custody or control of, any healthcare benefit program, regardless of the payor (e.g., public or private) and knowingly and willfully falsifying, concealing or covering up by any trick or device a material fact or making any materially false statements in connection with the delivery of, or payment for, healthcare benefits, items or services relating to healthcare matters. Similar to the federal Anti-Kickback Statute, a person or entity can be found guilty of violating HIPAA without actual knowledge of the statute or specific intent to

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violate it. HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, which impose requirements on certain covered healthcare providers, health plans, and healthcare clearinghouses as well as their respective business associates that perform services for them that involve the use, or disclosure of, individually identifiable health information, relating to the privacy, security and transmission of individually identifiable health information. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions;

- **Transparency Requirements**—The federal Physician Payments Sunshine Act, created under the ACA, and its implementing regulations, require manufacturers of drugs, devices, biologicals and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program to report annually to the U.S. Department of Health and Human Services under the Open Payments Program, information related to payments or other transfers of value made to physicians, certain other healthcare professionals, and teaching hospitals, as well as ownership and investment interests held by physicians, certain other healthcare professional and their immediate family members; and

- **Analogous State and Foreign Laws**—Analogous state and foreign fraud and abuse laws and regulations, such as state anti-kickback and false claims laws, which may be broader in scope and apply regardless of payor. These laws are enforced by various state agencies and through private actions. Some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant federal government compliance guidance, require drug manufacturers to report information related to payments and other transfers of value to physicians and other healthcare providers, and restrict marketing practices or require disclosure of marketing expenditures or drug pricing. Some state and local laws require the registration of pharmaceutical sales representatives. State and foreign laws also govern the privacy and security of health information in some circumstances. These data privacy and security laws may differ from each other in significant ways and often are not pre-empted by HIPAA, which may complicate compliance efforts.

Efforts to ensure that our business arrangements with third parties, and our business generally, will comply with applicable healthcare laws and regulations will involve substantial costs. It is possible that governmental authorities will conclude that our business practices may not comply with current or future statutes, regulations, agency guidance or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, imprisonment, disgorgement, exclusion from government funded healthcare programs, such as Medicare and Medicaid, integrity and oversight agreements to resolve allegations of non-compliance, contractual damages, reputational harm, diminished profits and future earnings, and the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our results of operations. Defending against any such actions can be costly, time-consuming and may require significant financial and personnel resources. Therefore, even if we are successful in defending against any such actions that may be brought against us, our business may be impaired. If any of the physicians or other healthcare providers or entities with whom we expect to do business is found to be not in compliance with applicable laws, they may be subject to significant criminal, civil or administrative sanctions, including exclusions from government funded healthcare programs.

The provision of benefits or advantages to physicians to induce or encourage the prescription, recommendation, endorsement, purchase, supply, order or use of medicinal products is generally not

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permitted in the countries that form part of the European Union. Some European Union Member States, like the United Kingdom, through the United Kingdom Bribery Act 2010, have enacted laws explicitly prohibiting the provision of these types of benefits and advantages. Infringements of these laws can result in substantial fines and imprisonment.

Payments made to physicians in certain European Union Member States (e.g., France or Belgium) must be publicly disclosed. Moreover, agreements with physicians often must be the subject of prior notification and approval by the physician's employer, his or her competent professional organization and/or the regulatory authorities of the individual European Union Member States. These requirements are provided in the European Union Member State national laws, industry codes (e.g. the European Federation of Pharmaceutical Industries and Associations Disclosure and Healthcare Professionals Codes) or professional codes of conduct. Failure to comply with these requirements could result in reputational risk, public reprimands, administrative penalties, fines or imprisonment.

The collection and processing of personal data—including health data—is governed by the European Union-wide General Data Protection Regulation, or GDPR, which became applicable on May 25, 2018, replacing the current data protection laws of each European Union Member State. GDPR applies to any business, regardless of its location, that provides goods or services to residents in the EU. This expansion includes our clinical trial activities in European Union Member States. The GDPR imposes more stringent operational requirements for processors and controllers of personal data, including, for example, special protections for "sensitive information" which includes health and genetic information of data subjects residing in the EU, expanded disclosures about how personal information is to be used, limitations on retention of information, increased requirements pertaining to health data and pseudonymised (i.e., key-coded) data, mandatory data breach notification requirements and higher standards for controllers to demonstrate that they have obtained valid consent for certain data processing activities. GDPR grants individuals the opportunity to object to the processing of their personal information, allows them to request deletion of personal information in certain circumstances, and provides the individual with an express right to seek legal remedies in the event the individual believes his or her rights have been violated. Further, the GDPR imposes strict rules on the transfer of personal data out of the European Union to the United States or other regions that have not been deemed to offer "adequate" privacy protections. The GDPR provides that European Union Member States may make their own further laws and regulations in relation to the processing of genetic, biometric or health data, which could result in differences between Member States, limit our ability to use and share personal data or could cause our costs to increase, and harm our business and financial condition. We are also subject to evolving and strict rules on the transfer of personal data out of the European Union to the United States. Failure to comply with European Union data protection laws may result in fines (for example, of up to €20,000,000 or up to 4% of the total worldwide annual turnover of the preceding financial year (whichever is higher) under the GDPR) and other administrative penalties, which may be onerous and adversely affect our business, financial condition, results of operations and prospects. As a result of the implementation of the GDPR, we may be required to put in place additional mechanisms ensuring compliance with the new data protection rules. There is significant uncertainty related to the manner in which data protection authorities will seek to enforce compliance with GDPR is not yet clear. For example, it is not clear if the authorities will conduct random audits of companies doing business in the EU, or if the authorities will wait for complaints to be filed by individuals who claim their rights have been violated. Enforcement uncertainty and the costs associated with ensuring GDPR compliance be onerous and adversely affect our business, financial condition, results of operations and prospects.

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Current and future legislation may increase the difficulty and cost for us and any collaborators to obtain regulatory approval of and commercialize our product candidates and affect the prices we, or they, may obtain.

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

In March 2010, President Obama signed into law the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, or collectively the ACA. Among the provisions of the ACA of potential importance to our business and our product candidates are the following:

- an annual, non-deductible fee on any entity that manufactures or imports specified branded prescription products and biologic products;
- an increase in the statutory minimum rebates a manufacturer must pay under the Medicaid Drug Rebate Program;
- a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for products that are inhaled, infused, instilled, implanted or injected;
- expansion of healthcare fraud and abuse laws, including the civil False Claims Act and the federal Anti-Kickback Statute, new government investigative powers and enhanced penalties for noncompliance;
- a new Medicare Part D coverage gap discount program, in which manufacturers must agree to offer 50% point-of-sale discounts, which was increased to 70% by the Bipartisan Budget Act of 2018, off negotiated prices of applicable brand products to eligible beneficiaries during their coverage gap period, as a condition for the manufacturer's outpatient products to be covered under Medicare Part D;
- extension of manufacturers' Medicaid rebate liability to individuals enrolled in Medicaid managed care organizations;
- expansion of the entities eligible for discounts under the Public Health Service pharmaceutical pricing program;
- new requirements to report certain financial arrangements with physicians and teaching hospitals;
- a new requirement to annually report product samples that manufacturers and distributors provide to physicians;
- a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research; and
- established the Center for Medicare and Medicaid Innovation within CMS to test innovative payment and service delivery models.

Some of the provisions of the ACA have yet to be implemented, and there have been judicial and Congressional challenges to certain aspects of the ACA, as well as recent efforts by the Trump administration to repeal or replace certain aspects of the ACA. Since January 2017, President Trump

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has signed two executive orders and other directives designed to delay the implementation of certain provisions of the ACA. Concurrently, Congress has considered legislation that would repeal or repeal and replace all or part of the ACA. While Congress has not passed comprehensive repeal legislation, it has enacted laws that modify certain provisions of the ACA. The Tax Cuts and Jobs Act of 2017, or Tax Act, includes a provision that repealed, effective January 1, 2019, the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the "individual mandate." On December 14, 2018, a U.S. District Court Judge in the Northern District of Texas, or the Texas District Court Judge, ruled that the individual mandate is a critical and inseverable feature of the ACA, and therefore, because it was repealed as part of the Tax Act, the remaining provisions of the ACA are invalid as well. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect, and on December 30, 2018 the Texas District Court Judge issued an order staying the judgment pending appeal. It is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA and our business.

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

Moreover, on January 22, 2018, President Trump signed a continuing resolution on appropriations for fiscal year 2018 that delayed the implementation of certain ACA-mandated fees, including the so called "Cadillac" tax on certain high cost employer-sponsored insurance plans, the annual fee imposed on certain health insurance providers based on market share, and the medical device excise tax on non-exempt medical devices. The Bipartisan Budget Act of 2018, also amended the ACA, effective January 1, 2019, by increasing the point-of-sale discount that is owed by pharmaceutical manufacturers who participate in Medicare Part D and closing the coverage gap in most Medicare drug plans, commonly referred to as the "donut hole." In July 2018, CMS published a 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. In addition, CMS has recently published a final rule that would give states greater flexibility, starting in 2020, in setting benchmarks for insurers in the individual and small group marketplaces, which may have the effect of relaxing the essential health benefits required under the ACA for plans sold through such marketplaces. In addition, other legislative changes have been proposed and adopted since the ACA was enacted. In August 2011, the Budget Control Act of 2011, among other things, included aggregate reductions to Medicare payments to providers of 2% per fiscal year, which went into effect in April 2013 and, due to subsequent legislative amendments to the statute, will remain in effect through 2027 unless additional Congressional action is taken. The American Taxpayer Relief Act of 2012, among other things, 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 new laws and regulations may result in additional reductions in Medicare and other healthcare funding and otherwise affect the prices we may obtain for any of our product candidates for which we

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may obtain regulatory approval or the frequency with which any such product candidate is prescribed or used.

There has been increasing legislative and enforcement interest in the United States with respect to drug pricing practices. Specifically, there have been several recent U.S. Congressional inquiries and proposed federal and state legislation designed to, among other things, bring more transparency to drug pricing, reduce the cost of prescription drugs under Medicare, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drugs. At the federal level, the Trump administration's budget proposal for fiscal years 2019 and 2020 contain further drug price control measures that could be enacted during the budget process or in other future legislation, including, for example, measures to permit Medicare Part D plans to negotiate the price of certain drugs under Medicare Part B, to allow some states to negotiate drug prices under Medicaid, and to eliminate cost sharing for generic drugs for low-income patients.

Additionally, the Trump administration released a "Blueprint" to lower drug prices and reduce out of pocket costs of drugs that contains additional proposals to increase drug manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products, and reduce the out of pocket costs of drug products paid by consumers. HHS has already started the process of soliciting feedback on some of these measures and, at the same time, is immediately implementing others under its existing authority. For example, in May 2019, CMS issued a final rule to allow Medicare Advantage Plans the option of using step therapy for Part B drugs beginning January 1, 2020. This final rule codified CMS's policy change that was effective January 1, 2019. Congress and the Trump administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. For example, on September 25, 2019, the Senate Finance Committee introduced the Prescription Drug Pricing Reduction Action of 2019, a bill intended to reduce Medicare and Medicaid prescription drug prices. The proposed legislation would restructure the Part D benefit, modify payment methodologies for certain drugs, and impose an inflation cap on drug price increases. An even more restrictive bill, the Lower Drug Costs Now Act of 2019, was introduced in the House of Representatives on September 19, 2019, and would require the Department of Health and Human Services (HHS) to directly negotiate drug prices with manufacturers. It is unclear whether either of these bills will make it through both chambers and be signed into law, and if either is enacted, what effect it would have on our business.

In addition, individual states have also become increasingly active in passing legislation and implementing regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, to encourage importation from other countries and bulk purchasing.

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

There have been, and likely will continue to be, legislative and regulatory proposals at the foreign, federal and state levels directed at containing or lowering the cost of healthcare. The implementation of cost containment measures or other healthcare reforms may prevent us from being able to generate revenue, attain profitability, or commercialize our product. Such reforms could have an adverse effect

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on anticipated revenue from product candidates that we may successfully develop and for which we may obtain regulatory approval and may affect our overall financial condition and ability to develop product candidates. We cannot predict the initiatives that may be adopted in the future. The continuing efforts of the government, insurance companies, managed care organizations and other payors of healthcare services to contain or reduce costs of healthcare and/or impose price controls may adversely affect:

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

We expect that the ACA, as well as other healthcare reform measures that may be adopted in the future, may result in additional reductions in Medicare and other healthcare funding, more rigorous coverage criteria, lower reimbursement, and new payment methodologies. This could lower the price that we receive for any approved product. Any denial in coverage or reduction in reimbursement from Medicare or other government-funded programs may result in a similar denial or reduction in payments from private payors, which may prevent us from being able to generate sufficient revenue, attain profitability or commercialize our product candidates, if approved.

Governments outside the United States may impose strict price controls, which may adversely affect our revenues, if any.

In some countries, including Member States of the European Union, the pricing of prescription drugs is subject to governmental control. Additional countries may adopt similar approaches to the pricing of prescription drugs. In such countries, pricing negotiations with governmental authorities can take considerable time after receipt of regulatory approval for a product. In addition, there can be considerable pressure by governments and other stakeholders on prices and reimbursement levels, including as part of cost containment measures. Political, economic and regulatory developments may further complicate pricing negotiations, and pricing negotiations may continue after coverage and reimbursement have been obtained. Reference pricing used by various countries and parallel distribution, or arbitrage between low-priced and high-priced countries, can further reduce prices. In some countries, we may be required to conduct a clinical study or other studies that compare the cost-effectiveness of any of our product candidates to other available therapies in order to obtain or maintain reimbursement or pricing approval, which is time-consuming and costly. We cannot be sure that such prices and reimbursement will be acceptable to us or our strategic partners. Publication of discounts by third-party payors or authorities may lead to further pressure on the prices or reimbursement levels within the country of publication and other countries. If pricing is set at unsatisfactory levels or if reimbursement of our products is unavailable or limited in scope or amount, our revenues from sales by us or our strategic partners and the potential profitability of any of our product candidates in those countries would be negatively affected.

Laws and regulations governing any international operations we may have in the future may preclude us from developing, manufacturing and selling certain products outside of the United States and require us to develop and implement costly compliance programs.

If we engage in operations outside of the United States, we must dedicate additional resources to comply with numerous laws and regulations in each jurisdiction in which we plan to operate. The Foreign Corrupt Practices Act, or FCPA, prohibits any U.S. individual or business from paying, offering,

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authorizing payment or offering of anything of value, directly or indirectly, to any foreign official, political party or candidate for the purpose of influencing any act or decision of the foreign entity in order to assist the individual or business in obtaining or retaining business. The FCPA also obligates companies whose securities are listed in the United States to comply with certain accounting provisions requiring us to maintain books and records that accurately and fairly reflect all transactions of the corporation, including international subsidiaries, and to devise and maintain an adequate system of internal accounting controls for international operations.

Compliance with the FCPA is expensive and difficult, particularly in countries in which corruption is a recognized problem. In addition, the FCPA presents particular challenges in the pharmaceutical industry, because, in many countries, hospitals are operated by the government, and doctors and other hospital employees are considered foreign officials. Certain payments to hospitals in connection with clinical trials and other work have been deemed to be improper payments to government officials and have led to FCPA enforcement actions.

Various laws, regulations and executive orders, including export control and trade sanctions laws, also restrict the use and dissemination outside of the United States, or the sharing with certain non-U.S. nationals, of information classified for national security purposes, as well as certain products and technical data relating to those products. If we expand our presence outside of the United States, it will require us to dedicate additional resources to comply with these laws, and these laws may preclude us from developing, manufacturing, or selling certain products and product candidates outside of the United States, which could limit our growth potential and increase our development costs.

The failure to comply with laws governing international business practices may result in substantial civil and criminal penalties and suspension or debarment from government contracting. The Securities and Exchange Commission, or SEC, also may suspend or bar issuers from trading securities on U.S. exchanges for violations of the FCPA's accounting provisions.

If we fail to comply with environmental, health and safety laws and regulations, we could become subject to fines or penalties or incur costs that could harm our business.

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. From time to time and in the future, our operations may involve the use of hazardous and flammable materials, including chemicals and biological materials, and may also produce hazardous waste products. Even if we contract with third parties for the disposal of these materials and waste products, we cannot completely eliminate the risk of contamination or injury resulting from these materials. In the event of contamination or injury resulting from the use or disposal of our hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties for failure to comply with such laws and regulations.

We maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees, but this insurance may not provide adequate coverage against potential liabilities. However, we do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us.

In addition, we may incur substantial costs in order to comply with current or future environmental, health and safety laws and regulations. Environmental laws and regulations may impair our research, development or production efforts. In addition, failure to comply with these laws and regulations may result in substantial fines, penalties or other sanctions.

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Risks Related to Our Dependence on Third Parties

We may seek to establish collaborations and, if we are not able to establish them on commercially reasonable terms, we may have to alter our development and commercialization plans.

The advancement of our product candidates and development programs and the potential commercialization of our current and future product candidates will require substantial additional cash to fund expenses. For some of our programs, we may decide to collaborate with additional pharmaceutical and biotechnology companies with respect to development and potential commercialization. Likely collaborators may include large and mid-size pharmaceutical companies, regional and national pharmaceutical companies and biotechnology companies. In addition, if we are able to obtain regulatory approval for product candidates from foreign regulatory authorities, we may enter into collaborations with international biotechnology or pharmaceutical companies for the commercialization of such product candidates.

We face significant competition in seeking appropriate collaborators. Whether we reach a definitive agreement for a 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 potential differentiation of our product candidate from competing product candidates, design or results of clinical trials, the likelihood of approval by the FDA or comparable foreign regulatory authorities and the regulatory pathway for any such approval, the potential market for the product candidate, the costs and complexities of manufacturing and delivering the product to patients and the potential of competing products. The collaborator may also consider alternative product candidates or technologies for similar indications that may be available for collaboration and whether such a collaboration could be more attractive than the one with us for our product candidate. 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 product revenue.

Collaborations are complex and time-consuming to negotiate and document. Further, 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. Any collaboration agreements that we enter into in the future may contain restrictions on our ability to enter into potential collaborations or to otherwise develop specified product candidates. We may not be able to negotiate 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 the product candidate for which we are seeking to collaborate, 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 enter into collaborations with third parties for the development and commercialization of our product candidates, our prospects with respect to those product candidates will depend in significant part on the success of those collaborations.

We may enter into collaborations for the development and commercialization of certain of our product candidates. If we enter into such collaborations, we will have limited control over the amount and timing of resources that our collaborators will dedicate to the development or commercialization of our product candidates. Our ability to generate revenues from these arrangements will depend on any future collaborators' abilities to successfully perform the functions assigned to them in these arrangements. In addition, any future collaborators may have the right to abandon research or

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development projects and terminate applicable agreements, including funding obligations, prior to or upon the expiration of the agreed upon terms.

Collaborations involving our product candidates pose a number of risks, including the following:

- collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations;
- collaborators may not perform their obligations as expected;
- collaborators may not pursue development and commercialization of our product candidates 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;
- a collaborator with marketing and distribution rights to one or more products may not commit sufficient resources to the marketing and distribution of such product or products;
- disagreements with collaborators, including disagreements over proprietary rights, including trade secrets and intellectual property 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 intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our 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 and, if terminated, may result in a need for 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 is involved in a business combination, it could decide to delay, diminish or terminate the development or commercialization of any product candidate licensed to it by us.

We rely on third parties to assist in conducting our clinical trials. If they do not perform satisfactorily, we may not be able to obtain regulatory approval or commercialize our product candidates, or such approval or commercialization may be delayed, and our business could be substantially harmed.

We have relied upon and plan to continue to rely on third parties, such as contract research organizations, clinical data management organizations, medical institutions and clinical investigators, to conduct our clinical trials and expect to rely on these third parties to conduct clinical trials of any other product candidate that we develop. Any of these third parties may terminate their engagements with us under certain circumstances. We may not be able to enter into alternative arrangements or do so on

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commercially reasonable terms. In addition, there is a natural transition period when a new CRO begins work. As a result, delays may occur, which could negatively impact our ability to meet our expected clinical development timelines and harm our business, financial condition and prospects.

Further, although our reliance on these third parties for clinical development activities limits our control over these activities, we remain responsible for ensuring that each of our trials is conducted in accordance with the applicable protocol, legal and regulatory requirements and scientific standards. Moreover, the FDA requires us to comply with 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. The FDA enforces these GCPs through periodic inspections of trial sponsors, principal investigators, clinical trial sites and IRBs. If we or our third-party contractors fail to comply with applicable GCPs, the clinical data generated in our clinical trials may be deemed unreliable and the FDA may require us to perform additional clinical trials before approving our product candidates, which would delay the regulatory approval process. We cannot be certain that, upon inspection, the FDA will determine that any of our clinical trials comply with GCPs. We are also required to register certain clinical trials and post the results of completed clinical trials on a government-sponsored database, ClinicalTrials.gov, within certain timeframes. Failure to do so can result in fines, adverse publicity and civil and criminal sanctions.

Furthermore, the third parties conducting clinical trials on our behalf are not our employees, and except for remedies available to us under our agreements with such contractors, we cannot control whether or not they devote sufficient time, skill and resources to our ongoing development programs. These contractors may also have relationships with other commercial entities, including our competitors, for whom they may also be conducting clinical trials or other drug development activities, which could impede their ability to devote appropriate time to our clinical programs. If these third parties, including clinical investigators, do not successfully carry out their contractual duties, meet expected deadlines or conduct our clinical trials in accordance with regulatory requirements or our stated protocols, we may not be able to obtain, or may be delayed in obtaining, regulatory approvals for our product candidates. If that occurs, we will not be able to, or may be delayed in our efforts to, successfully commercialize our product candidates. In such an event, our financial results and the commercial prospects for any product candidates that we seek to develop could be harmed, our costs could increase and our ability to generate revenues could be delayed, impaired or foreclosed.

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

Our use of third parties to manufacture our product candidates may increase the risk that we will not have sufficient quantities of our product candidates, products, or necessary quantities of such materials on time or at an acceptable cost.

We do not own or operate manufacturing facilities for the production of clinical or commercial quantities of our product candidates, and we lack the resources and the capabilities to do so. As a result, we currently rely on third parties for the manufacture and supply of the active pharmaceutical ingredients, or APIs, in our product candidates. Our current strategy is to outsource all manufacturing of our product candidates to third parties.

We currently engage third-party manufacturers to provide the APIs of KarXT and for the final drug product formulation of KarXT that is being used in our clinical trials. Although we believe that there are several potential alternative manufacturers who could manufacture KarXT, we may incur added costs

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and delays in identifying and qualifying any such replacement. In addition, we typically order raw materials and services on a purchase order basis and do not enter into long-term dedicated capacity or minimum supply arrangements with any commercial manufacturer. There is no assurance that we will be able to timely secure needed supply arrangements on satisfactory terms, or at all. Our failure to secure these arrangements as needed could have a material adverse effect on our ability to complete the development of our product candidates or, to commercialize them, if approved. We may be unable to conclude agreements for commercial supply with third-party manufacturers, or may be unable to do so on acceptable terms. There may be difficulties in scaling up to commercial quantities and formulation of KarXT, and the costs of manufacturing could be prohibitive.

Even if we are able to establish and maintain arrangements with third-party manufacturers, reliance on third-party manufacturers entails additional risks, including:

- the failure of the third-party manufacturer to comply with applicable regulatory requirements and reliance on third-parties for manufacturing process development, regulatory compliance and quality assurance;
- manufacturing delays if our third-party manufacturers give greater priority to the supply of other products over our product candidates or otherwise do not satisfactorily perform according to the terms of the agreement between us;
- limitations on supply availability resulting from capacity and scheduling constraints of third-parties;
- the possible breach of manufacturing agreements by third-parties because of factors beyond our control;
- the possible termination or non-renewal of the manufacturing agreements by the third-party, at a time that is costly or inconvenient to us; and
- the possible misappropriation of our proprietary information, including our trade secrets and know-how.

If we do not maintain our key manufacturing relationships, we may fail to find replacement manufacturers or develop our own manufacturing capabilities, which could delay or impair our ability to obtain regulatory approval for our products. If we do find replacement manufacturers, we may not be able to enter into agreements with them on terms and conditions favorable to us and there could be a substantial delay before new facilities could be qualified and registered with the FDA and other foreign regulatory authorities.

If KarXT for any of our initial or potential additional indications or any other product candidate is approved by any regulatory agency, we intend to utilize arrangements with third-party contract manufacturers for the commercial production of those products. This process is difficult and time consuming and we may face competition for access to manufacturing facilities as there are a limited number of contract manufacturers operating under cGMPs that are capable of manufacturing our product candidates. Consequently, we may not be able to reach agreement with third-party manufacturers on satisfactory terms, which could delay our commercialization.

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, seizures or voluntary recalls of product candidates, operating restrictions and criminal prosecutions, any of which could significantly affect supplies of our product candidates. The facilities used by our contract manufacturers to manufacture our product candidates must be evaluated by the FDA. We do not control the manufacturing process of, and are completely dependent on, our contract manufacturing partners for compliance with cGMPs. If our

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contract manufacturers cannot successfully manufacture material that conforms to our specifications and the strict regulatory requirements of the FDA or others, we may not be able to secure and/or maintain regulatory approval for our product manufactured at these facilities. 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 finds deficiencies or a comparable foreign regulatory authority 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. Contract manufacturers may face manufacturing or quality control problems causing drug substance production and shipment delays or a situation where the contractor may not be able to maintain compliance with the applicable cGMP requirements. Any failure to comply with cGMP requirements or other FDA, EMA and comparable foreign regulatory requirements could adversely affect our clinical research activities and our ability to develop our product candidates and market our products, if approved.

The FDA and other foreign regulatory authorities require manufacturers to register manufacturing facilities. The FDA and corresponding foreign regulators also inspect these facilities to confirm compliance with cGMPs. Contract manufacturers may face manufacturing or quality control problems causing drug substance production and shipment delays or a situation where the contractor may not be able to maintain compliance with the applicable cGMP requirements. Any failure to comply with cGMP requirements or other FDA, EMA and comparable foreign regulatory requirements could adversely affect our clinical research activities and our ability to develop our product candidates and market our products following approval.

If any third-party manufacturer of our product candidates is unable to increase the scale of its production of our product candidates, and/or increase the product yield of its manufacturing, then our costs to manufacture the product may increase and commercialization may be delayed.

In order to produce sufficient quantities to meet the demand for clinical trials and, if approved, subsequent commercialization of KarXT, or any other product candidates that we may develop, our third-party manufacturers will be required to increase their production and optimize their manufacturing processes while maintaining the quality of the product. The transition to larger scale production could prove difficult. In addition, if our third party manufacturers are not able to optimize their manufacturing processes to increase the product yield for our product candidates, or if they are unable to produce increased amounts of our product candidates while maintaining the quality of the product, then we may not be able to meet the demands of clinical trials or market demands, which could decrease our ability to generate profits and have a material adverse impact on our business and results of operation.

We may need to maintain licenses for active ingredients from third parties to develop and commercialize some of our product candidates, which could increase our development costs and delay our ability to commercialize those product candidates.

Should we decide to use API in any of our product candidates that are proprietary to one or more third parties, we would need to maintain licenses to those active ingredients from those third parties. If we are unable to gain or continue to access rights to these active ingredients prior to conducting preclinical toxicology studies intended to support clinical trials, we may need to develop alternate product candidates from these programs by either accessing or developing alternate active ingredients, resulting in increased development costs and delays in commercialization of these product candidates. If we are unable to gain or maintain continued access rights to the desired active ingredients on commercially reasonable terms or develop suitable alternate active ingredients, we may not be able to commercialize product candidates from these programs.

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Use of third parties to conduct testing of our product candidates in tissues or animals may increase the risk that we will have unsuitable or invalidated data for regulatory submissions and approval.

We currently do not own or operate laboratory facilities in which to conduct preclinical testing of our product candidates in tissues or animals. Preclinical studies regulated by FDA, EMA and most other health authorities are governed by Good Laboratory Practices, or GLP. Additionally, studies involving animals may be subject to further regulation by institutional, private or government animal welfare authorities that may vary by territory. Studies involving human tissues may also be subject to institutional and government human subject privacy policies that may vary by territory. Third party vendors conducting tissue and/or animal studies on our behalf may be found to be in violation of one or more of these regulations or policies and may be subject to closure, censure or other penalties. In some cases, these penalties could materially impact the performance, availability, or validity of studies conducted on our behalf. Even in the absence of violations resulting in penalties, regulatory and other authorities may refuse to authorize the conduct or to accept the results of studies for regulatory or ethical reasons.

Cyber-attacks or other failures in our telecommunications or information technology systems, or those of our collaborators, contract research organizations, third-party logistics providers, distributors or other contractors or consultants, could result in information theft, data corruption and significant disruption of our business operations.

We, our collaborators, our CROs, third-party logistics providers, distributors and other contractors and consultants utilize information technology, or IT, systems and networks to process, transmit and store electronic information in connection with our business activities. As use of digital technologies has increased, cyber incidents, including third parties gaining access to employee accounts using stolen or inferred credentials, computer malware, viruses, spamming, phishing attacks or other means, and deliberate attacks and attempts to gain unauthorized access to computer systems and networks, have increased in frequency and sophistication. These threats pose a risk to the security of our, our collaborators', our CROs', third-party logistics providers', distributors' and other contractors' and consultants' systems and networks, and the confidentiality, availability and integrity of our data. There can be no assurance that we will be successful in preventing cyber-attacks or successfully mitigating their effects. Similarly, there can be no assurance that our collaborators, CROs, third-party logistics providers, distributors and other contractors and consultants will be successful in protecting our clinical and other data that is stored on their systems. Any cyber-attack, data breach or destruction or loss of data could result in a violation of applicable U.S. and international privacy, data protection and other laws, and subject us to litigation and governmental investigations and proceedings by federal, state and local regulatory entities in the United States and by international regulatory entities, resulting in exposure to material civil and/or criminal liability. Further, our general liability insurance and corporate risk program may not cover all potential claims to which we are exposed and may not be adequate to indemnify us for all liability that maybe imposed; and could have a material adverse effect on our business and prospects. For example, the loss of clinical trial data from completed, ongoing or planned clinical trials for any of our product candidates could result in delays in our development and regulatory approval efforts and significantly increase our costs to recover or reproduce the data. In addition, we may suffer reputational harm or face litigation or adverse regulatory action as a result of cyber-attacks or other data security breaches and may incur significant additional expense to implement further data protection measures.

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Risks Related to Our Intellectual Property

Our commercial success depends on our ability to protect our intellectual property and proprietary technology.

Our commercial success depends in large part on our ability to obtain and maintain intellectual property rights protection through patents, trademarks, and trade secrets in the United States and other countries with respect to our proprietary product candidates. If we do not adequately protect our intellectual property rights, competitors may be able to erode, negate or preempt any competitive advantage we may have, which could harm our business and ability to achieve profitability. To protect our proprietary position, we have patent applications and may file other patent applications in the United States or abroad related to our product candidates that are important to our business; we may also license or purchase patent applications filed by others. The patent application and approval process is expensive and time-consuming. We may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner.

Agreements through which we license patent rights may not give us control over patent prosecution or maintenance, so that we may not be able to control which claims or arguments are presented, how claims are amended, and may not be able to secure, maintain, or successfully enforce necessary or desirable patent protection from those patent rights. We may not have primary control over patent prosecution and maintenance for certain of the patents and patent applications we may license in the future, and therefore cannot guarantee that these patents and applications will be prosecuted or maintained in a manner consistent with the best interests of our business. We cannot be certain that patent prosecution and maintenance activities by our licensor or future licensor have been or will be conducted in compliance with applicable laws and regulations or will result in valid and enforceable patents.

If the scope of the patent protection we or our future licensors obtain is not sufficiently broad, we may not be able to prevent others from developing and commercializing technology and products similar or identical to ours. The degree of patent protection we require to successfully compete in the marketplace may be unavailable or severely limited in some cases and may not adequately protect our rights or permit us to gain or keep any competitive advantage. We cannot provide any assurances that any of our licensed patents have, or that any of our pending owned or licensed patent applications that mature into issued patents will include, claims with a scope sufficient to protect our proprietary platform or otherwise provide any competitive advantage, nor can we assure you that our licenses are or will remain in force. Other parties have developed or may develop technologies that may be related or competitive with our approach, and may have filed or may file patent applications and may have been issued or may be issued patents with claims that overlap or conflict with our patent applications, either by claiming the same compounds, formulations or methods or by claiming subject matter that could dominate our patent position. In addition, the laws of foreign countries may not protect our rights to the same extent as the laws of the United States. Furthermore, patents have a limited lifespan. In the United States, the natural expiration of a patent is generally twenty years after it is filed. Various extensions may be available; however, the life of a patent, and the protection it affords, is limited. 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. As a result, our patent portfolio may not provide us with adequate and continuing patent protection sufficient to exclude others from commercializing products similar to our product candidates.

Even if they are unchallenged, our owned and licensed patent and pending patent applications, if issued, may not provide us with any meaningful protection or prevent competitors from designing around our patent claims to circumvent our patents by developing similar or alternative technologies or therapeutics in a non-infringing manner. For example, a third party may develop a competitive therapy

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that provides benefits similar to our product candidate but falls outside the scope of our patent protection or license rights. If the patent protection provided by the patent and patent applications we hold or pursue with respect to our product candidates is not sufficiently broad to impede such competition, our ability to successfully commercialize our product candidate could be negatively affected, which would harm our business. Currently, a significant portion of our patents and patent applications are in-licensed, though similar risks would apply to any patents or patent applications that we now own or may own or in-license in the future.

We, or any future partners, collaborators, or licensees, may fail to identify patentable aspects of inventions made in the course of development and commercialization activities before it is too late to obtain patent protection on them. Therefore, we may miss potential opportunities to strengthen our patent position.

It is possible that defects of form in the preparation or filing of our patent or patent applications may exist, or may arise in the future, for example with respect to proper priority claims, inventorship, claim scope, or requests for patent term adjustments. If we or our partners, collaborators, licensees, or licensors, whether current or future, fail to establish, maintain or protect such patents and other intellectual property rights, such rights may be reduced or eliminated. If our partners, collaborators, licensees, or licensors, are not fully cooperative or disagree with us as to the prosecution, maintenance or enforcement of any patent rights, such patent rights could be compromised. If there are material defects in the form, preparation, prosecution, or enforcement of our patents or patent applications, such patents may be invalid and/or unenforceable, and such applications may never result in valid, enforceable patents. Any of these outcomes could impair our ability to prevent competition from third parties, which may have an adverse impact on our business.

The patent position of biotechnology and pharmaceutical companies carries uncertainty. In addition, the determination of patent rights with respect to pharmaceutical compounds commonly involves complex legal and factual questions, which are dependent upon the current legal and intellectual property context, extant legal precedent and interpretations of the law by individuals. As a result, the issuance, scope, validity, enforceability and commercial value of our patent rights are characterized by uncertainty.

Pending patent applications cannot be enforced against third parties practicing the technology claimed in such applications unless and until a patent issues from such applications. Assuming the other requirements for patentability are met, currently, the first to file a patent application is generally entitled to the patent. However, prior to March 16, 2013, in the United States, the first to invent was entitled to the patent. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we were the first to make the inventions claimed in our patent or pending patent applications, or that we were the first to file for patent protection of such inventions. Similarly, we cannot be certain that parties from whom we do or may license or purchase patent rights were the first to make relevant claimed inventions, or were the first to file for patent protection for them. If third parties have filed prior patent applications on inventions claimed in our patents or applications that were filed on or before March 15, 2013, an interference proceeding in the United States can be initiated by such third parties to determine who was the first to invent any of the subject matter covered by the patent claims of our applications. If third parties have filed such prior applications after March 15, 2013, a derivation proceeding in the United States can be initiated by such third parties to determine whether our invention was derived from theirs.

Moreover, because the issuance of a patent is not conclusive as to its inventorship, scope, validity or enforceability, our patents or pending patent applications may be challenged in the courts or

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patent offices in the United States and abroad. There is no assurance that all of the potentially relevant prior art relating to our patents and patent applications has been found. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing or, in some cases, not at all. Therefore, we cannot know with certainty whether we were the first to make the inventions claimed in our patents or pending patent applications, or that we were the first to file for patent protection of such inventions. If such prior art exists, it may be used to invalidate a patent, or may prevent a patent from issuing from a pending patent application. For example, such patent filings may be subject to a third-party submission of prior art to the U.S. Patent and Trademark Office, or USPTO, or to other patent offices around the world. Alternately or additionally, we may become involved in post-grant review procedures, oppositions, derivation proceedings, *ex parte* reexaminations, *inter partes* review, supplemental examinations, or interference proceedings or challenges in district court, in the United States or in various foreign patent offices, including both national and regional, challenging patents or patent applications in which we have rights, including patents on which we rely to protect our business. An adverse determination in any such challenges may result in loss of the patent or in patent or patent application claims being narrowed, invalidated or held unenforceable, in whole or in part, or in denial of the patent application or loss or reduction in the scope of one or more claims of the patent or patent application, any of which could limit our ability to stop others from using or commercializing similar or identical technology and products, or limit the duration of the patent protection of our technology and products. In addition, given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting such candidates might expire before or shortly after such candidates are commercialized.

Pending and future patent applications may not result in patents being issued that protect our business, in whole or in part, or which effectively prevent others from commercializing competitive products. Competitors may also be able to design around our patents. Changes in either the patent laws or interpretation of the patent laws in the United States and other countries may diminish the value of our patents or narrow the scope of our patent protection. In addition, the laws of foreign countries may not protect our rights to the same extent or in the same manner as the laws of the United States. For example, patent laws in various jurisdictions, including significant commercial markets such as Europe, restrict the patentability of methods of treatment of the human body more than United States law does. If these developments were to occur, they could have a material adverse effect on our ability to generate revenue.

The patent application process is subject to numerous risks and uncertainties, and there can be no assurance that we or any of our future development partners will be successful in protecting our product candidates by obtaining and defending patents. These risks and uncertainties include the following:

- the USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the patent process. There are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case;
- patent applications may not result in any patents being issued;
- patents that may be issued or in-licensed may be challenged, invalidated, modified, revoked, circumvented, found to be unenforceable or otherwise may not provide any competitive advantage;
- our competitors, many of whom have substantially greater resources and many of whom have made significant investments in competing technologies, may seek or may have already

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obtained patents that will limit, interfere with or eliminate our ability to make, use, and sell our product candidates;

- there may be significant pressure on the U.S. government and international governmental bodies to limit the scope of patent protection both inside and outside the United States for disease treatments that prove successful, as a matter of public policy regarding worldwide health concerns; and
- countries other than the United States may have patent laws less favorable to patentees than those upheld by U.S. courts, allowing foreign competitors a better opportunity to create, develop and market competing product candidates.

Issued patents that we have or may obtain or license may not provide us with any meaningful protection, prevent competitors from competing with us or otherwise provide us with any competitive advantage. Our competitors may be able to circumvent our patents by developing similar or alternative technologies or products in a non-infringing manner. Our competitors may also seek approval to market their own products similar to or otherwise competitive with our products. Alternatively, our competitors may seek to market generic versions of any approved products by submitting ANDAs to the FDA in which they claim that patents owned or licensed by us are invalid, unenforceable or not infringed. In these circumstances, we may need to defend or assert our patents, or both, including by filing lawsuits alleging patent infringement. In any of these types of proceedings, a court or other agency with jurisdiction may find our patents invalid or unenforceable, or that our competitors are competing in a non-infringing manner. Thus, even if we have valid and enforceable patents, these patents still may not provide protection against competing products or processes sufficient to achieve our business objectives.

In addition, we rely on the protection of our trade secrets and proprietary, unpatented know-how. Although we have taken steps to protect our trade secrets and unpatented know-how, including entering into confidentiality agreements with third parties, and confidential information and invention assignment agreements with employees, consultants, collaborators, vendors, and advisors, we cannot provide any assurances that all such agreements have been duly executed, and third parties may still obtain this information or may come upon this or similar information independently. It is possible that technology relevant to our business will be independently developed by a person who is not a party to such a confidentiality or invention assignment agreement. We may not be able to prevent the unauthorized disclosure or use of our technical knowledge or trade secrets by consultants, collaborators, vendors, advisors, former employees and current employees. Furthermore, if the parties to our confidentiality agreements breach or violate the terms of these agreements, we may not have adequate remedies for any such breach or violation, and we could lose our trade secrets as a consequence of such breaches or violations. Our trade secrets could otherwise become known or be independently discovered by our competitors. Additionally, if the steps taken to maintain our trade secrets are deemed inadequate, we may have insufficient recourse against third parties for misappropriating our trade secrets. If any of these events occurs or if we otherwise lose protection for our trade secrets or proprietary know-how, our business may be harmed.

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

We are party to a patent license agreement with PureTech Health that provides us with intellectual property rights relating to KarXT. This license agreement imposes milestone payment, royalty and other obligations on us. If we fail to comply with our obligations, including achieving specified milestone events, PureTech Health may have the right to terminate this license, 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 PureTech Health and may face other penalties. Such an

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occurrence would materially adversely affect our business prospects. For a variety of purposes, we will likely enter into additional licensing and funding arrangements with third parties that may also impose similar obligations on us.

Termination of any of our current or future in-licenses 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 our product candidate, which could have a material adverse effect on our operating results and overall financial condition.

In addition to the above risks, intellectual property rights that we license in the future may include sublicenses under intellectual property owned by third parties, in some cases through multiple tiers. The actions of our future 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 licensor 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.

Moreover, disputes may arise regarding intellectual property subject to a licensing agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- the extent to which our product candidates, technology and processes infringe on intellectual property of the licensor that is not subject to the licensing agreement;
- the sublicensing of patent and other rights under our collaborative development relationships;
- our diligence obligations under the license agreement and what activities satisfy those diligence obligations;
- the inventorship and ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and us and our partners; and
- the priority of invention of patented technology.

In addition, the agreements under which we currently license intellectual property or technology from third parties are complex, and certain provisions in such agreements may be susceptible to multiple interpretations. The resolution of any contract interpretation disagreement that may arise could narrow what we believe to be the scope of our rights to the relevant intellectual property or technology, or increase what we believe to be our financial or other obligations under the relevant agreement, either of which could have a material adverse effect on our business, financial condition, results of operations, and prospects. Moreover, if disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on commercially acceptable terms, we may be unable to successfully develop and commercialize the affected product candidates, which could have a material adverse effect on our business, financial conditions, results of operations, and prospects.

It is difficult and costly to protect our intellectual property and our proprietary technologies, and we may not be able to ensure their protection.

Our commercial success will depend in part on obtaining and maintaining patent protection and trade secret protection for the use, formulation and structure of our product candidate, and associated

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methods of treatment as well as on successfully defending these patents against potential third-party challenges. Our ability to protect our product candidate from unauthorized making, using, selling, offering to sell or importing by third parties is dependent on the extent to which we have rights under valid and enforceable patents that cover these activities.

The patent positions of pharmaceutical, biotechnology and other life sciences companies can be highly uncertain and involve complex legal and factual questions for which important legal principles remain unresolved and have in recent years been the subject of much litigation. Changes in either the patent laws or in interpretations of patent laws in the United States and other countries may diminish the value of our intellectual property. Further, the determination that a patent application or patent claim meets all of the requirements for patentability is a subjective determination based on the application of law and jurisprudence. The ultimate determination by the USPTO or by a court or other trier of fact in the United States, or corresponding foreign national patent offices or courts, on whether a claim meets all requirements of patentability cannot be assured. Although we have conducted searches for third-party publications, patents and other information that may affect the patentability of claims in our various patent applications and patents, we cannot be certain that all relevant information has been identified. Accordingly, we cannot predict the breadth of claims that may be allowed or enforced in our owned patents or patent applications, in our licensed patents or patent applications or in third-party patents.

We cannot provide assurances that any of our patent applications will be found to be patentable, including over our own or our licensors' prior art publications or patent literature, or will issue as patents. Neither can we make assurances as to the scope of any claims that may issue from our pending and future patent applications nor to the outcome of any proceedings by any potential third parties that could challenge the patentability, validity or enforceability of our patents and patent applications in the United States or foreign jurisdictions. Any such challenge, if successful, could limit patent protection for our products and product candidates and/or materially harm our business.

The degree of future protection for our proprietary rights is uncertain because legal means afford only limited protection and may not adequately protect our rights or permit us to gain or keep our competitive advantage. For example:

- we may not be able to generate sufficient data to support full patent applications that protect the entire breadth of developments in one or more of our programs;
- it is possible that one or more of our pending patent applications will not become an issued patent or, if issued, that the patent(s) claims will have sufficient scope to protect our technology, provide us with a basis for commercially viable products or provide us with any competitive advantages;
- if our pending applications issue as patents, they may be challenged by third parties as not infringed, invalid or unenforceable under United States or foreign laws;
- if issued, the patents under which we hold rights may not be valid or enforceable;
- we may not successfully commercialize KarXT, if approved, before our relevant patents expire;
- we may not be the first to make the inventions covered by each of our patents and pending patent applications; or
- we may not develop additional proprietary technologies or product candidates that are separately patentable.

In addition, to the extent that we are unable to obtain and maintain patent protection for one of our products or product candidates or in the event that such patent protection expires, it may no longer be cost-effective to extend our portfolio by pursuing additional development of a product or product candidate for follow-on indications.

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If we are unable to protect the confidentiality of our trade secrets, the value of our technology could be materially adversely affected and our business would be harmed.

In addition to patents, we also may rely on trade secrets to protect our technologies or products, especially where we do not believe patent protection is appropriate or obtainable. Also, we cannot provide any assurances that any of our licensed patents have claims with a scope sufficient to protect our technology or otherwise provide any competitive advantage, nor can we assure you that our licenses are or will remain in full force or effect, in which case we would similarly rely on trade secrets. However, trade secrets are difficult to protect. We seek to protect our confidential proprietary information, in part, by confidentiality agreements and invention assignment agreements with our employees, consultants, scientific advisors, contractors and collaborators. These agreements are designed to protect our proprietary information. However, we cannot be certain that such agreements have been entered into with all relevant parties, and we cannot be certain that our trade secrets and other confidential proprietary information will not be disclosed or that competitors will not otherwise gain access to our trade secrets or independently develop substantially equivalent information and techniques. For example, our employees, consultants, contractors, outside scientific collaborators and other advisers may unintentionally or willfully disclose our information to competitors. Enforcing a claim that a third-party entity illegally obtained and is using any of our trade secrets is expensive and time-consuming, and the outcome is unpredictable, and we may not be able to obtain adequate remedies for such breaches. We also seek to preserve the integrity and confidentiality of our confidential proprietary information by maintaining physical security of our premises and physical and electronic security of our information technology systems, but it is possible that these security measures could be breached. In addition, courts outside the United States are sometimes less willing to protect trade secrets. Moreover, our competitors may independently develop equivalent knowledge, methods and know-how. Notably, proprietary technology protected by a trade secret does not preempt the patenting of independently developed equivalent technology, even if such equivalent technology is invented subsequent to the technology protected by a trade secret. If any of our confidential proprietary information were to be lawfully obtained or independently developed by a competitor, we would have no right to prevent such competitor from using that technology or information to compete with us, which could harm our competitive position.

Obtaining and maintaining patent protection depends on compliance with various procedural, document submission, fee payment and other requirements imposed by governmental 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 governmental fees on patents and applications are required to be paid to the USPTO and various governmental patent agencies outside of the United States in several stages over the lifetime of the patents and applications. The USPTO and various non-U.S. governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process and after a patent has issued. There are situations in which non-compliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such a circumstance, competitors may be able to enter the market earlier than otherwise would be the case. Under the terms of some of our current and future licenses, we may not have the ability to maintain patents or prosecute patent applications in the portfolio, and may therefore have to rely on third parties to comply with these requirements.

Patent terms may be inadequate to protect our competitive position on our products for an adequate amount of time.

Patents have a limited lifespan. In the United States, if all maintenance fees are timely paid, the natural expiration of a patent is generally 20 years from its earliest U.S. non-provisional filing date.

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Various extensions may be available, but the life of a patent, and the protection it affords, is limited. 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. We expect to seek extensions of patent terms in the United States and, if available, in other countries where we are prosecuting patents. In the United States, the Drug Price Competition and Patent Term Restoration Act of 1984 permits a patent term extension of up to seven and a half years beyond the normal expiration of the patent, which is limited to the approved indication (or any additional indications approved during the period of extension). We might not be granted an extension because of, for example, failure to apply within applicable periods, failure to apply prior to the expiration of relevant patents or otherwise failure to satisfy any of the numerous applicable requirements. Moreover, the applicable authorities, including the FDA and the USPTO in the United States, and any equivalent regulatory authority in other countries, may not agree with our assessment of whether such extensions are available, and may refuse to grant extensions to our patents, or may grant more limited extensions than we request. If this occurs, our competitors may be able to obtain approval of competing products following our patent expiration by referencing our clinical and preclinical data and launch their product earlier than might otherwise be the case. If this were to occur, it could have a material adverse effect on our ability to generate revenue.

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

As is the case with other biopharmaceutical companies, our commercial success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biopharmaceutical industry involves both technological and legal complexity and is therefore costly, time consuming and inherently uncertain. Wide-ranging patent reform legislation in the United States, including the Leahy-Smith America Invents Act, or the America Invents Act, could increase those uncertainties and costs. The America Invents Act was signed into law on September 16, 2011, and many of the substantive changes became effective on March 16, 2013. The America Invents Act reforms United States patent law in part by changing the U.S. patent system from a “first to invent” system to a “first inventor to file” system, expanding the definition of prior art, and developing a post-grant review system. This legislation changes United States patent law in a way that may weaken our ability to obtain patent protection in the United States for those applications filed after March 16, 2013.

Further, the America Invents Act created new procedures to challenge the validity of issued patents in the United States, including post-grant review and *inter partes* review proceedings, which some third parties have been using to cause the cancellation of selected or all claims of issued patents of competitors. For a patent filed March 16, 2013 or later, a petition for post-grant review can be filed by a third party in a nine-month window from issuance of the patent. A petition for *inter partes* review can be filed immediately following the issuance of a patent if the patent has an effective filing date prior to March 16, 2013. A petition for *inter partes* review can be filed after the nine-month period for filing a post-grant review petition has expired for a patent with an effective filing date of March 16, 2013 or later. Post-grant review proceedings can be brought on any ground of invalidity, whereas *inter partes* review proceedings can only raise an invalidity challenge based on published prior art and patents. These adversarial actions at the USPTO review patent claims without the presumption of validity afforded to U.S. patents in lawsuits in U.S. federal courts, and use a lower burden of proof than used in litigation in U.S. federal courts. Therefore, it is generally considered easier for a competitor or third party to have a U.S. patent invalidated in a USPTO post-grant review or *inter partes* review proceeding than invalidated in a litigation in a U.S. federal court. If any of our patents are challenged by a third party in such a USPTO proceeding, there is no guarantee that we or our licensors or collaborators will be successful in defending the patent, which may result in a loss of the challenged patent right to us.

In addition, recent court rulings in cases such as *Association for Molecular Pathology v. Myriad Genetics, Inc., BRCA1- & BRCA2-Based Hereditary Cancer Test Patent Litigation, and Promega Corp.*

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v. Life Technologies Corp. have narrowed the scope of patent protection available in certain circumstances and weakened 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 future actions by the U.S. Congress, the U.S. courts, the USPTO and the relevant law-making bodies in other countries, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future.

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

Filing, prosecuting, enforcing and defending patents on our product candidate in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. The requirements for patentability may differ in certain countries, particularly in developing countries; thus, even in countries where we do pursue patent protection, there can be no assurance that any patents will issue with claims that cover our products.

Moreover, our ability to protect and enforce our intellectual property rights may be adversely affected by unforeseen changes in foreign intellectual property laws. Additionally, laws of some countries outside of the United States and Europe do not afford intellectual property protection to the same extent as the laws of the United States and Europe. Many companies have encountered significant problems in protecting and defending intellectual property rights in certain foreign jurisdictions. The legal systems of some countries, including India, China and other developing countries, do not favor the enforcement of patents and other intellectual property rights. This could make it difficult for us to stop the infringement of our patents or the misappropriation of our other intellectual property rights. For example, many foreign countries have compulsory licensing laws under which a patent owner must grant licenses to third parties. Consequently, we may not be able to prevent third parties from practicing our inventions in certain countries outside the United States and Europe or from selling or importing products made from our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop and market their own products and, further, may export otherwise infringing products to territories where we have patent protection, if our ability to enforce our patents to stop infringing activities is inadequate. These products may compete with our products, and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

Agreements through which we license patent rights may not give us sufficient rights to permit us to pursue enforcement of our licensed patents or defense of any claims asserting the invalidity of these patents (or control of such enforcement or defense) of such patent rights in all relevant jurisdictions as requirements may vary.

Proceedings to enforce our patent rights, whether or not successful, could result in substantial costs and divert our efforts and resources from other aspects of our business. Moreover, such proceedings could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate and the damages or other remedies awarded, if any, may not be commercially meaningful. Furthermore, while we intend to protect our intellectual property rights in major markets for our products, 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 products, if approved. Accordingly, our efforts to protect our intellectual property rights in such countries may be inadequate.

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Others may challenge inventorship or claim an ownership interest in our intellectual property which could expose it to litigation and have a significant adverse effect on its prospects.

A third party or former employee or collaborator may claim an inventorship or ownership interest in one or more of our or our licensors' patents or other proprietary or intellectual property rights. A third party could bring legal actions against us and seek monetary damages and/or enjoin clinical testing, manufacturing and marketing of the affected product or products. While we are presently unaware of any claims or assertions by third-parties with respect to our patents or other intellectual property, we cannot guarantee that a third party will not assert a claim or an interest in any of such patents or intellectual property. If we or our licensors 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, intellectual property that is important to our product candidates. Further, regardless of the outcome, if we become involved in any litigation, it could consume a substantial portion of our resources, and cause a significant diversion of effort by our technical and management personnel.

If we are sued for infringing intellectual property rights of third parties, such litigation could be costly and time consuming and could prevent or delay us from developing or commercializing our product candidates.

Our commercial success depends, in part, on our ability to develop, manufacture, market and sell our product candidate without infringing the intellectual property and other proprietary rights of third parties. However, our research, development and commercialization activities may be subject to claims that we infringe or otherwise violate patents or other intellectual property rights owned or controlled by third parties. Third parties may have U.S. and non-U.S. issued patents and pending patent applications relating to compounds, methods of manufacturing compounds and/or methods of use for the treatment of the disease indications for which we are developing our product candidates. If any third-party patents or patent applications are found to cover our product candidates or their methods of use or manufacture, we may not be free to manufacture or market our product candidates as planned without obtaining a license, which may not be available on commercially reasonable terms, or at all.

There is a substantial amount of intellectual property litigation in the biotechnology and pharmaceutical industries, and we may become party to, or threatened with, litigation or other adversarial proceedings regarding intellectual property rights with respect to our products candidates, including patent infringement lawsuits in the US or abroad, as well as interference, derivation, *inter partes* review, and post-grant proceedings before the USPTO and opposition or other proceedings before corresponding foreign patent offices. There may be third-party patents or patent applications with claims to materials, formulations, methods of manufacture or methods for treatment related to the composition, use or manufacture of our product candidates. We cannot guarantee that any of our patent searches or analyses including, but not limited to, the identification of relevant patents, the scope of patent claims or the expiration of relevant patents are complete or thorough, nor can we be certain that we have identified each and every patent and pending application in the United States and abroad that is relevant to or necessary for the commercialization of our product candidates in any jurisdiction. Because patent applications can take many years to issue, there may be currently pending patent applications which may later result in issued patents that our product candidates may be accused of infringing. In addition, third parties may obtain patents in the future and claim that use of our technologies infringes upon these patents. Accordingly, third parties may assert infringement claims against us based on intellectual property rights that exist now or arise in the future. The outcome of intellectual property litigation is subject to uncertainties that cannot be adequately quantified in advance. The pharmaceutical and biotechnology industries have produced a significant number of patents, and it may not always be clear to industry participants, including us, which patents cover various types of products or methods of use or manufacture. The scope of protection afforded by a patent is subject to interpretation by the courts, and the interpretation is not always uniform. If we

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were sued for patent infringement, we would need to demonstrate that our product candidates, products or methods either do not infringe the patent claims of the relevant patent or that the patent claims are invalid or unenforceable, and we may not be able to do this. Proving invalidity is difficult. For example, in the United States, proving invalidity requires a showing of clear and convincing evidence to overcome the presumption of validity enjoyed by issued patents. Even if we are successful in these proceedings, we may incur substantial costs and the time and attention of our management and scientific personnel could be diverted in pursuing these proceedings, which could significantly harm our business and operating results. In addition, parties making claims against us may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources, and we may not have sufficient resources to bring these actions to a successful conclusion.

If we are found to infringe a third party's intellectual property rights, we could be forced, including by court order, to cease developing, manufacturing or commercializing the infringing product candidate or product. Alternatively, we may be required to obtain a license from such third party in order to use the infringing technology and continue developing, manufacturing or marketing the infringing product candidate or product. If we were required to obtain a license to continue to manufacture or market the affected product, we may be required to pay substantial royalties or grant cross-licenses to our patents. We cannot, however, assure you that any such license will be available on acceptable terms, if at all. Ultimately, we could be prevented from commercializing a product, or be forced to cease some aspect of our business operations as a result of claims of patent infringement or violation of other intellectual property rights, Further, the outcome of intellectual property litigation is subject to uncertainties that cannot be adequately quantified in advance, including the demeanor and credibility of witnesses and the identity of any adverse party. This is especially true in intellectual property cases that may turn on the testimony of experts as to technical facts upon which experts may reasonably disagree. Furthermore, we may not be able to obtain any required license on commercially reasonable terms or at all. Even if we were able to obtain a license, it could be non-exclusive, thereby giving our competitors access to the same technologies licensed to us; alternatively or additionally it could include terms that impede or destroy our ability to compete successfully in the commercial marketplace. In addition, we could be found liable for monetary damages, including treble damages and attorneys' fees if we are found to have willfully infringed a patent. 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. Claims that we have misappropriated the confidential information or trade secrets of third parties could have a similar negative impact on our business. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation or administrative proceedings, there is a risk that some of our confidential information could be compromised by disclosure. In addition, any uncertainties resulting from the initiation and continuation of any litigation could have material adverse effect on our ability to raise additional funds or otherwise have a material adverse effect on our business, results of operations, financial condition and prospects.

We may be subject to claims by third parties asserting that our employees or we have misappropriated their intellectual property, or claiming ownership of what we regard as our own intellectual property.

Many of our current and former employees and our licensors' current and former employees, including our senior management, were previously employed at universities or at other biotechnology or pharmaceutical companies, including some which may be competitors or potential competitors. Some of these employees, including members of our senior management, may have executed proprietary rights, non-disclosure and non-competition agreements, or similar agreements, in connection with such previous employment. Although we try to ensure that our employees do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that

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we or these employees have used or disclosed intellectual property, including trade secrets or other proprietary information, of any such third party. Litigation may be necessary to defend against such claims. If we fail in defending any such claims, in addition to paying monetary damages, we may sustain damages or lose key personnel, valuable intellectual property rights or the personnel's work product, which could hamper or prevent commercialization of our technology, which could materially affect our commercial development efforts. Such intellectual property rights could be awarded to a third party, and we could be required to obtain a license from such third party to commercialize our technology or products. Such a license may not be available on commercially reasonable terms or at all. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management.

In addition, while we typically require our employees, consultants and contractors who may be involved in the development of intellectual property to execute agreements assigning such intellectual property to us, we may be unsuccessful in executing such an agreement with each party who in fact develops intellectual property that we regard as our own, which may result in claims by or against us related to the ownership of such intellectual property. If we fail in prosecuting or defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights. Even if we are successful in prosecuting or defending against such claims, litigation could result in substantial costs and be a distraction to our senior management and scientific personnel.

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

Competitors may infringe our patent, trademarks, copyrights or other intellectual property. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time consuming and divert the time and attention of our management and scientific personnel. Any claims we assert against perceived infringers could provoke these parties to assert counterclaims against us alleging that we infringe their patents, in addition to counterclaims asserting that our patents are invalid or unenforceable, or both. In any patent infringement proceeding, there is a risk that a court will decide that a patent of ours is invalid or unenforceable, in whole or in part, and that we do not have the right to stop the other party from using the invention at issue. There is also a risk that, even if the validity of such patents is upheld, the court will construe the patent's claims narrowly or decide that we do not have the right to stop the other party from using the invention at issue on the grounds that our patent claims do not cover the invention. An adverse outcome in a litigation or proceeding involving our patent could limit our ability to assert those patents against those parties or other competitors, and may curtail or preclude our ability to exclude third parties from making and selling similar or competitive products. Similarly, if we assert trademark infringement claims, a court may determine that the marks we have asserted are invalid or unenforceable, or that the party against whom we have asserted trademark infringement has superior rights to the trademarks in question. In this case, we could ultimately be forced to cease use of such trademarks.

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

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Additionally, for certain of our existing and future in-licensed patent rights, we may not have the right to bring suit for infringement and may have to rely on third parties to enforce these rights for us. If we cannot or choose not to take action against those we believe infringe our intellectual property rights, we may have difficulty competing in certain markets where such potential infringers conduct their business, and our commercialization efforts may suffer as a result.

If our trademarks and trade names are not adequately protected, then we may not be able to build name recognition in our trademarks of interest and our business may be adversely affected.

Our trademarks or trade names may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. We rely on both registration and common law protection for our trademarks. We may not be able to protect our rights to these trademarks and trade names or may be forced to stop using these names, which we need for name recognition by potential partners or customers in our markets of interest. During trademark registration proceedings, we may receive rejections. Although we would be given an opportunity to respond to those rejections, we may be unable to overcome such rejections. In addition, in the USPTO and in comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and to seek to cancel registered trademarks. Opposition or cancellation proceedings may be filed against our trademarks, and our trademarks may not survive such proceedings. Moreover, any name we propose to use for our products in the United States must be approved by the FDA, regardless of whether we have registered it, or applied to register it, as a trademark. The FDA typically conducts a review of proposed product names, including an evaluation of potential for confusion with other product names. If the FDA objects to any of our proposed product names, we may be required to expend significant additional resources in an effort to identify a usable substitute name that would qualify under applicable trademark laws, not infringe the existing rights of third parties and be acceptable to the FDA. If we are unable to establish name recognition based on our trademarks and trade names, we may not be able to compete effectively and our business may be adversely affected.

Risks Related to Employee Matters and Managing Growth

We depend heavily on our executive officers, principal consultants and others, and the loss of their services would materially harm our business.

Our success depends, and will likely continue to depend, upon our ability to hire, retain the services of our current executive officers, principal consultants and others, including Steven Paul, our President and Chief Executive Officer, Andrew Miller, our Chief Operating Officer, Stephen Brannan, our Chief Medical Officer, and Troy Ignelzi, our Chief Financial Officer. We have entered into employment agreements with Dr. Paul, Dr. Miller, Dr. Brannan and Mr. Ignelzi, but they may terminate their employment with us at any time. The loss of their services might impede the achievement of our research, development and commercialization objectives.

Our ability to compete in the biotechnology and pharmaceuticals industries depends upon our ability to attract and retain highly qualified managerial, scientific and medical personnel. Our industry has experienced a high rate of turnover of management personnel in recent years. Replacing executive officers or other 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 develop, gain regulatory approval of and commercialize products successfully.

Competition to hire from this limited pool is intense, and we may be unable to hire, train, retain or motivate these additional key employees 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.

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We rely on consultants and advisors, including scientific and clinical advisors, to assist us in formulating our research and development and commercialization strategy. Our consultants and advisors may be employed by other entities and may have commitments under consulting or advisory contracts with those entities that may limit their availability to us. If we are unable to continue to attract and retain highly qualified personnel, our ability to develop and commercialize our product candidates will be limited.

We only have a limited number of employees to manage and operate our business.

As of November 1, 2019, we had 19 full-time employees. Our focus on the development of KarXT requires us to optimize cash utilization and to manage and operate our business in a highly efficient manner. We cannot assure you that we will be able to hire and/or retain adequate staffing levels to develop KarXT or run our operations and/or to accomplish all of the objectives that we otherwise would seek to accomplish.

Our employees, independent contractors, consultants, collaborators and contract research organizations may engage in misconduct or other improper activities, including non-compliance with regulatory standards and requirements, which could cause significant liability for us and harm our reputation.

We are exposed to the risk that our employees, independent contractors, consultants, collaborators and contract research organizations may engage in fraudulent conduct or other illegal activity. Misconduct by those parties could include intentional, reckless and/or negligent conduct or disclosure of unauthorized activities to us that violates:

- FDA regulations or similar regulations of comparable non-U.S. regulatory authorities, including those laws requiring the reporting of true, complete and accurate information to such authorities;
- manufacturing standards;
- federal and state healthcare fraud and abuse laws and regulations and similar laws and regulations established and enforced by comparable non-U.S. regulatory authorities; and
- laws that require the reporting of financial information or data accurately.

Activities subject to these laws also involve the improper use or misrepresentation of information obtained in the course of clinical trials, creating fraudulent data in our preclinical studies or clinical trials or illegal misappropriation of product materials, which could result in regulatory sanctions and serious harm to our reputation. 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, standards or regulations. Additionally, we are subject to the risk that a person or government could allege such fraud or other misconduct, even if none occurred. 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 and results of operations, including the imposition of civil, criminal and administrative penalties, damages, monetary fines, disgorgement, integrity oversight and reporting obligations, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, contractual damages, reputational harm, diminished profits and future earnings, and curtailment of our operations, any of which could have a material adverse effect on our ability to operate our business and our results of operations.

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We expect to expand our organization, and as a result, we may encounter difficulties in managing our growth, which could disrupt our operations.

We expect to experience significant growth in the number of our employees and the scope of our operations, particularly in the areas of regulatory affairs and sales, marketing and distribution, as well as to support our public company operations. To manage these growth activities, 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. Our management may need to devote a significant amount of its attention to managing these growth activities. Moreover, our expected growth could require us to relocate to a different geographic area of the country. 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 or relocation of our operations, retain key employees, or identify, recruit and train additional qualified personnel. Our inability to manage the expansion or relocation of our operations effectively may result in weaknesses in our infrastructure, give rise to operational mistakes, loss of business opportunities, loss of employees and reduced productivity among remaining employees. Our expected growth could also require significant capital expenditures and may divert financial resources from other projects, such as the development of additional product candidates. If we are unable to effectively manage our expected growth, our expenses may increase more than expected, our ability to generate revenues could be reduced and we may not be able to implement our business strategy, including the successful commercialization of our product candidates.

Risks Related to Our Common Stock and this Offering

If you purchase shares of common stock in this offering, you will suffer immediate dilution in the net tangible book value of your investment.

The 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 net tangible book value per share after this offering. Based on the public offering price of $96.00 per share, you will experience immediate dilution of $80.76 per share, representing the difference between our as adjusted net tangible book value per share after giving effect to this offering and the public offering price. Furthermore, if the underwriters exercise their over-allotment option or our previously issued options, warrant and other rights to acquire common stock at prices below the public offering price are exercised, you will experience further dilution. For additional information on the dilution that you will experience immediately after this offering, see the section titled “Dilution.”

An active trading market for our common stock may not be sustainable, and investors may not be able to resell their shares at or above the purchase price and our ability to raise capital in the future may be impaired.

In July 2019, we closed our initial public offering. Prior to that offering, there was no public market for our common stock. Although we completed our initial public offering and shares of our common stock are listed on The Nasdaq Global Market, an active trading market for our shares may not be maintained. If an active market for our common stock is not maintained, it may be difficult for our investors to resell their shares without depressing the market price for the shares or at all. An inactive trading market may also impair our ability to raise capital to continue to fund operations by selling shares and may impair our ability to acquire other companies or technologies by using our shares as consideration.

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The trading price of our common stock is likely to be highly volatile, which could result in substantial losses for purchasers of our common stock in this offering. Securities class action or other litigation involving our company or members of our management team could also substantially harm our business, financial condition and results of operations.

Our stock price is volatile. The stock market in general and the market for smaller pharmaceutical and biotechnology companies in particular have experienced extreme volatility that has often been unrelated to the operating performance of particular companies. As a result of this volatility, you may not be able to sell your common stock at or above the public offering price and you may lose some or all of your investment. The market price for our common stock may be influenced by many factors, including:

- the success of existing or new competitive products or technologies;
- regulatory actions with respect to our product candidates or our competitors' products and product candidates;
- announcements by us or our competitors of significant acquisitions, strategic partnerships, joint ventures, collaborations or capital commitments;
- the timing and results of clinical trials of KarXT and any other product candidates;
- commencement or termination of collaborations for our development programs;
- failure or discontinuation of any of our development programs;
- results of clinical trials of product candidates of our competitors;
- regulatory or legal developments in the United States and other countries;
- developments or disputes concerning patent applications, issued patents or other proprietary rights;
- the recruitment or departure of key personnel;
- the level of expenses related to any of our product candidates or clinical development programs;
- the results of our efforts to develop additional product candidates or products;
- actual or anticipated changes in estimates as to financial results or development timelines;
- announcement or expectation of additional financing efforts;
- sales of our common stock by us, our insiders or other stockholders;
- variations in our financial results or those of companies that are perceived to be similar to us;
- changes in estimates or recommendations by securities analysts, if any, that cover us;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors;
- general economic, industry and market conditions; and
- the other factors described in this "Risk Factors" section.

In the past, securities class action litigation has often been brought against a company following a decline in the market price of its securities. This risk is especially relevant for biopharmaceutical companies, which have experienced significant stock price volatility in recent years.

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If securities analysts publish negative evaluations of our stock, the price of our stock could decline.

The trading market for our common stock depends in part on the research and reports that industry or securities analysts publish about us or our business. If one or more of the analysts who cover us issues an adverse opinion about our company, our stock price would likely decline. If one or more of these analysts ceases research coverage of us or fails to regularly publish reports on us, we could lose visibility in the financial markets, which in turn could cause our stock price or trading volume to decline.

We have broad discretion in the use of the net 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 yield a return on your investment.

Although we currently intend to use the net proceeds from this offering in the manner described in the section titled “Use of Proceeds” in this prospectus, our management will have broad discretion in the application of the net proceeds from this offering and could spend the proceeds in ways that do not improve our results of operations or enhance the value of our common stock. You will not have the opportunity to influence our decisions on how to use the net proceeds from this offering. The failure by our management to apply these funds effectively could result in financial losses that could harm our business, cause the price of our common stock to decline and delay the development of our product candidates. Pending their use, we may invest the net proceeds from this offering in a manner that does not produce income or that loses value.

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

We are an emerging growth company, and, for as long as we continue to be an emerging growth company, we may choose to take advantage of exemptions from various reporting requirements applicable to other public companies but not to “emerging growth companies.” We could remain an “emerging growth company” until December 31, 2024, or until the earliest of (1) the last day of the first fiscal year in which our annual gross revenue exceeds $1.07 billion, (2) the date that we become a “large accelerated filer” as defined in Rule 12b-2 under the Securities Exchange Act of 1934, which would occur if the market value of our common stock that is held by non-affiliates exceeds $700.0 million as of the last business day of our most recently completed second fiscal quarter or (3) the date on which we have issued more than $1.0 billion in non-convertible debt during the preceding three-year period. So long as we remain an “emerging growth company,” we expect to avail ourselves of the exemption from the requirement that our independent registered public accounting firm attest to the effectiveness of our internal control over financial reporting under Section 404 of the Sarbanes-Oxley Act of 2002, or Section 404. When our independent registered public accounting firm is required to undertake an assessment of our internal control over financial reporting, the cost of our compliance with Section 404 will correspondingly increase. Moreover, if we are not able to comply with the requirements of Section 404 applicable to us in a timely manner, or if we or our independent registered public accounting firm identifies deficiencies in our internal control over financial reporting that are deemed to be material weaknesses, the market price of our stock could decline and we could be subject to sanctions or investigations by the SEC or other regulatory authorities, which would require additional financial and management resources.

We are also a “smaller reporting company” as defined in the Exchange Act, and have elected to take advantage of certain of the scaled disclosures available to smaller reporting companies.

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

As a public company, and particularly after we are no longer an "emerging growth company," we have incurred, and will continue to incur, significant legal, accounting and other expenses that we did not incur as a private company, including costs associated with public company reporting requirements. The Sarbanes-Oxley Act of 2002, the Dodd-Frank Wall Street Reform and Consumer Protection Act, the listing requirements of the Nasdaq Global Market and other applicable securities rules and regulations impose various requirements on public companies, including establishment and maintenance of effective disclosure and financial controls and corporate governance practices. Our management and other personnel will need to devote a substantial amount of time to these compliance initiatives. Moreover, these rules and regulations will increase our legal and financial compliance costs and will make some activities more time-consuming and costly. For example, we expect that these rules and regulations may make it more difficult and more expensive for us to obtain director and officer liability insurance, which in turn could make it more difficult for us to attract and retain qualified members of our board of directors.

We are currently evaluating and monitoring developments with respect to these rules, and we cannot predict or estimate the amount of additional costs we may incur or the timing of such costs. These rules and regulations are often subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices.

Pursuant to Section 404, we will be required to furnish a report by our management on our internal control over financial reporting beginning with our Annual Report on Form 10-K for the year ending December 31, 2020. However, while we remain an emerging growth company, we will not be required to include an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. To achieve compliance with Section 404 within the prescribed period, we will be engaged in a process to document and evaluate our internal control over financial reporting, which is both costly and challenging. In this regard, we will need to continue to dedicate internal resources, potentially engage outside consultants and adopt a detailed work plan to assess and document the adequacy of internal control over financial reporting, continue steps to improve control processes as appropriate, validate through testing that controls are functioning as documented and implement a continuous reporting and improvement process for internal control over financial reporting. Despite our efforts, there is a risk that we will not be able to conclude, within the prescribed timeframe or at all, that our internal control over financial reporting is effective as required by Section 404. If we identify one or more material weaknesses, it could result in an adverse reaction in the financial markets due to a loss of confidence in the reliability of our financial statements.

A significant portion of our total outstanding shares is restricted from immediate resale but may be sold into the market in the near future, which could cause the market price of our common stock to decline 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. These sales, or the perception in the market that the holders of a large number of shares intend to sell shares, could reduce the market price of our common stock. After this offering, we will have 26,012,754 outstanding shares of common stock based on the number of shares outstanding as of September 30, 2019. This includes the shares that we are selling in this offering, which may be resold in the public market immediately without restriction, unless purchased by our affiliates or existing

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stockholders. Of the remaining shares, 17,017,912 shares are currently restricted as a result of securities laws or lock-up agreements, but will become eligible to be sold after the offering as described in the "Shares Eligible for Future Sale" section of this prospectus. Moreover, holders of an aggregate of 15,879,157 shares of our common stock will have rights, subject to specified conditions, to require us to file registration statements covering their shares or to include their shares in registration statements that we may file for ourselves or other stockholders.

We do not anticipate paying any cash dividends on our capital stock in the foreseeable future. Accordingly, stockholders must rely on capital appreciation, if any, for any return on their investment.

We have never declared nor paid cash dividends on our capital stock. We currently plan to retain all of our future earnings, if any, to finance the operation, development and growth of our business. In addition, the terms of any future debt or credit agreements may preclude us from paying dividends. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future.

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.

Based upon 23,412,754 shares outstanding as of September 30, 2019, upon the closing of this offering, our executive officers and directors, combined with our stockholders who owned more than 5% of our outstanding common stock before this offering and their affiliates, will, in the aggregate, beneficially own shares representing approximately 16.7% of our common stock. In particular, PureTech Health will own approximately 28.4% of our common stock following this offering and be our largest stockholder following this offering. As a result, if PureTech Health along with stockholders who own more than 5% of our outstanding common stock after this offering were to choose to act together, they would be able to control all matters submitted to our stockholders for approval, as well as our management and affairs. For example, these persons, if they choose to act together, would control the election of directors and approval of any merger, consolidation or sale of all or substantially all of our assets. This concentration of ownership control may:

- delay, defer or prevent a change in control;
- entrench our management or the board of directors; or
- impede a merger, consolidation, takeover or other business combination involving us that other stockholders may desire.

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 price at which shares are being sold in this offering 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.

Provisions in our corporate charter documents and under Delaware law may prevent or frustrate attempts by our stockholders to change our management or hinder efforts to acquire a controlling interest in us.

Provisions in our corporate charter and our bylaws may discourage, delay or prevent a merger, acquisition or other change in control of us that stockholders may consider favorable, including transactions in which you might otherwise receive a premium for your shares. These provisions could

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also limit the price that investors might be willing to pay in the future for shares of our common stock, thereby depressing the market price of our common stock. In addition, because our board of directors is responsible for appointing the members of our management team, these provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors. Among other things, these provisions:

- establish a classified board of directors such that all members of the board are not elected at one time;
- allow the authorized number of our directors to be changed only by resolution of our board of directors;
- limit the manner in which stockholders can remove directors from the board;
- establish advance notice requirements for nominations for election to the board of directors or for proposing matters that can be acted on at stockholder meetings;
- require that stockholder actions must be effected at a duly called stockholder meeting and prohibit actions by our stockholders by written consent;
- limit who may call a special meeting of stockholders;
- authorize our board of directors to issue preferred stock without stockholder approval, which could be used to institute a “poison pill” that would work to dilute the stock ownership of a potential hostile acquirer, effectively preventing acquisitions that have not been approved by our board of directors; and
- require the approval of the holders of at least 75% of the votes that all our stockholders would be entitled to cast to amend or repeal certain provisions of our charter or bylaws.

Moreover, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the General Corporation Law of the State of Delaware, which prohibits a person who owns in excess of 15% of our outstanding voting stock from merging or combining with us for a period of three years after the date of the transaction in which the person acquired in excess of 15% of our outstanding voting stock, unless the merger or combination is approved in a prescribed manner. This could discourage, delay or prevent someone from acquiring us or merging with us, whether or not it is desired by, or beneficial to, our stockholders. This 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.

If we fail to maintain an effective system of internal control over financial reporting, we may not be able to accurately report our financial results or prevent fraud. As a result, stockholders could lose confidence in our financial and other public reporting, which would harm our business and the trading price of our common stock.

Effective internal controls over financial reporting are necessary for us to provide reliable financial reports and, together with adequate disclosure controls and procedures, are designed to prevent fraud. Any failure to implement required new or improved controls, or difficulties encountered in their implementation could cause us to fail to meet our reporting obligations. In addition, any testing by us conducted in connection with Section 404 of the Sarbanes-Oxley Act of 2002, or any subsequent testing by our independent registered public accounting firm, may reveal deficiencies in our internal controls over financial reporting that are deemed to be material weaknesses or that may require prospective or retroactive changes to our financial statements or identify other areas for further attention or improvement. Inferior internal controls could also cause investors to lose confidence in our reported financial information, which could have a negative effect on the trading price of our stock.

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We are required to disclose changes made in our internal controls and procedures on a quarterly basis and our management is required to assess the effectiveness of these controls annually. However, for as long as we are an "emerging growth company" under the JOBS Act, our independent registered public accounting firm will not be required to attest to the effectiveness of our internal controls over financial reporting pursuant to Section 404. We could be an "emerging growth company" for up to five years. An independent assessment of the effectiveness of our internal controls over financial reporting could detect problems that our management's assessment might not. Undetected material weaknesses in our internal controls over financial reporting could lead to financial statement restatements and require us to incur the expense of remediation.

Our disclosure controls and procedures may not prevent or detect all errors or acts of fraud.

Upon the closing of our initial public offering in July 2019, we became subject to certain reporting requirements of the Exchange Act. Our disclosure controls and procedures are designed to reasonably assure that information required to be disclosed by us in reports we file or submit under the Exchange Act is accumulated and communicated to management, recorded, processed, summarized and reported within the time periods specified in the rules and forms of the SEC. We believe that any disclosure controls and procedures or internal controls and procedures, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. These inherent limitations include the realities that judgments in decision-making can be faulty, and that breakdowns can occur because of simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people or by an unauthorized override of the controls. Accordingly, because of the inherent limitations in our control system, misstatements or insufficient disclosures due to error or fraud may occur and not be detected.

Our restated certificate of incorporation provides that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for most legal actions 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, employees or agents.

Our restated certificate of incorporation specifies that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for most legal actions involving state law claims brought against us by stockholders. Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and to have consented to the provisions of our restated certificate of incorporation described above.

We believe this provision benefits us by providing increased consistency in the application of Delaware law by chancellors particularly experienced in resolving corporate disputes, efficient administration of cases on a more expedited schedule relative to other forums and protection against the burdens of multi-forum litigation. However, the provision may have the effect of discouraging lawsuits against our directors, officers, employees and agents as it may limit any stockholder's ability to bring a claim in a judicial forum that such stockholder finds favorable for disputes with us or our directors, officers, employees or agents. The enforceability of similar choice of forum provisions in other companies' certificates of incorporation has been challenged in legal proceedings, and it is possible that, in connection with any applicable action brought against us, a court could find the choice of forum provisions contained in our restated certificate of incorporation to be inapplicable or unenforceable in such action. If a court were to find the choice of forum provision contained in our 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, financial condition or results of operations.

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS AND INDUSTRY DATA

This prospectus contains forward-looking statements that involve substantial risks and uncertainties. All statements, other than statements of historical facts, contained in this prospectus, including statements regarding our strategy, future operations, future financial position, future revenue, projected costs, prospects, plans and objectives of management and expected market growth are forward-looking statements. The words “anticipate,” “believe,” “continue,” “could,” “estimate,” “expect,” “intend,” “may,” “plan,” “potential,” “predict,” “project,” “should,” “target,” “would” and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words.

These forward-looking statements include, among other things, statements about:

- the timing, progress and results of preclinical studies and clinical trials for KarXT in our current indications and other product candidates we may develop, including statements regarding the timing of initiation and completion of studies or trials and related preparatory work and the period during which the results of the trials will become available;
- our research and development plans, including our plans to explore the therapeutic potential of KarXT in additional indications;
- our plans to develop and commercialize KarXT and other product candidates;
- the timing of and our ability to obtain and maintain marketing approvals for our product candidates;
- the rate and degree of market acceptance and clinical utility of any product candidates for which we receive marketing approval;
- our commercialization, marketing and manufacturing capabilities and strategy;
- our intellectual property position and strategy;
- our ability to identify additional product candidates with significant commercial potential;
- our plans to enter into collaborations for the development and commercialization of product candidates;
- the potential benefits of any future collaboration;
- our expectations related to the use of proceeds from this offering;
- our estimates regarding expenses, future revenue, capital requirements and needs for additional financing;
- our ability to retain the continued service of our key professionals and to identify, hire and retain additional qualified professionals;
- developments relating to our competitors and our industry; and
- the impact of government laws and regulations.

We may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Actual results or events could differ materially from the plans, intentions and expectations disclosed in the forward-looking statements we make. We have included important factors in the cautionary statements included in this prospectus, particularly in the “Risk Factors” section, that could cause actual results or events to differ materially from the forward-looking statements that we make. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, collaborations, joint ventures or investments that we may make or enter into.

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In addition, statements that “we believe” and similar statements reflect our beliefs and opinions on the relevant subject. These statements are based upon information available to us as of the date of this prospectus, and while we believe such information forms a reasonable basis for such statements, such information may be limited or incomplete, and our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all potentially available relevant information. These statements are inherently uncertain and investors are cautioned not to unduly rely upon these statements.

You should read this prospectus and the documents that we 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 do not assume any obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by law.

This prospectus includes statistical and other industry and market data that we obtained from industry publications and research, surveys and studies conducted by third parties. Industry publications and third-party research, surveys and studies generally indicate that their information has been obtained from sources believed to be reliable, although they do not guarantee the accuracy or completeness of such information. We are responsible for all of the disclosure contained in this prospectus, and we believe these industry publications and third-party research, surveys and studies are reliable.

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USE OF PROCEEDS

We estimate that the net proceeds to us from the sale of the shares of our common stock in this offering will be approximately $234.0 million, or approximately $269.2 million if the underwriters exercise their option to purchase additional shares from us in full, based upon the public offering price of $96.00 per share, and after deducting underwriting discounts and commissions and estimated offering expenses payable by us.

As of September 30, 2019, we had cash, cash equivalents and short-term investments of $161.6 million. We currently estimate that we will use the net proceeds from this offering, together with our existing cash, cash equivalents and short-term investments, as follows:

- approximately $75 million to fund the completion of a planned Phase 3 clinical trial for the treatment of psychosis in schizophrenia, including, if necessary, a global Phase 3 clinical trial, and an open-label extension trial and filing on a New Drug Application with the U.S. Food and Drug Administration for KarXT for the treatment of psychosis in schizophrenia;
- approximately $15 million to fund the development and expansion of our pipeline, including other muscarinic candidates, formulations and derivatives; and
- the remainder to fund working capital and other general corporate activities.

This expected use of the net proceeds from this offering along with our existing cash, cash equivalents and short-term investments represents our intentions based upon our current plans and business conditions, which could change in the future as our plans and business conditions evolve. For example, we may use a portion of the net proceeds for the acquisition of businesses or technologies to continue to build our pipeline, our research and development capabilities and our intellectual property position, although we currently have no agreements, commitments or understandings with respect to any such transaction. The amounts and timing of our actual expenditures may vary significantly depending on numerous factors, including the progress of our development and commercialization efforts, the status of and results from clinical trials, any collaborations that we may enter into with third parties for our product candidates and any unforeseen cash needs. Moreover, our estimates of the costs to fund our trials are based on the current designs of the trials. If we were to modify the design of any of these trials, for instance, to increase the number of patients in the trials, our costs to fund the trials could increase. As a result, our management will retain broad discretion over the allocation of the net proceeds from this offering.

Based on our current plans, we believe that our existing cash, cash equivalents and short-term investments, together with the net proceeds from this offering, will be sufficient to enable us to fund our operating expenses and capital expenditure requirements through the second half of 2021. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect. We do not have any committed external source of funds.

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

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DIVIDEND POLICY

We have never declared nor paid cash dividends on our capital stock. We currently intend to retain all of our future earnings, if any, to finance the growth and development of our business. We do not intend to pay cash dividends in respect of our capital stock in the foreseeable future.

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CAPITALIZATION

The following table sets forth our cash, cash equivalents and short-term investments and our capitalization as of September 30, 2019:

- on an actual basis;
- on an as adjusted basis to give effect to our issuance and sale of 2,600,000 shares of our common stock in this offering at the public offering price of $96.00 per share, after deducting underwriting discounts and commissions and estimated offering expenses payable by us.

You should read this table together with our financial statements and the related notes appearing at the end of this prospectus and the sections of this prospectus titled “Selected Financial Data”, “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and “Description of Capital Stock” sections of this prospectus.

	As of September 30, 2019	
	Actual	As Adjusted
Cash, cash equivalents and short-term investments	$ 161,605	$ 395,629
Stockholders’ equity (deficit):		
Preferred stock, $0.0001 par value; 10,000,000 shares authorized and no shares issued and outstanding, actual and as adjusted	-	-
Common stock, $0.0001 par value; 150,000,000 shares authorized, actual and as adjusted; 23,412,754 shares issued and outstanding, actual; 26,012,754 shares issued and outstanding, as adjusted	2	3
Additional paid-in capital	230,216	464,239
Accumulated deficit	(67,738)	(67,738)
Accumulated other comprehensive income	50	50
Total stockholders’ equity (deficit)	162,530	396,554
Total capitalization	$ 162,530	$ 396,554

The table above excludes:

- 4,671,906 shares of our common stock issuable upon the exercise of stock options outstanding as of September 30, 2019, at a weighted average exercise price of $8.58 per share;
- 772,308 shares of our common stock reserved for future issuance under our 2019 Stock Option and Incentive Plan as of September 30, 2019, as well as any automatic increases in the number of shares of our common stock reserved for future issuance under this plan; and
- 213,729 shares of our common stock reserved for future issuance under our 2019 Employee Stock Purchase Plan as of September 30, 2019, as well as any automatic increases in the number of shares of our common stock reserved for future issuance under this plan.

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DILUTION

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

Our historical net tangible book value (deficit) as of September 30, 2019 was $162.5 million, or $6.94 per share of our common stock. Our historical net tangible book value (deficit) is the amount of our total tangible assets less our total liabilities and convertible preferred stock. Historical net tangible book value (deficit) per share represents our historical net tangible book value (deficit) divided by the 23,412,754 shares of our common stock outstanding as of September 30, 2019.

After giving further effect to our issuance and sale of 2,600,000 shares of our common stock in this offering at the public offering price of $96.00 per share, and after deducting underwriting discounts and commissions and estimated offering expenses payable by us, our as adjusted net tangible book value as of September 30, 2019 would have been $396.6 million, or $15.24 per share. This represents an immediate increase in as adjusted net tangible book value per share of $8.30 to existing stockholders and immediate dilution of $80.76 in as adjusted net tangible book value per share to new investors purchasing common stock in this offering. Dilution per share to new investors is determined by subtracting as adjusted net tangible book value per share after this offering from the public offering price per share paid by new investors. The following table illustrates this dilution on a per share basis:

Public offering price per share		$96.00
Historical net tangible book value (deficit) per share as of September 30, 2019	$6.94	
Increase in as adjusted net tangible book value per share attributable to new investors purchasing shares in this offering	8.30	
As adjusted net tangible book value per share after this offering		15.24
Dilution per share to new investors purchasing shares in this offering		$80.76

If the underwriters exercise their option to purchase additional shares in full, our as adjusted net tangible book value per share after this offering would be $16.35 per share, representing an immediate increase in as adjusted net tangible book value per share of $9.41 to existing stockholders and immediate dilution in as adjusted net tangible book value per share of $79.65 to new investors purchasing common stock in this offering, at the public offering price of $96.00 per share, and after deducting underwriting discounts and commissions and estimated offering expenses payable by us. If any shares are issued upon exercise of outstanding options, you will experience further dilution.

The above calculations exclude:

- 4,671,906 shares of our common stock issuable upon the exercise of stock options outstanding as of September 30, 2019, at a weighted average exercise price of $8.58 per share;
- 772,308 shares of our common stock reserved for future issuance under our 2019 Stock Option and Incentive Plan as of September 30, 2019, as well as any automatic increases in the number of shares of our common stock reserved for future issuance under this plan; and
- 213,729 shares of our common stock reserved for future issuance under our 2019 Employee Stock Purchase Plan as of September 30, 2019, as well as any automatic increases in the number of shares of our common stock reserved for future issuance under this plan.

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SELECTED FINANCIAL DATA

You should read the following selected financial data together with our financial statements and the related notes appearing at the end of this prospectus and the "Management's Discussion and Analysis of Financial Condition and Results of Operations" section of this prospectus. We have derived the statement of operations data for the years ended December 31, 2017 and 2018 and the balance sheet data as of December 31, 2017 and 2018 from our audited financial statements appearing at the end of this prospectus. We have derived the statement of operations data for the nine months ended September 30, 2018 and 2019 and the balance sheet data as of September 30, 2019 from our unaudited interim financial statements appearing at the end of this prospectus. The unaudited interim financial statements have been prepared on the same basis as the audited financial statements and reflect, in the opinion of management, all adjustments of a normal, recurring nature that are necessary for a fair statement of the financial information included in those unaudited interim financial statements. Our historical results are not necessarily indicative of the results that may be expected in the future, and the results for the nine months ended September 30, 2019 are not necessarily indicative of results to be expected for the full year or any other period.

	Year Ended December 31,		Nine Months Ended September 30,	
	2017	2018	2018	2019
	(in thousands, except share and per share data)			
Statement of Operations Data:				
Revenue	-	-	-	-
Operating expenses:				
Research and development	$ 3,616	$ 11,536	$ 4,816	$ 19,544
General and administrative	1,190	2,974	1,548	16,995
Total operating expenses	4,806	14,510	6,364	36,539
Loss from operations	(4,806)	(14,510)	(6,364)	(36,539)
Other income (expense):				
Interest income (expense)	(555)	(407)	(396)	11
Interest income	-	25	-	1,425
Accretion of debt discount	(616)	(2,176)	(1,996)	(945)
Change in fair value of derivative	(55)	(444)	(429)	(135)
Total other income (expense), net	(1,226)	(3,002)	(2,821)	356
Net loss before income taxes	$ (6,032)	$ (17,512)	$ (9,185)	$ (36,183)
Net loss per share—basic and diluted(1)		$ (4,378,000)	$ (4,592,500)	$ (4.67)
Weighted-average number of common shares used in net loss per share—basic and diluted(1)		4	2	7,755,137

(1) See Note 2 in the notes to our financial statements appearing at the end of this prospectus for a description of the method used to calculate basic and diluted net loss per share.

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	As of December 31,		As of September 30,
	2017	2018	2019
Balance Sheet Data:			
Cash, cash equivalents and short-term investments	$ 1,942	$ 13,887	$ 161,605
Working capital(1)	(9,394)	14,400	162,395
Total assets	2,129	15,857	164,227
Redeemable convertible preferred stock	1	41,965	0
Total stockholders' deficit	(13,368)	(29,922)	162,530

(1) We define working capital as current assets less current liabilities. Included in current liabilities as of December 31, 2017, December 31, 2018 and September 30, 2019 are $10.3 million, $0.4 million, and zero, respectively, related to the current portion of convertible notes and associated derivative liability.

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

You should read the following discussion and analysis of our financial condition and results of operations together with the "Selected Financial Data" section of this prospectus and our financial statements and the related notes included at the end of this prospectus. This discussion and other parts of this prospectus contain forward-looking statements that involve risks and uncertainties, such as statements of our plans, objectives, expectations and intentions. As a result of many factors, including those factors set forth in the "Risk Factors" section of this prospectus, our actual results could differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis.

Overview

We are an innovative clinical-stage biopharmaceutical company primarily focused on developing novel therapies to address disabling neuropsychiatric conditions characterized by significant unmet medical need. Our pipeline is built on the broad therapeutic potential of our lead product candidate, KarXT, an oral modulator of muscarinic receptors that are located both in the central nervous system, or CNS, and various peripheral tissues. KarXT is our proprietary product candidate that combines xanomeline, a novel muscarinic agonist, with trospium, an approved muscarinic antagonist, to preferentially stimulate muscarinic receptors in the CNS. In November 2019, we announced topline results from our Phase 2 clinical trial of KarXT for the treatment of acute psychosis in patients with schizophrenia, in which KarXT met the trial's primary endpoint with a statistically significant ($p<0.0001$) and clinically meaningful reduction in total Positive and Negative Syndrome Scale scores over placebo and was observed to be well tolerated. We also plan to initiate clinical trials of KarXT to evaluate its potential therapeutic benefit in other CNS disorders, including psychosis in Alzheimer's disease, or AD, as well as pain. We have assembled a team whose members have extensive expertise in the research, development and commercialization of numerous CNS agents, as well as deep familiarity with the biology of neuropsychiatric disorders, such as schizophrenia and AD, including the role of muscarinic receptors in their potential treatment. We plan to leverage this expertise to develop a pipeline of product candidates targeting a broad range of psychiatric and neurological conditions.

Since our inception in 2009, we have focused substantially all of our efforts and financial resources on organizing and staffing our company, acquiring and developing our technology, raising capital, building our intellectual property portfolio, undertaking preclinical studies and clinical trials and providing general and administrative support for these activities.

On June 27, 2019, our registration statement on Form S-1 relating to our initial public offering, or IPO, of our common stock was declared effective by the Securities and Exchange Commission, or SEC. In the IPO, which closed on July 2, 2019, we issued and sold 6,414,842 shares of our common stock, including full exercise of the underwriters' over-allotment option to purchase an additional 836,718 shares, at a public offering price of $16.00 per share. The aggregate net proceeds to us from the IPO, inclusive of proceeds from the over-allotment exercise, were approximately $93.0 million after deducting underwriting discounts and commissions of $7.2 million and offering expenses of approximately $2.4 million. Prior to the IPO, we have funded our operations primarily with proceeds from the sales of redeemable convertible preferred stock and the issuance of convertible notes.

We have never generated revenue and have incurred significant net losses since inception. Our net losses were $6.0 million and $17.5 million for the years ended December 31, 2017 and 2018, respectively, and for the nine months ended September 30, 2019, our net loss was $36.2 million. As of September 30, 2019, we had an accumulated deficit of $67.7 million. Our net losses may fluctuate significantly from quarter to quarter and year to year. We expect to incur significant expenses and

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increasing operating losses for the foreseeable future. We anticipate that our operating expenses and capital expenditures will increase substantially, particularly as we:

- invest significantly to further develop KarXT for our current and future indications;
- advance additional product candidates into preclinical and clinical development;
- seek regulatory approvals for any product candidates that successfully complete clinical trials;
- require the manufacture of larger quantities of our product candidates for clinical development and potential commercialization;
- hire additional clinical, scientific, management and administrative personnel;
- maintain, expand and protect our intellectual property portfolio;
- acquire or in-license other assets and technologies; and
- add additional operational, financial and management information systems and processes to support our ongoing development efforts, any future manufacturing or commercialization efforts and our transition to operating as a public company.

We do not expect to generate revenue from product sales unless and until we successfully complete development and obtain regulatory approval for a product candidate or enter into collaborative agreements with third parties, which we expect will take a number of years, if ever, and the outcome of which is subject to significant uncertainty. Additionally, we currently use third parties such as contract research organizations, or CROs, and contract manufacturing organizations, or CMOs, to carry out our preclinical and clinical development activities, and we do not yet have a sales organization. If we obtain regulatory approval for any product candidates, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution.

As a result, we will need substantial additional funding to support our continuing operations and pursue our growth strategy. Until such time as we can generate significant revenue from product sales, if ever, we expect to finance our operations through a combination of private and public equity offerings, debt financings, collaborations, strategic alliances and marketing, distribution or licensing arrangements with third parties. We may be unable to raise additional funds or enter into such other agreements or arrangements when needed on favorable terms, or at all. If we fail to raise capital or enter into such agreements as, and when, needed, we may have to significantly delay, scale back or discontinue the development and commercialization of one or more of our product candidates.

As of September 30, 2019, we had cash, cash equivalents and short-term investments of $161.6 million. We believe that our existing cash, cash equivalents and short-term investments as of September 30, 2019, will be sufficient to meet our anticipated operating and capital expenditure requirements will be sufficient to meet our anticipated operating and capital expenditure requirements for at least the next 18 months. We have based this estimate on assumptions that may prove to be wrong, and we could exhaust our available capital resources sooner than we expect. See “—Liquidity and Capital Resources.”

Components of Our Results of Operations

Revenue

To date, we have not generated any revenue and do not expect to generate any revenue in the foreseeable future, if at all. If our development efforts for our product candidates are successful and result in regulatory approval, we may generate revenue in the future from product sales. If we enter into license or collaboration agreements for any of our product candidates or intellectual property, we may generate revenue in the future from payments as a result of such license or collaboration

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agreements. We cannot predict if, when, or to what extent we will generate revenue from the commercialization and sale of our product candidates. We may never succeed in obtaining regulatory approval for any of our product candidates.

Operating Expenses

Research and Development Expenses

Research and development expenses consist primarily of costs incurred for the development of our product candidates and our drug discovery efforts, which include:

- personnel costs, including salaries and the related costs, and stock-based compensation expense, for employees engaged in research and development functions;
- expenses incurred in connection with the preclinical and clinical development of our product candidates, including under agreements with CROs;
- expenses incurred in connection with CMOs that manufacture drug products for use in our preclinical and clinical trials;
- formulation costs and chemistry, manufacturing and controls, or CMC, costs; and
- expenses incurred under agreements with consultants who supplement our internal capabilities.

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

We do not track our internal research and development expenses on an indication-by-indication basis as they primarily relate to personnel, early research and consumable costs, which are deployed across multiple projects under development. These costs are included in unallocated research and development expenses in the table below. A portion of our research and development costs are external costs, such as fees paid to consultants, central laboratories, contractors, CMOs and CROs in connection with our clinical development activities, which costs we do track on an indication-by-indication basis. Substantially all of our allocable expenses made to date have been for the development of KarXT for the treatment of psychosis in patients with schizophrenia, and accordingly, we do not show expenses allocated to any other indication in the table below. Formulation costs and CMC costs and preclinical expenses consist of external costs associated with activities to support our current and future clinical programs, but are not allocated on an indication-by-indication basis due to the overlap of the potential benefit of those efforts across multiple indications that utilize KarXT. The following table summarizes our research and development expenses:

	Year Ended December 31,		Nine Months Ended September 30,	
	2017	2018	2018	2019
	(in thousands)			
Schizophrenia clinical trials	$ 1,138	$ 8,160	$ 2,474	$ 12,193
Pain clinical trials	-	-	-	369
Alzheimer's Disease clinical trials	-	-	-	38
Formulation and CMC	510	1,130	620	1,536
Preclinical	731	540	523	1,704
Unallocated expenses	1,237	1,706	1,199	3,704
Total research and development expense	$ 3,616	$ 11,536	$ 4,816	$ 19,544

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We expect our research and development expenses to increase substantially for the foreseeable future as we continue to invest in research and development activities related to developing our product candidates, including investments in manufacturing, as our programs advance into later stages of development and we continue to conduct clinical trials. The process of conducting the necessary clinical research to obtain regulatory approval is costly and time-consuming, and the successful development of our product candidates is highly uncertain.

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

- continue to develop and conduct clinical trials for KarXT for our current and future indications;
- initiate and continue research, preclinical and clinical development efforts for future product candidates;
- seek to identify additional product candidates;
- seek regulatory approvals for KarXT for our current and future indications as well as any other product candidates that successfully complete clinical development;
- add operational, financial and management information systems and personnel, including personnel to support our product development and help us comply with our obligations as a public company;
- hire and retain additional personnel, such as clinical, quality control, scientific, commercial and administrative personnel;
- maintain, expand and protect our intellectual property portfolio;
- establish sales, marketing, distribution, manufacturing, supply chain and other commercial infrastructure in the future to commercialize various products for which we may obtain regulatory approval, if any;
- add equipment and physical infrastructure to support our research and development; and
- acquire or in-license other product candidates and technologies.

A change in the outcome of any of these variables with respect to the development of any of our product candidates would significantly change the costs and timing associated with the development of that product candidate. We may never succeed in obtaining regulatory approval for any of our product candidates.

We do not believe that it is possible at this time to accurately project total indication-specific expenses through commercialization. There are numerous factors associated with the successful commercialization of any of our product candidates, including future trial design and various regulatory requirements, many of which cannot be determined with accuracy at this time based on our stage of development. Additionally, future commercial and regulatory factors beyond our control will impact our clinical development programs and plans.

General and Administrative Expenses

General and administrative expenses consist primarily of employee-related costs for personnel in executive, finance and administrative functions, costs related to maintenance and filing of intellectual

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property, facility-related costs, and other expenses for outside professional services, including legal, human resources, data management, audit and accounting services. Personnel costs consist of salaries, benefits, travel expense and stock-based compensation expense.

We anticipate that our general and administrative expenses will increase in the future as we increase our headcount to support our continued research activities and development of our product candidates. We also anticipate that we will incur increased accounting, audit, legal, regulatory, compliance and director and officer insurance costs as well as investor and public relations expenses associated with operating as a public company.

Other Income (Expense)

Interest (Expense) Income. Interest (expense) income consists of interest accrued on the principal balance of convertible notes that had been issued as of May 1, 2019, all of which were converted into redeemable convertible preferred stock in August 2018, March 2019, and April 2019. A portion of the accrued interest was forgiven with respect to certain of the convertible notes upon their conversion into redeemable convertible preferred stock in August 2018, and the forgiven interest was recorded as a reduction to interest expense in the year ended December 31, 2018.

Interest Income. Interest income consists of interest income from our short-term investments.

Accretion of Debt Discount. Upon issuance of our convertible notes, each note was recorded at cost, net of the derivative liability (see "—Critical Accounting Polices and Estimates"). This discount on each outstanding note, if any, was amortized as interest expense to the date such note was expected to convert using the effective interest rate method and is reflected in the statements of operations as accretion of debt discount.

All outstanding principal under our convertible notes, totaling $19.8 million of principal, converted into shares of our Series A redeemable convertible preferred stock in our Series A financing in August 2018. With the exception of the 2018 Wellcome Trust Note, as defined and further described below, all outstanding convertible note agreements were cancelled upon such conversion. In March and April 2019, the $5.8 million outstanding principal drawn down following August 2018 under the 2018 Wellcome Trust Note converted into shares of our Series B redeemable convertible preferred stock. In April 2019, an additional $1.6 million was drawn down under the Wellcome Trust Note, which was subsequently converted into shares of our Series B redeemable convertible preferred stock.

Change in Fair Value of Derivatives. Our convertible notes contained conversion options at a significant premium that were deemed to be embedded derivatives that are required to be bifurcated and accounted for separately from the convertible note. We remeasure the derivative liability to fair value at each reporting date, and we recognize changes in the fair value of the derivative liabilities in our statements of operations.

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Results of Operations

Comparison of the Three Months Ended September 30, 2018 and 2019

	Three Months Ended September 30,		
	2018	2019	Change
		(in thousands)	
Revenue	$ -	$ -	$ -
Operating expenses:			
Research and development	1,417	5,793	4,376
General and administrative	1,056	4,103	3,047
Total operating expenses	2,473	9,896	7,423
Loss from operations	(2,473)	(9,896)	(7,423)
Total other income (expense), net	(3,765)	858	4,623
Net loss attributable to common stockholders	(6,238)	(9,038)	(2,800)

Research and Development Expenses

	Three Months Ended September 30,		
	2018	2019	Change
		(in thousands)	
Direct research and development expenses:			
Schizophrenia clinical studies	$ 498	3,376	$2,878
Pain clinical trials	-	369	369
Alzheimer's Disease clinical trials	-	38	38
Formulation and CMC	392	176	(216)
Preclinical	71	217	146
Unallocated expenses:			
Personnel related (including stock-based compensation)	267	886	619
Consultant fees and other expenses	189	731	542
Total research and development expense	$ 1,417	$ 5,793	$4,376

Expenses related to our schizophrenia clinical trials increased by $2.9 million due to the completion of enrollment of our Phase 2 clinical trial for which enrollment began in September 2018. The $0.4 million and less than $0.1 million in expenses related to new pain and Alzheimer's Disease clinical trials consist of study preparation and startup costs for Phase 1 clinical trials incurred in the three months ended September 30, 2019. Formulation and CMC expenses decreased by $0.2 million due to a decrease in manufacturing activities as sufficient supply was manufactured for the clinical trials referenced above. Preclinical expenses increased by $0.1 million due to the initiation and execution of toxicology studies. The increase of $0.6 million in personnel-related costs was primarily a result of an increase in headcount. The increase of $0.5 million in consultant fees and other expenses was due to a combination of an increase in consulting activities as well as costs associated with our discovery programs.

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General and Administrative Expenses

	Three Months Ended September 30,		
	2018	2019	Change
		(in thousands)	
Personnel-related (including stock-based compensation)	$ 677	$ 2,376	$1,699
Professional and consultant fees	281	730	449
Other	98	997	899
Total general and administrative expense	$ 1,056	$ 4,103	$3,047

The increase of $1.7 million in personnel-related costs was primarily the result of increased headcount as well as an increase in stock-based compensation expense of $1.2 million. The increase of $0.4 million in professional and consultant fees was primarily due to an increase in audit fees, legal costs, and public relations consulting fees related to our ongoing business activities as a public company. The increase of $0.9 million in other costs was primarily due to insurance costs and our facility lease in Boston, Massachusetts.

Other Income (Expense), Net

	Three Months Ended September 30,		
	2018	2019	Change
		(in thousands)	
Interest income (expense)	$ 192	$ -	$ (192)
Interest income	-	858	858
Accretion of debt discount	(1,324)	-	1,324
Change in fair value of derivative	(2,633)	-	2,633
Total other income (expense), net	$ (3,765)	$ 858	$4,623

Interest income (expense) for the three months ended September 30, 2018 represents the forgiveness of accrued interest associated with the conversion of the outstanding notes issued to the Wellcome Trust, or the Wellcome Trust Notes, and other convertible notes during our Series A convertible preferred stock financing. There was no interest income (expense) recorded during the three months ended September 30, 2019 because there were no convertible notes outstanding during the quarter.

Interest income is attributable to interest earned on our short-term investments, which were purchased beginning in November 2018.

All outstanding Wellcome Trust Notes and other convertible notes as of August 1, 2018 were converted into shares of Series A convertible preferred stock and the debt discount was fully accreted at that time. There was no debt outstanding during the three months ended September 30, 2019 and therefore no related accretion of debt discount.

The change in fair value of derivative for the three months ended September 30, 2018 reflects the final mark-to-market of the derivative liabilities of the Wellcome Trust Notes and other convertible notes which were converted into shares of Series A convertible preferred stock. There was no change in fair value of derivative recorded during the three months ended September 30, 2019 because there were no convertible notes outstanding during the quarter.

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Results of Operations

Comparison of the Nine Months Ended September 30, 2018 and 2019

	Nine Months Ended September 30,		
	2018	2019	Change
		(in thousands)	
Revenue	$ -	$ -	$ -
Operating expenses:			
Research and development	4,816	19,544	14,728
General and administrative	1,548	16,995	15,447
Total operating expenses	6,364	36,539	30,175
Loss from operations	(6,364)	(36,539)	(30,175)
Total other income (expense), net	(2,821)	356	3,177
Net loss attributable to common stockholders	$ (9,185)	$ (36,183)	$ (26,998)

Research and Development Expenses

	Nine Months Ended September 30,		
	2018	2019	Change
		(in thousands)	
Direct research and development expenses:			
Schizophrenia clinical studies	$ 2,474	12,193	$ 9,719
Pain clinical trials	-	369	369
Alzheimer's Disease clinical trials	-	38	38
Formulation and CMC	620	1,536	916
Preclinical	523	1,704	1,181
Unallocated expenses:			
Personnel related (including stock-based compensation)	672	2,184	1,512
Consultant fees and other expenses	527	1,520	993
Total research and development expense	$ 4,816	$ 19,544	$ 14,728

Expenses related to our schizophrenia clinical trials increased by $9.7 million due to the continued enrollment of our Phase 2 clinical trial for which enrollment began in September 2018. The $0.4 million and less than $0.1 million in expenses related to new pain and Alzheimer's Disease clinical trials consist of study preparation and startup costs for Phase 1 clinical trials incurred in the three months ended September 30, 2019. Formulation and CMC expenses increased by $0.9 million due to an increase in formulation development activities. Preclinical expenses increased by $1.2 million due to the initiation and execution of toxicology studies. The increase of $1.5 million in personnel-related costs was primarily a result of an increase in headcount. The increase of $1.0 million in consultant fees and other expenses was due to a combination of increase in consulting activities as well as costs associated with our discovery programs.

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General and Administrative Expenses

	Nine Months Ended September 30,		
	2018	2019	Change
		(in thousands)	
Personnel-related (including stock-based compensation)	$ 877	$ 13,729	$12,852
Professional and consultant fees	526	1,444	918
Other	145	1,822	1,677
Total general and administrative expense	$ 1,548	$ 16,995	$15,477

The increase of $12.9 million in personnel-related costs was primarily the result of increased headcount as well as an increase in stock-based compensation expense of $10.8 million. The increase of $0.9 million in professional and consultant fees was primarily due to an increase in audit fees, legal costs, and public relations consulting fees related to our preparations to be, and our ongoing business activities as, a public company. The increase of $1.7 million in other costs was primarily due to insurance costs and our facility lease in Boston, Massachusetts.

Other Income (Expense), Net

	Nine Months Ended September 30,		
	2018	2019	Change
		(in thousands)	
Interest income (expense)	$ (396)	$ 11	$ 407
Interest income	-	1,425	1,425
Accretion of debt discount	(1,996)	(945)	1,051
Change in fair value of derivative	(429)	(135)	294
Total other income (expense), net	$ (2,821)	$ 356	$3,177

Interest income (expense) for the nine months ended September 30, 2018 represents interest expense accrued on outstanding convertible notes net of the impact of the forgiveness of accrued interest associated with the conversion of the outstanding Wellcome Trust Notes and other convertible notes during our Series A convertible preferred stock financing. Interest income (expense) for the nine months ended September 30, 2019 reflects excess of interest forgiven on the Wellcome Trust Notes at the time of conversion over interest expense accrued on all convertible notes outstanding during the period.

Interest income is attributable to interest earned on our short-term investments, which were purchased beginning in November 2018.

The accretion of debt discount for the nine months ended September 30, 2018 was attributable to the outstanding Wellcome Trust Notes and other convertible notes which were converted in the Series A convertible preferred stock financing on August 1, 2018. The accretion of debt discount for the nine months ended September 30, 2019 was attributable to the convertible notes issued in accordance with the Wellcome Trust Notes. These notes were subsequently converted in March and April 2019 into shares of our Series B convertible preferred stock. The related debt discounts were fully accreted at the time of each respective conversion.

The change in fair value of derivative for the nine months ended September 30, 2018 reflects the mark-to-market of the convertible note derivative liabilities prior to the conversion of the associated

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notes in August 2018 into shares of our Series A convertible preferred stock. The change in fair value of derivative for the nine months ended September 30, 2019 reflects the mark-to-market of the convertible note derivative liabilities prior to the conversion of the associated notes in March 2019 into shares of our Series B convertible preferred stock.

Results of Operations

Comparison of the Years Ended December 31, 2017 and 2018

	Year Ended December 31,		
	2017	2018	Change
		(in thousands)	
Revenue	$ -	$ -	$ -
Operating expenses:			
Research and development	3,616	11,536	7,920
General and administrative	1,190	2,974	1,784
Total operating expenses	4,806	14,510	9,704
Loss from operations	(4,806)	(14,510)	(9,704)
Total other income (expense), net	(1,226)	(3,002)	(1,776)
Net loss attributable to common stockholders	$(6,032)	$ (17,512)	$(11,480)

Research and Development Expenses

	Year Ended December 31,		
	2017	2018	Change
		(in thousands)	
Direct research and development expenses:			
Schizophrenia clinical trials	$1,138	$ 8,160	$7,022
Formulation and CMC	510	1,130	620
Preclinical	731	540	(191)
Unallocated expenses:			
Personnel related (including stock-based compensation)	505	947	442
Consultant fees and other expenses	732	759	27
Total research and development expense	$3,616	$ 11,536	$7,920

Expenses related to our schizophrenia clinical trials increased by $7.0 million due to the initiation and enrollment of our Phase 2 clinical trial. Formulation and CMC expenses increased by $0.6 million due to production of clinical trial materials used in our clinical trials and oral formulation development activities. Preclinical expenses decreased by $0.2 million due to the timing of toxicology studies. The increase of $0.4 million in personnel-related costs was primarily a result of an increase in headcount for preclinical and discovery work, in addition to recognizing full year costs for employees that were hired in 2017.

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General and Administrative Expenses

	Year Ended December 31,		
	2017	2018	Change
		(in thousands)	
Personnel-related (including stock-based compensation)	$ 425	$ 1,564	$1,139
Professional and consultant fees	585	999	414
Other	180	411	231
Total general and administrative expense	$1,190	$ 2,974	$1,784

The increase of $1.1 million in personnel-related costs was primarily the result of an increase in headcount. The increase of $0.4 million in professional and consultant fees was primarily due to an increase in audit fees and legal costs related to our ongoing business activities and preparations to operate as a public company. The increase of $0.2 million in other costs was primarily due to data management services and our facility lease in Boston, Massachusetts.

Other Income (Expense), Net

	Year Ended December 31,		
	2017	2018	Change
		(in thousands)	
Interest expense	$ (555)	$ (407)	$ 148
Interest income	-	25	25
Accretion of debt discount	(616)	(2,176)	(1,560)
Change in fair value of derivative	(55)	(444)	(389)
Total other income (expense), net	$(1,226)	$ (3,002)	$(1,776)

The increase in other expense, net was primarily attributable to non-cash expenses associated with our convertible notes. Interest expense decreased by $0.1 million as a result of the forgiveness of interest on certain convertible notes upon their conversion, as contractually agreed upon, which was partially offset by additional interest accrued while the convertible notes were outstanding. The increase of $1.6 million in the accretion of debt discount and increase of $0.4 million in the change in fair value of derivative were primarily due to the settlement of the derivative liabilities and the conversion of the outstanding convertible notes into shares of our Series A redeemable convertible preferred stock in conjunction with our Series A redeemable convertible preferred stock financing on August 1, 2018. Interest income was attributable to interest earned on our short-term investments.

Income Taxes

We have not recorded any income tax benefits for the net losses we incurred or for the research and development tax credits we generated during the years ended December 31, 2017 and 2018 as we believed, based upon the weight of available evidence, that it was more likely than not that all of the net operating loss carryforwards and tax credits will not be realized. At December 31, 2018, we had federal net operating loss carryforwards totaling $23.0 million, of which $9.7 million begin to expire in 2029 and $13.3 million can be carried forward indefinitely. At December 31, 2018, we had state net operating loss carryforwards totaling $22.9 million which begin to expire in 2029. The federal and state operating loss carryforwards may be available to offset future income tax liabilities. As of December 31, 2018, we also had federal and state research and development tax credit carryforwards of $0.5 million and less than $0.1 million, respectively, which begin to expire in 2038 and 2033, respectively. Through December 31, 2018, we had recorded a full valuation allowance against our net deferred tax assets at each balance sheet date.

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We filed federal and state taxes as part of a controlled group with PureTech Health LLC, or PureTech Health, a related party, until the closing of our Series A financing in August 2018. Following the financing, we no longer met the requirements to be included in the controlled group filing, as PureTech Health no longer held 80% of our outstanding voting securities, thereby requiring us to file a separate U.S. federal income tax return for the period beginning on that date going forward. We are still required to file tax returns on a combined basis with PureTech Health in certain state jurisdictions.

While we did not record any deferred tax assets for research and development tax credits for from our inception through August 1, 2018, at which time we exited the controlled group, we believe that some of our activities during that period qualify for the credit. We may recognize these deferred tax assets at the point when PureTech Health completes a formal study and allocates the tax credits to us.

Liquidity and Capital Resources

Since our inception, we have incurred significant operating losses. We have not yet commercialized any of our product candidates and we do not expect to generate revenue from sales of any product candidates for several years, if at all. To date, we have funded our operations primarily with proceeds from the sale of redeemable convertible preferred stock, issuance of convertible notes and sales of our common stock. Through September 30, 2019, our operations have been financed by gross proceeds of $24.1 million from the issuance of convertible notes, $91.0 million from the sale of shares of our redeemable convertible preferred stock and $93.0 million from the sale of our common stock in our initial public offering. As of September 30, 2019, we had $161.6 million in cash, cash equivalents and short-term investments, and an accumulated deficit of $67.7 million.

Our primary use of cash has been to fund operating expenses, which consist of research and development and general and administrative expenditures. Cash used to fund operating expenses is impacted by the timing of when we pay these expenses, as reflected in the change in our outstanding accounts payable and accrued expenses.

Cash Flows

The following table summarizes our sources and uses of cash for each of the periods presented:

	Year Ended December 31,		Nine Months Ended September 30,	
	2017	2018	2018	2019
	(in thousands)			
Net cash used in operating activities	$ (4,027)	$ (15,377)	$ (8,513)	$ (24,103)
Net cash used in investing activities	(13)	(5,115)	-	(101,716)
Net cash provided by financing activities	4,250	27,577	24,877	171,059
Net increase in cash, cash equivalents and restricted cash	$ 210	$ 7,085	$ 16,364	$ 45,240

Cash Flows from Operating Activities

Cash used in operating activities for the nine months ended September 30, 2018 was $8.5 million, consisting of a net loss of $9.2 million partially offset by noncash items, including the accretion of debt discount related to the convertible notes of $2.0 million, non-cash interest expense of $0.4 million, stock-based compensation expense of $0.5 million and $0.4 million resulting from the change in fair value of the convertible note derivative liabilities. The change in our net operating assets and liabilities was due primarily to an increase in prepaid expenses and other current assets of $2.1 million primarily due to CRO payment timing, as well as by a decrease in accounts payable of $0.6 million.

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Cash used in operating activities for the nine months ended September 30, 2019 was $24.1 million, consisting of a net loss of $36.2 million partially offset by non-cash items, including stock-based compensation expense of $11.6 million, the accretion of debt discount related to the convertible notes of $0.9 million, and $0.1 million resulting from the change in fair value of the convertible note derivative liabilities. Net loss was also adjusted for $0.8 million of non-cash interest income. The change in our net operating assets and liabilities was due to an increase in accrued expenses of $0.8 million as well as $0.1 million related to an increase in deferred lease obligation, partially offset by an increase in prepaid expenses and other current assets of $0.6 million, and decrease to accounts payable of $0.1 million, which were driven by timing of payments to CROs and CMOs.

Cash used in operating activities for the year ended December 31, 2017 was $4.0 million, consisting of a net loss of $6.0 million partially offset by noncash items, including the accretion of debt discount related to the convertible notes of $0.6 million, non-cash interest expense of $0.6 million, stock-based compensation expense of $0.2 million and $0.1 million resulting from the change in fair value of the convertible note derivative liabilities. The change in our net operating assets and liabilities was due primarily to an increase in accounts payable of $0.5 million and an increase in accrued expense of $0.2 million, both primarily due to payment timing, which was partially offset by an increase in prepaid expenses of $0.2 million due to timing of payment of general and administrative expenses.

Cash used in operating activities for the year ended December 31, 2018 was $15.4 million, consisting of a net loss of $17.5 million partially offset by noncash items, including the accretion of debt discount related to the convertible notes of $2.2 million, stock-based compensation expense of $1.0 million, $0.4 million resulting from the change in fair value of the convertible note derivative liabilities and non-cash interest expense of $0.4 million. The cash used in our net operating assets and liabilities was due primarily to an increase in prepaid expenses of $1.5 million as a result of increased clinical activities and a decrease in accounts payable of $0.5 million primarily due to payment timing, which was partially offset by an increase in accrued expenses of $0.1 million due to timing of payment of general and administrative expenses and an increase in deferred lease obligation of $0.1 million.

Cash Flows from Investing Activities

During the nine months ended September 30, 2018, there was no cash flow from investing activities.

Cash used in investing activities for the nine months ended September 30, 2019 was $101.7 million, primarily attributable to the purchases of short-term investments of $131.6 million, and partially offset by maturities of short-term investments of $30.0 million.

Cash used in investing activities for the year ended December 31, 2017 was less than $0.1 million, attributable to the purchases of property and equipment.

Cash used in investing activities for the year ended December 31, 2018 was approximately $5.1 million and consisted of $5.0 million for the purchases of short-term investments with a duration of under one year, and $0.1 million for the purchase of property and equipment.

Cash Flows from Financing Activities

Cash provided by financing activities for the nine months ended September 30, 2018 was $24.9 million and was related to $15.9 million of proceeds from the issuance of redeemable convertible preferred stock, net of issuance costs and $9.0 million of proceeds from the issuance of convertible notes.

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Cash provided by financing activities for the nine months ended September 30, 2019 was $171.1 million and was related primarily to $95.5 million of proceeds from the sale of our common stock in our initial public offering, net of $7.2 million in underwriting discounts and commissions and partially offset by $2.4 million in payments of initial public offering costs, $74.8 million of net proceeds from the issuance of redeemable convertible preferred stock, as well as $3.1 million related to proceeds from the issuance of convertible notes.

Cash provided by financing activities for the year ended December 31, 2017 was $4.3 million and was related to the proceeds from the issuance of convertible notes.

Cash provided by financing activities for the year ended December 31, 2018 was $27.6 million and was related to the $15.9 million of proceeds from the issuance of redeemable convertible preferred stock, net of issuance costs and $11.7 million of proceeds from the issuance of convertible notes.

Future Funding Requirements

We expect our expenses to increase substantially in connection with our ongoing activities, in particular as we continue to advance our product candidates through clinical trials. In addition, upon the completion of this offering, we expect to incur additional costs associated with operating as a public company.

As of September 30, 2019, we had cash and cash equivalents and short-term investments of $161.6 million. Based on our current plans, we believe that our existing cash, cash equivalents and short-term investments, together with the net proceeds from this offering, will be sufficient to meet our anticipated operating and capital expenditure requirements will be sufficient to meet our anticipated operating and capital expenditure requirements through the second half of 2021.

We have based this estimate on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we currently expect. Because of the numerous risks and uncertainties associated with research, development and commercialization of pharmaceutical product candidates, we are unable to estimate the exact amount of our working capital requirements. Our future funding requirements will depend on and could increase significantly as a result of many factors, including:

- the scope, progress, results and costs of researching and developing KarXT for our current and future indications as well as other product candidates we may develop;
- the timing of, and the costs involved in, obtaining marketing approvals for KarXT for our current and future indications as well as future product candidates we may develop and pursue;
- the number of future indications and product candidates that we pursue and their development requirements;
- if approved, the costs of commercialization activities for KarXT for the approved indication, or any other product candidate that receives regulatory approval to the extent such costs are not the responsibility of any future collaborators, including the costs and timing of establishing product sales, marketing, distribution and manufacturing capabilities;
- subject to receipt of regulatory approval, revenue, if any, received from commercial sales of KarXT for any program or revenues received from any future product candidates;
- the extent to which we in-license or acquire rights to other products, product candidates or technologies;
- our headcount growth and associated costs as we expand our research and development and establish a commercial infrastructure;

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- the costs of preparing, filing and prosecuting patent applications, maintaining and protecting our intellectual property rights including enforcing and defending intellectual property related claims; and
- the ongoing costs of operating as a public company.

A change in the outcome of any of these or other variables with respect to the development of any of our product candidates could significantly change the costs and timing associated with the development of that product candidate. Further, our operating plans may change in the future, and we may need additional funds to meet operational needs and capital requirements associated with such operating plans.

Until such time, if ever, as we can generate substantial product revenue, we expect to finance our operations through a combination of equity financings, debt financings, collaborations with other companies or other strategic transactions. We do not currently have any 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 acquisitions or 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 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 or other arrangements when needed, we may be required to delay, limit, reduce or terminate our research, 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.

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

Contractual Obligations and Other Commitments

The following table summarizes our outstanding contractual obligations as of payment due date by period at September 30, 2019.

	Payments Due by Period				
	Total	Less Than 1 Year	1 to 3 Years	3 to 5 Years	More than 5 Years
	(in thousands)				
Operating lease commitments(1)	$1,728	$ 498	$1,016	$214	$ -
Total	$1,728	$ 498	$1,016	$214	$ -

(1) Reflects payments due for our lease of office space in Boston, Massachusetts under an operating lease agreement that expires in February 2023.

We enter into contracts in the normal course of business with CROs, CMOs and other third parties for clinical trials, preclinical research studies and testing and manufacturing services. These

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contracts are cancelable by us upon prior written notice. Payments due upon cancellation consist only of payments for services provided or expenses incurred, including noncancelable obligations of our service providers, up to the date of cancellation. These payments are not included in the preceding table as the amount and timing of such payments are not known.

We are also party to certain license and collaboration agreements with PureTech Health and Eli Lilly and Company. We have not included future payments under these agreements in the table of contractual obligations above since obligations under these agreements are contingent upon future events such as our achievement of specified development, regulatory and commercial milestones, or royalties on net product sales. As of September 30, 2019, we were unable to estimate the timing or likelihood of achieving these milestones or generating future product sales.

Critical Accounting Polices and Estimates

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

While our significant accounting policies are described in more detail in Note 2 to our financial statements appearing elsewhere in this prospectus, we believe that the accounting policies discussed below are critical to understanding our historical and future performance, as these policies relate to the more significant areas involving management's judgments and estimates.

Research and Development Contract Costs and Accruals

As part of the process of preparing our financial statements, we are required to estimate our accrued research and development expenses. We accrue for estimated costs of research and development activities conducted by third-party service providers, which include the conduct of preclinical studies and clinical trials, and contract manufacturing activities. We record the estimated costs of research and development activities based upon the estimated amount of services provided and include these costs in accrued liabilities in the balance sheets and within research and development expense in the statements of operations. When evaluating the adequacy of the accrued liabilities, we analyze progress of the research studies or clinical trials and manufacturing activities, including the phase or completion of events, invoices received and contracted costs. Significant judgments and estimates may be made in determining the accrued balances at the end of any reporting period. Actual results could differ from our estimates. Our historical accrual estimates have not been materially different from the actual costs.

Stock-Based Compensation Expense

Prior to our IPO, the estimated fair value of our common stock had been determined by our board of directors as of the date of each award grant, with input from management, considering our most recently available third-party valuations of common stock and our board of directors' assessment of additional objective and subjective factors that it believed were relevant and which may have changed

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from the date of the most recent valuation through the date of the grant. Subsequent to our IPO, the fair value of our common stock is based on quoted market prices. The determination of the fair value of share-based payment awards utilizing the Black-Scholes model is affected by our stock price and a number of assumptions, including expected volatility, expected life, risk-free interest rate and expected dividends.

Expected Term—We have opted to use the "simplified method" for estimating the expected term of employee options, whereby the expected term equals the arithmetic average of the vesting term and the original contractual term of the option (generally 10 years).

Expected Volatility—Due to our limited operating history and a lack of company specific historical and implied volatility data, we have based our estimate of expected volatility on the historical volatility of a group of similar companies that are publicly traded. The historical volatility data was computed using the daily closing prices for the selected companies' shares during the equivalent period of the calculated expected term of the stock-based awards.

Risk-Free Interest Rate—The risk-free rate assumption is based on the U.S. Treasury instruments with maturities similar to the expected term of our stock options.

Expected Dividend—We have not issued any dividends and do not expect to issue dividends over the life of the options. As a result, we have estimated the dividend yield to be zero.

The estimated fair value of stock options granted to employees and non-employee service providers are expensed over the requisite service period (generally the vesting term) on a straight-line basis. We account for the impact of forfeitures as they occur.

The assumptions underlying these valuations represent management's best estimates, which involve inherent uncertainties and the application of management judgment. As a result, if factors or expected outcomes change and we use significantly different assumptions or estimates, our share-based compensation expense could be materially different.

Off-Balance Sheet Arrangements

We did not have during the periods presented, and we do not currently have, any off-balance sheet arrangements, as defined in the rules and regulations of the Securities and Exchange Commission.

Quantitative and Qualitative Disclosures about Market Risk

We are exposed to market risk related to changes in interest rates. 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 equivalents and short-term investments are primarily invested in short-term U.S. Treasuries. However, because of the short-term nature of the investments in our portfolio, an immediate one percentage point change in market interest rates would not have a material impact on the fair market value of our investment portfolio or on our financial position or results of operations.

We are not currently exposed to significant market risk related to changes in foreign currency exchange rates; however, we have contracted with and may continue to contract with vendors that are located outside of the United States. As a result, our operations may be subject to fluctuations in foreign currency exchange rates in the future.

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Inflation generally affects us by increasing our cost of labor. 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, 2017 and 2018.

JOBS Act Accounting Election

We are an "emerging growth company," as defined in the Jumpstart Our Business Startups Act of 2012, or 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. Other exemptions and reduced reporting requirements under the JOBS Act for emerging growth companies include presentation of only two years audited financial statements in this prospectus, an exemption from the requirement to provide an auditor's report on internal controls over financial reporting pursuant to the Sarbanes-Oxley Act of 2012, an exemption from any requirement that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation, and less extensive disclosure about our executive compensation arrangements. We have elected to use the 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 (i) we are no longer an emerging growth company or (ii) we affirmatively and irrevocably opt out of the extended transition period provided in the JOBS Act. As a result, our financial statements may not be comparable to companies that comply with the new or revised accounting pronouncements as of public company effective dates.

We are also evaluating the benefits of relying on other exemptions and reduced reporting requirements under the JOBS Act. Subject to certain conditions, as an emerging growth company, we may rely on certain of these exemptions, including without limitation, providing an auditor's attestation report on our system of internal controls over financial reporting pursuant to Section 404(b) of the Sarbanes-Oxley Act. We would cease to be an emerging growth company upon the earliest of: (1) December 31, 2024; (2) the last day of the fiscal year in which we have more than $1.07 billion in annual revenue; (3) the last day of the fiscal year in which we qualify as a "large accelerated filer," with at least $700.0 million of equity securities held by non-affiliates as of the prior June 30th; or (4) the issuance, in any three-year period, by our company of more than $1.0 billion in non-convertible debt securities held by non-affiliates.

Recently Issued and Adopted Accounting Pronouncements

A description of recently issued accounting pronouncements that may potentially impact our financial position and results of operations is disclosed in Note 2 to our financial statements appearing elsewhere in this prospectus.

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BUSINESS

Overview

We are an innovative clinical-stage biopharmaceutical company primarily focused on developing novel therapies to address disabling neuropsychiatric conditions characterized by significant unmet medical need. Our pipeline is built on the broad therapeutic potential of our lead product candidate, KarXT, an oral modulator of muscarinic receptors that are located both in the central nervous system, or CNS, and various peripheral tissues. KarXT is our proprietary product candidate that combines xanomeline, a novel muscarinic agonist, with trospium, an approved muscarinic antagonist, to preferentially stimulate muscarinic receptors in the CNS. In November 2019, we announced topline results from our Phase 2 clinical trial of KarXT for the treatment of acute psychosis in patients with schizophrenia, in which KarXT met the trial's primary endpoint with a statistically significant ($p<0.0001$) and clinically meaningful reduction in total Positive and Negative Syndrome Scale, or PANSS, scores over placebo and was observed to be well tolerated. We also plan to initiate clinical trials of KarXT to evaluate its potential therapeutic benefit in other CNS disorders, including psychosis in Alzheimer's disease, or AD, as well as pain. We have assembled a team whose members have extensive expertise in the research, development and commercialization of numerous CNS agents, as well as deep familiarity with the biology of neuropsychiatric disorders, such as schizophrenia and AD, including the role of muscarinic receptors in potential treatment of these diseases. We plan to leverage this expertise to develop a pipeline of product candidates targeting a broad range of psychiatric and neurological conditions.

Psychosis is a prominent and debilitating symptom that occurs in many neuropsychiatric disorders, including schizophrenia, AD, bipolar disorder, Parkinson's disease, major depressive disorder and inflammatory neurological diseases, such as multiple sclerosis. Patients with schizophrenia experience psychotic symptoms, also known as positive symptoms, such as hallucinations and delusions. Schizophrenia is a chronic disabling disorder that is typically diagnosed in the late teenage years or early adulthood and is characterized by recurring episodes of psychosis requiring long-term treatment with antipsychotic drugs in most patients. The World Health Organization ranks psychosis as the third-most disabling medical condition in the world. In 2017, an estimated 2.7 million Americans, or approximately 0.5% to 1.0% of the United States population, had schizophrenia. Additionally, up to 50% of the estimated 5.7 million patients with AD in the United States experience psychosis at some point during the course of their disease, which often leads to institutional care in a hospital or nursing home.

Worldwide sales of antipsychotic drugs exceeded $11 billion in 2015 and are expected to exceed $14 billion by 2025, despite a highly generic market. Several branded market-leading antipsychotic medicines have each achieved worldwide annual sales in excess of $5 billion. Despite the large number of antipsychotic drugs developed over the last 20 years, current medicines have undergone only modest innovation relative to first generation drugs developed in the 1950s. In many patients, current antipsychotics are hampered by modest efficacy and significant side effects. At least half of patients fail to adequately respond to antipsychotic drugs. Additionally, in many patients, these treatments are associated with severe side effects including sedation, extrapyramidal side effects, such as motor rigidity, tremors and slurred speech, and significant weight gain resulting in the complications of diabetes, hyperlipidemia, hypertension and cardiovascular disease. The clinical benefit of current antipsychotics is further limited by poor adherence. In a 1,493-patient clinical trial funded by the National Institutes of Health, approximately 75% of patients reported discontinuing their antipsychotic medication within 18 months of starting treatment.

Current antipsychotic treatments work primarily by inhibiting D2 dopamine receptors and are often used by physicians to address a wide range of disorders in addition to schizophrenia, including bipolar disorder and psychotic depression, as well as psychosis and agitation in elderly patients with dementia. Muscarinic receptor agonists emerged in the 1990s as a potential alternative approach for

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treating psychosis. There are five distinct muscarinic receptors, M1 through M5, which are found in the brain as well as various peripheral tissues. The link between muscarinic receptor stimulation in the CNS, particularly stimulation of M1 and M4 receptors, and the reduction of psychotic symptoms and cognitive impairment, has been well studied and is supported by data from preclinical studies and two third-party clinical trials published in peer reviewed journals. However, the successful development of a therapeutic agent targeting muscarinic receptors has been limited by undesirable side effects that are believed to arise primarily as a result of stimulation of muscarinic receptors in peripheral tissues. We believe a therapeutic agent that can preferentially target and stimulate muscarinic receptors in the CNS, but not in peripheral tissues, has the potential to treat psychosis in schizophrenia and AD, including the associated agitation in patients with AD. We also believe the preferential stimulation of M1 and M4 muscarinic receptors in the CNS may address the negative symptoms of schizophrenia, such as apathy, reduced social drive and loss of motivation, as well as cognitive deficits in working memory and attention, all of which currently lack any approved treatments. This approach has the potential to produce a differentiated therapy relative to current D2 dopamine receptor-based antipsychotic drugs and to beneficially impact the lives of millions of patients with schizophrenia and other psychotic and cognitive disorders.

We are initially developing our lead product candidate, KarXT, for the treatment of acute psychosis in patients with schizophrenia. KarXT combines xanomeline, a muscarinic receptor agonist that preferentially stimulates M1 and M4 muscarinic receptors, and trospium, an approved muscarinic receptor antagonist that does not measurably cross the blood-brain barrier, confining its effects to peripheral tissues. M1 and M4 muscarinic receptors are the receptor subtypes believed to mediate the antipsychotic, procognitive and analgesic effects of xanomeline and other muscarinic agonists. Results from preclinical studies and clinical trials conducted by third parties support the hypothesis that xanomeline can reduce psychosis and improve cognition. Like all muscarinic receptor agonists studied to date, however, xanomeline's tolerability has been limited by side effects arising from muscarinic receptor stimulation in peripheral tissues, leading to nausea, vomiting, diarrhea and increased salivation and sweating, collectively referred to as cholinergic adverse events. Trospium is a muscarinic receptor antagonist approved in the United States and Europe for the treatment of overactive bladder that inhibits all five muscarinic receptor subtypes in peripheral tissues. We believe that a combination therapy of xanomeline and trospium has the potential to preferentially stimulate M1 and M4 muscarinic receptors in the brain without stimulating muscarinic receptors in peripheral tissues in order to achieve meaningful therapeutic benefit in patients with psychotic and cognitive disorders.

In our initial Phase 1 clinical trial, we observed that in healthy volunteers the combination of xanomeline and trospium was associated with 46% fewer cholinergic adverse events as compared to xanomeline administered with placebo. Additionally, we have completed a randomized, double-blind, placebo-controlled multiple ascending dose Phase 1 clinical trial in healthy volunteers, in which we examined various doses of our proprietary KarXT co-formulation and determined the dosing to be further examined in our recently completed Phase 2 clinical trial. Our Phase 2 clinical trial was designed to assess the safety and efficacy of KarXT in patients with schizophrenia experiencing acute psychosis. In this trial, KarXT demonstrated a statistically significant ($p<0.0001$) and clinically meaningful reduction in PANSS scores over placebo. KarXT was observed to be well tolerated. Cholinergic adverse events were mild or moderate in severity and did not lead to any discontinuations. We intend to hold an End-of-Phase 2 meeting with the FDA in the second quarter of 2020 to discuss our planned Phase 3 clinical trial development plan. Subject to FDA feedback, we anticipate initiating a Phase 3 clinical trial for the treatment of psychosis in patients with schizophrenia by the end of 2020. Based on our clinical data with KarXT and third-party published clinical data with xanomeline, we believe that KarXT has the potential to have therapeutic benefit in multiple CNS disorders, including the treatment of positive, negative and cognitive symptoms of schizophrenia and psychosis, as well as agitation associated with AD and other forms of dementia. We remain on track to initiate a Phase 1b clinical trial in healthy elderly volunteers to assess the safety and tolerability of KarXT before the end of

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2019 for the treatment of psychosis in patients with AD and expect topline results from this trial in the second half of 2020. In addition, we believe published third-party preclinical data support the development of KarXT as a novel non-opioid therapeutic for various forms of post-operative, inflammatory and neuropathic pain. We remain on track to initiate a Phase 1b clinical trial in healthy volunteers for the treatment of experimentally induced pain before the end of 2019 and expect topline results from this trial in mid-2020.

Our co-founder and Chief Operating Officer, Andrew Miller, Ph.D., was responsible for identifying, developing and testing the initial hypothesis supporting a combination of xanomeline and trospium. We have since assembled a team of employees and advisors who have expertise and extensive experience in developing psychiatric and neurological drugs, including several former scientists at Eli Lilly and Company, or Eli Lilly, who were actively involved in xanomeline's initial development. Steven Paul, M.D., our Chief Executive Officer and Chairman, was formerly the Executive Vice President for Science and Technology and President of the Lilly Research Laboratories at Eli Lilly, where he helped develop the antipsychotic drug Zyprexa and the antidepressant Cymbalta. Dr. Paul was the senior author of the initial publication evaluating xanomeline's effects in treating psychosis and agitation in patients with AD. Stephen Brannan, M.D., our Chief Medical Officer, was previously the Therapeutic Head of Neuroscience at Takeda Pharmaceutical Company Ltd. Alan Breier, M.D., our Chief Clinical Advisor and Chair of our Scientific Advisory Board, was previously Chief Medical Officer at Eli Lilly.

Pipeline

We are advancing a pipeline of therapeutic programs to address the positive, negative and cognitive symptoms associated with schizophrenia and psychosis associated with AD, as well as various forms of pain. We are leveraging our expertise and experience to explore the development of KarXT for additional CNS disorders, as well as advance other muscarinic-targeted drug candidates.

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Strategy

Our goal is to become a leading biopharmaceutical company focused on the development and commercialization of novel therapies for the treatment of CNS disorders. To achieve this, we are focused on the following key strategies:

Advance KarXT in our initial indications of psychosis in patients with schizophrenia and AD, as well as pain. In November 2019, we announced topline results from our Phase 2 clinical trial of KarXT for the treatment of acute psychosis in patients with schizophrenia, in which KarXT demonstrated a statistically significant and clinically meaningful reduction in total PANSS scores over placebo and was observed to be well tolerated. The established regulatory pathway for antipsychotic drug development in schizophrenia gives us significant historical precedent for regulatory approval requirements as well as pivotal Phase 3 clinical trial design, which we expect to be the same fundamental design as our recently completed Phase 2 clinical trial. We intend to hold an End-of-Phase 2 meeting with the FDA in the second quarter of 2020 to discuss our planned Phase 3 clinical trial development plan. Subject to FDA feedback, we anticipate initiating a Phase 3 clinical trial for the treatment of acute psychosis in patients with schizophrenia before the end of 2020. Based on the results of our completed Phase 1 and Phase 2 clinical trials of KarXT and the previous third-party Phase 2 clinical trial in AD, we remain on track to initiate a Phase 1b clinical trial in healthy elderly volunteers to assess the safety and tolerability of KarXT before the end of 2019 and expect topline results from this trial in the second half of 2020. In addition, we believe that KarXT has clinical and commercial potential in pain and we remain on track to initiate a Phase 1b clinical trial in healthy volunteers for the treatment of experimentally induced pain before the end of 2019 and expect topline results from this trial in mid-2020.

Apply our expertise in muscarinic receptor biology to expand into other indications for KarXT. Our deep knowledge and expertise of muscarinic receptor biology and CNS drug development, along with data from the recently completed Phase 2 trial in schizophrenia, will guide our future development of KarXT for additional indications. Our recently completed Phase 2 clinical trial was focused on the treatment of acute psychosis, but also included endpoints that assessed the negative and cognitive symptoms of schizophrenia. The final data from this trial will help us guide KarXT's future development for negative and cognitive symptoms, for which there are currently no approved treatments. In addition, we believe these data, together with our insights around the novel mechanism of KarXT, will inform further exploration of KarXT as a therapeutic treatment in a broad range of disorders where stimulation of muscarinic receptors in the CNS may be beneficial, including bipolar disorder, Parkinson's disease, major depressive disorder and inflammatory neurological diseases, such as multiple sclerosis.

Advance the development of additional KarXT formulations. We are developing additional formulations of KarXT that could improve its therapeutic window and increase medication adherence by reducing the dosing frequency, as well as to be further optimized for target patient populations. We believe our ongoing work on both next generation oral and non-oral formulations of KarXT could improve patient outcomes, particularly in patients with schizophrenia and AD, where medication adherence has been problematic.

Develop and advance our early-stage pipeline. We have developed a series of novel compounds targeting muscarinic receptors that we are currently evaluating and optimizing for purposes of selecting additional product candidates. We believe our scientific expertise will allow us to build a pipeline of product candidates targeting muscarinic and non-muscarinic receptors for a broad range of disabling and debilitating CNS disorders through differentiated pharmacology.

Selectively collaborate to realize the potential of our product candidates. We have retained global commercialization rights to KarXT for all therapeutic uses. If approved, we expect to

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initially commercialize KarXT for schizophrenia and AD psychosis directly, using a specialized psychiatrist- and neurologist-targeted sales force in the United States. In other markets and indications, we intend to evaluate the merits of entering into development and commercialization agreements with collaborators who have local market or specialized expertise and capabilities.

Muscarinic Receptor Biology in the Nervous System

Neurotransmitters are chemical messengers secreted by neurons, or nerve cells, to facilitate information flow and communication with other cells, such as muscle or similar nerve cells, in both the central and peripheral nervous systems. As a result, stimulating or inhibiting neurotransmission can have a profound effect on the overall function of an organism. There are many identified neurotransmitters with a variety of structures and functions. One of the key neurotransmitters in the brain is acetylcholine, for which there are two different receptor classes: ion channel-gated nicotinic receptors, and G protein-coupled muscarinic receptors. Within the muscarinic receptor family, there are five subtypes, M1 through M5, all of which are expressed in the brain and in peripheral tissues.

Muscarinic receptors serve a number of key physiological roles including in cognitive, behavioral, sensory, motor and autonomic processes. Disruption of muscarinic receptor signaling is believed to contribute to psychosis and cognitive impairment in a wide variety of diseases, including schizophrenia and AD. Conversely, third-party preclinical and clinical data suggest that the enhancement of muscarinic receptor signaling leads to improvement in these same symptoms. M1 and M4 muscarinic receptors in particular have been reported to be under-expressed in the brains of patients with schizophrenia. In animal behavioral models, drug candidates that selectively stimulated M1 and M4 muscarinic receptors have demonstrated improvements in psychosis and cognition. Third-party clinical data suggest that stimulation of M1 and M4 muscarinic receptors may similarly be therapeutically beneficial for the treatment of patients with these symptoms. Conversely, inhibition of these receptors has been observed to disrupt memory and cognition, as well as to exacerbate psychosis in patients with schizophrenia.

Muscarinic receptors are also believed to play an important role in processing the sensation of pain. In particular, muscarinic receptors are abundant in pain centers of the brain, and the stimulation of M1, M2 and M4 muscarinic receptors has been associated with analgesia and the suppression of painful stimuli in a variety of acute, inflammatory and neuropathic animal models of pain.

The stimulation of muscarinic receptors in peripheral tissues can have significant physiological consequences. In peripheral tissues, such as the gastrointestinal and genitourinary tracts, and salivary and sweat glands, M2 and M3 muscarinic receptors are prominently expressed and have specialized functions. In the gastrointestinal tract, muscarinic receptors play a significant role in regulating gastrointestinal motility. Dosing with agonists that stimulate these muscarinic receptors can lead to diarrhea and increased motility, while dosing with muscarinic antagonists can lead to constipation and decreased motility. In the bladder, stimulation or inhibition of muscarinic receptors modulates bladder contraction leading to increases or decreases in urinary frequency, respectively. Similarly, stimulation of muscarinic receptors in salivary glands and sweat glands can lead to increased salivation and sweating, respectively.

Background and Rationale For KarXT

We have designed our lead product candidate, KarXT, to preferentially stimulate M1 and M4 receptors in the brain, without stimulating muscarinic receptors in peripheral tissues outside the CNS. We assessed the potential of over 7,000 possible combinations of muscarinic receptor agonists and antagonists to find an optimized combination that could preferentially stimulate muscarinic receptors in the CNS to improve the symptoms of psychosis, while avoiding stimulation of muscarinic receptors in

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the peripheral tissues and the associated side effects. As a result of our research, we identified xanomeline and trospium as the most promising pairing for development. Trospium is a potent and effective muscarinic receptor antagonist that does not measurably cross the blood-brain barrier, confining its effects to peripheral tissues. We believe that the combination of xanomeline, a centrally-acting muscarinic agonist, and trospium, a peripherally-acting muscarinic antagonist, will have the therapeutic benefits of xanomeline but with markedly reduced side effects. Based on our clinical data with KarXT, either co-administered or co-formulated, and clinical data of xanomeline published by third parties, we believe that KarXT has potential therapeutic benefit in multiple CNS disorders, including the treatment of the positive, negative and cognitive symptoms of schizophrenia, psychosis and agitation associated with dementia, including AD, and as a novel non-opioid therapeutic for various forms of post-operative, inflammatory and neuropathic pain.

Xanomeline Background

Xanomeline as a treatment for psychosis and related neuropsychiatric disorders has been examined in clinicals trials enrolling over 1,000 subjects or patients conducted by us and third parties, with 68 patients being dosed for at least one year and a maximum treatment duration of almost four years. We believe that the results from these clinical trials, as well as results from numerous preclinical studies, supports the further development of xanomeline, in the form of KarXT, as an antipsychotic and procognitive therapeutic agent.

Xanomeline for the Treatment of Psychotic Symptoms and Agitation in AD

Eli Lilly conducted a 343-patient, randomized, double-blind, placebo-controlled Phase 2 clinical trial of xanomeline in patients with mild to moderate AD, administering up to 225 mg of xanomeline daily (75 mg three times a day, or TID), for 24 weeks. In this clinical trial, 87 patients received placebo, while 85, 83 and 87 patients received 75-150-225 mg xanomeline, respectively. One patient who entered the trial was assigned a group but never received study drug or placebo. As shown in the figure below, patients on xanomeline were observed to have dose-dependent decreases in multiple psychotic symptoms and related behaviors, including hallucinations, delusions and agitation, as compared to patients on placebo. For instance, one of the 17 patients (6%) in the placebo arm who presented with hallucinations at baseline had a remission of symptoms while receiving treatment, compared to nine of the 17 patients (53%) in the high-dose xanomeline arm ($p=0.003$). These responses were seen as early as two to three weeks after commencement of dosing with xanomeline. Xanomeline was also observed to reduce the emergence of psychotic symptoms over the course of the six-month trial in patients who did not have psychotic symptoms at the initiation of the trial. For example, 32% of patients in the placebo arm developed delusions during the trial compared to only 7% in the high-dose xanomeline treatment arm ($p=0.001$). A dose-response analysis across the 75-150-225 mg xanomeline dose levels reported increasing effects of xanomeline for several symptoms ($P<0.05$), suggesting that exploration of xanomeline doses above 75 mg TID has the potential for additional therapeutic benefits.

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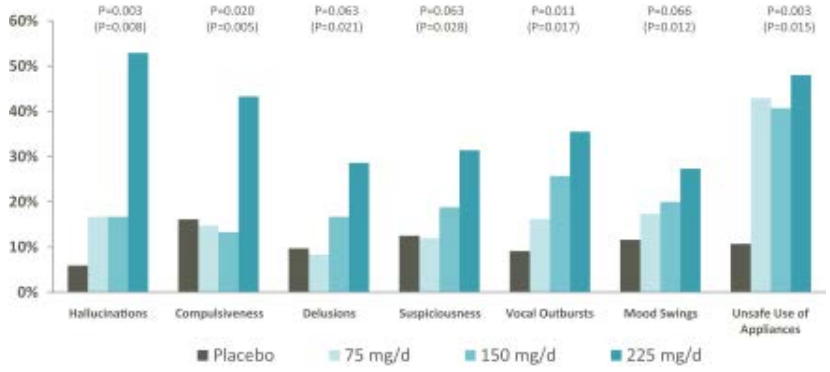
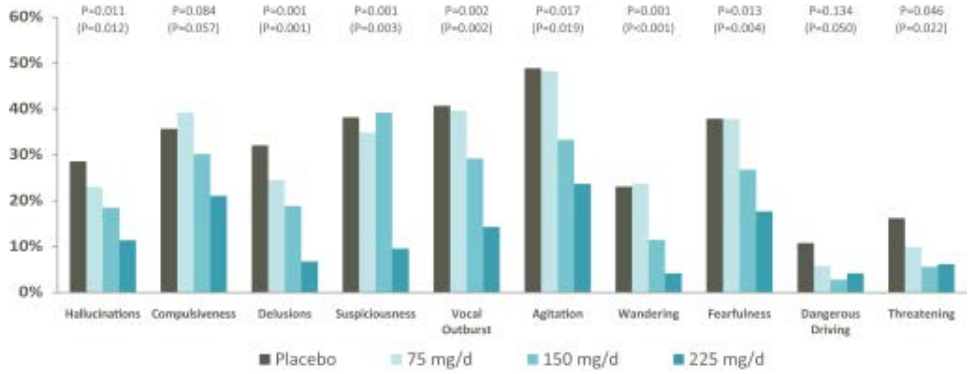
Effects of Xanomeline on Psychotic and Related Behavioral Symptoms in AD



p-value represents the comparison of the 225 mg xanomeline arm compared to placebo and, in the case of the p-value in parenthesis, the dose-response analysis.

Effects of Xanomeline on Emergence of Psychosis and Related Behaviors in AD Over Six Months



p-value represents the comparison of the 225 mg xanomeline arm compared to placebo and, in the case of the p-value in parenthesis, the dose-response analysis.

In this same trial, cognitive symptoms of patients with AD treated with xanomeline also showed improvements compared to placebo as measured by both the ADAS-Cog and the CIBIC+, suggesting that xanomeline may also improve cognition. The Alzheimer's Disease Assessment Scale-Cognitive Subscale, or ADAS-Cog, is one of the most frequently used tests to measure cognition while the Clinician Interview-Based Impression of Change plus caregiver interview, or CIBIC+, examines disease severity and changes in behavior, cognition and overall function on a scale of 1 to 7, where 1 means markedly improved and 7 means markedly worse. There were high rates of patient discontinuation in the mid-dose (48%) and high-dose (59%) xanomeline cohorts driven in part by side effects, compared to discontinuation rates of 35% and 19% for the placebo and low-dose xanomeline groups, respectively. This high discontinuation rate led to a substantial reduction of statistical power in this trial. Despite this reduction in statistical power, patients in the mid-dose cohort showed a statistically significant benefit on the CIBIC+ as compared to placebo (p=0.02, 4.11 vs. 4.34, respectively). An analysis of patients who completed the trial identified a mean benefit of 2.84 units on the ADAS-Cog for the 225 mg xanomeline arm over placebo (p<0.05), which is similar to the effect seen with donepezil, an approved treatment for the cognitive impairment associated with AD.

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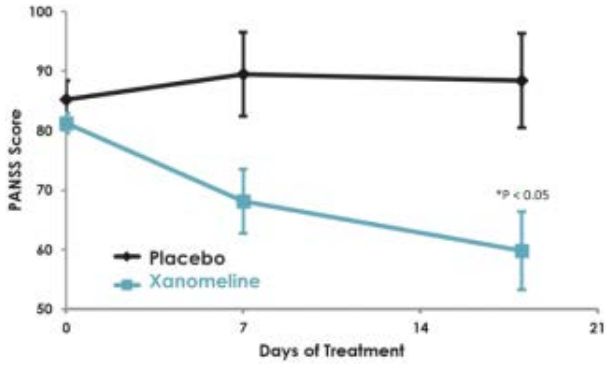
Xanomeline for the Treatment of Psychotic Symptoms in Schizophrenia

A randomized, double-blind, placebo-controlled, small Phase 2 trial of xanomeline was conducted in 20 patients with schizophrenia with acute psychosis, as a collaboration between Eli Lilly and the Indiana University School of Medicine. This monotherapy trial used the Positive and Negative Syndrome Scale, or PANSS, as a primary endpoint. The PANSS is a set of measurements used for evaluating symptom severity in patients with schizophrenia and the change in PANSS score has been used as the primary endpoint in many registrational trials of antipsychotic medicines. As depicted in the figure below, a clinically meaningful and statistically significant 24-point PANSS score difference was observed between xanomeline and placebo after 18 days of treatment, which was the pre-specified analysis time point. By comparison, meta-analyses of published clinicals trials of currently approved antipsychotic medicines report an average difference of nine to ten points in PANSS score versus placebo. Historically, changes as small as five points have supported the approval of current antipsychotics. While this xanomeline trial was designed primarily to evaluate changes in positive symptoms, a six point improvement in negative symptoms, as measured by the PANSS-negative subscale, was also observed in patients treated with xanomeline as compared to placebo. Improvements in cognitive symptoms including list learning ($p<0.05$), story recall ($p<0.01$), delayed memory ($p<0.05$) and digit span tests were also observed in patients treated with xanomeline as compared to placebo.

Effects of Xanomeline on Psychotic Symptoms in Patients with Schizophrenia



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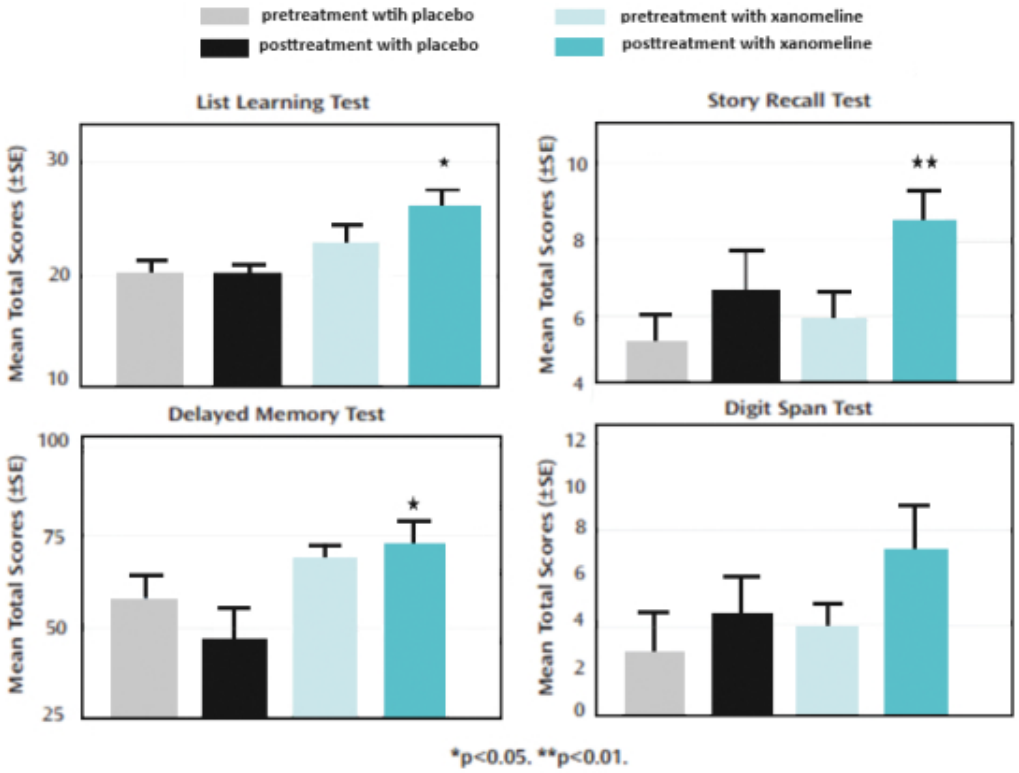
Effects of Xanomeline on Cognition in Patients with Schizophrenia



Limitations of Xanomeline

Despite xanomeline's promising therapeutic benefit in treating psychosis and related behavioral symptoms in patients with schizophrenia and AD, its potential has been limited by cholinergic side effects, which are believed to result from the stimulation of muscarinic receptors in peripheral tissues. These side effects led to a 59% dropout rate in the high-dose xanomeline group compared to 35% on placebo in Eli Lilly's six month AD trial. Syncope, which is a temporary loss of consciousness, was observed in the AD trial (12.6% on high dose xanomeline versus 4.6% on placebo), but not in the schizophrenia trial, in which patients are generally much younger than patients in the AD trial and therefore less prone to syncope. Xanomeline treatment was also associated with transient increases in heart rate and liver function tests, both of which returned to baseline with continued treatment. Electrocardiograms showed no meaningful changes in cardiac conductivity, including QTc interval.

Our KarXT Programs

We specifically designed KarXT, a proprietary combination of xanomeline and trospium, to unlock the therapeutic potential of xanomeline by overcoming its limiting side effects resulting from the stimulation of muscarinic receptors in peripheral tissues. We believe that the results of two third-party, randomized, double-blind, placebo-controlled clinical trials of xanomeline, as well as the results of a wide variety of preclinical studies conducted by third parties, support the further development of xanomeline, in the form of KarXT, as an antipsychotic and procognitive therapeutic agent. We selected trospium to counteract xanomeline's undesirable peripheral side effects for a number of reasons, but importantly because trospium does not measurably cross the blood-brain barrier and therefore would

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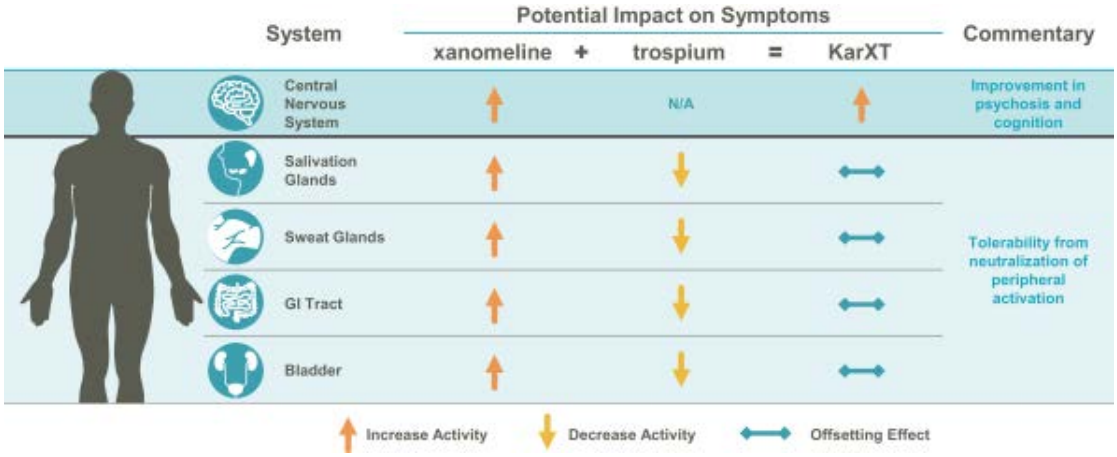
not be expected to negate the therapeutic benefits of xanomeline in the CNS. Trospium is generically available in the United States and European Union for the treatment of overactive bladder and is well-tolerated with limited side effects, that include dry mouth and constipation. Since xanomeline and trospium compete for the same muscarinic receptors in peripheral tissues, but with opposing effects, we believe their combination has the potential to reduce the cholinergic side effects of xanomeline. We believe that there are no overlaps in the drug metabolism pathways of xanomeline and trospium and therefore we do not anticipate any significant adverse drug-drug interactions with the combination. Our Phase 1 clinical trial data suggests that each of xanomeline and trospium do not affect the other's pharmacokinetics or systemic exposure.



We believe that the novel mechanism of KarXT has the potential to provide meaningfully better outcomes for patients suffering from schizophrenia and other neuropsychiatric conditions without the debilitating side effects of current D2 dopamine receptor-based therapies, including sedation, extrapyramidal side effects, such as motor rigidity, tremors and slurred speech, and significant weight gain resulting in the complications of diabetes, hyperlipidemia, hypertension and cardiovascular disease. We obtained an exclusive license to xanomeline from Eli Lilly along with a large database of preclinical and clinical data generated by Eli Lilly supporting xanomeline's development. Our team of employees and advisors includes several former scientists at Eli Lilly who were actively involved in xanomeline's preclinical and clinical development to help us advance the development of KarXT.

Proof of Concept of KarXT

Phase 1 Clinical Trials

We observed KarXT's ability to ameliorate the side effects of xanomeline in our randomized, double-blind, placebo-controlled, Phase 1 clinical trial in 70 healthy volunteers conducted under our investigational new drug application. In this trial, we compared the tolerability profile and pharmacokinetics of xanomeline administered with placebo against KarXT co-administered as xanomeline in combination with trospium. Volunteers in this trial first received 40 mg (20 mg twice a day, or BID) of either trospium or placebo for two days, and then received 225 mg of xanomeline (75 mg TID) in addition to their existing regimen of trospium or placebo for seven days. We selected the 225-mg (75 mg TID) dose for evaluation in our trial due to the results of this dose in Eli Lilly's schizophrenia and AD trials of xanomeline. As depicted in the table below, we observed that the addition of trospium to xanomeline was associated with clinically meaningful reductions in the rate of the most common treatment-emergent cholinergic adverse events, or ChAEs, than reported with xanomeline plus placebo, including nausea, vomiting, diarrhea and excess sweating and salivation. The overall ChAE rate was 64% on xanomeline plus placebo compared to 34% on KarXT (p=0.016).

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The rate of ChAEs for volunteers receiving KarXT (34%) was similar to the rate observed in volunteers receiving placebo during the lead-in period (32%), suggesting that the tolerability of KarXT was more similar to the placebo lead-in period than to treatment with xanomeline plus placebo.

ChAE Incidence Rates	Xanomeline+ placebo N=33	KarXT N=35	% Reduction in Incidence Rates
Any Cholinergic AE (p=0.016)	**64%**	**34%**	**46%**
Nausea	24%	17%	29%
Vomiting	15%	6%	62%
Diarrhea	21%	6%	73%
Sweating	49%	20%	59%
Salivation	36%	26%	29%

We observed no meaningful differences between the KarXT and xanomeline plus placebo treatment groups in heart rate, blood pressure or any electrocardiogram parameters. Only one volunteer discontinued treatment due to treatment emergent adverse events in the KarXT arm, and this discontinuation was voluntary, not at the discretion of the investigator. Two episodes of syncope were observed on xanomeline plus placebo while none were observed with KarXT. We did not observe syncope in the KarXT arm of this trial (or in any other subject treated with KarXT in any of our trials, representing over 140 patients). Rates of postural dizziness were reduced by approximately 57% in patients treated with KarXT as compared to patients treated with xanomeline plus placebo. Overall, we considered treatment with xanomeline 225 mg combined with trospium 40 mg administered over seven days to be well-tolerated.

Phase 1 Multiple Ascending Dose Clinical Trial

We have also completed a randomized, double-blind, placebo-controlled multiple ascending dose Phase 1 clinical trial of KarXT. This trial evaluated BID dosing of our proprietary KarXT co-formulation containing fixed ratios of xanomeline and trospium, rather than the TID dosing previously used with xanomeline. We designed our Phase 1 clinical trial based on the improved tolerability of KarXT over xanomeline plus placebo observed in our prior Phase 1 clinical trial and the dose-dependent clinical activity observed in the Eli Lilly AD trial of xanomeline. In particular, Eli Lilly observed that the antipsychotic effect of xanomeline improved when the dose was increased from 25 mg to 50 mg to 75 mg, all administered TID, suggesting that the dose response may extend beyond 75 mg TID and that doses of xanomeline higher than 75 mg TID may lead to additional therapeutic benefit. Based on these observations, we set out to (i) test our co-formulation using BID dosing, (ii) explore higher doses of xanomeline and (iii) optimize the ratio of xanomeline and trospium. Healthy volunteers enrolled in this trial received 50 mg of xanomeline plus 20 mg of trospium (50/20 mg) both BID, on days one and two. From days three to seven, volunteers received BID doses of xanomeline and trospium in ratios of either 100/20 mg, 125/40 mg, 150/20 mg or 150/40 mg (xanomeline/trospium) in different dosing cohorts. The trial was designed to randomize up to 24 volunteers in each of the four cohorts, with a 3:1 randomization of KarXT to placebo.

In this trial, administration of KarXT co-formulation provided robust xanomeline and trospium exposures as measured by plasma levels. In particular, KarXT containing xanomeline 100 mg BID provided drug exposures equivalent to, or higher than, 75 mg of xanomeline TID when administered alone. KarXT was also well-tolerated in volunteers at dose levels of 100 mg and 125 mg of xanomeline BID when paired with 20 mg and 40 mg of trospium, respectively.

Eighteen volunteers received KarXT in the 100/20 mg cohort. In this group, 16 volunteers experienced either no ChAEs (n=11; 61%) or mild, transient ChAEs (n=5; 28%). The majority of ChAEs were reported for less than one hour over the seven days of treatment and the longest duration

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reported was a total of 15 hours over the course of treatment. Two volunteers (11%) experienced transient ChAEs that were rated as moderate, with the longest ChAE lasting a total of approximately 11 hours over the course of treatment. Given the transient and generally mild nature of the ChAEs, we considered the 100/20 mg dose level of KarXT well tolerated. Eighteen volunteers were given the 125/40 mg dose level of KarXT, of which 11 volunteers (61%) reported no ChAEs and seven volunteers (39%) reported mild, transient ChAEs. These mild ChAEs lasted less than three hours over the course of the seven day treatment period. The increased dose of trospium (40 mg BID) was associated with reports of mild anticholinergic adverse events, including dry mouth, constipation, blurred vision and urinary hesitancy, suggesting a decreased trospium dose level may be more appropriate to pair with 125 mg BID of xanomeline. Xanomeline doses of 150 mg in KarXT led to increased reporting of moderate ChAEs and were therefore less well-tolerated than either the 100 or 125 mg xanomeline doses.

In this Phase 1 clinical trial, we observed that KarXT doses containing either 100 mg or 125 mg of xanomeline administered BID were well-tolerated when paired with trospium. Importantly, the 100 mg BID dose level administered in our co-formulation provided blood exposures equal to or greater than those observed by us and Eli Lilly with 75 mg TID xanomeline, which was observed to have beneficial effects on psychosis and cognition in both schizophrenia and AD. While a minority of patients still experienced ChAEs, these were predominately mild and transient in nature. We believe this tolerability profile has the potential to provide a substantial improvement over current antipsychotic medicines, which are often not tested at therapeutic doses in healthy volunteers due to their poor tolerability. Based on the results of this trial, we identified 100/20 mg and 125/30 mg BID as the doses and ratios of xanomeline to trospium to evaluate in our Phase 2 clinical trial of KarXT for acute psychosis in patients with schizophrenia.

We submitted an Investigational New Drug application to the U.S. Food and Drug Administration, or the FDA, for KarXT for the treatment of schizophrenia, which went into effect in August 2016.

KarXT for the Treatment of Acute Psychosis in Patients with Schizophrenia

We recently completed a Phase 2 clinical trial for KarXT for the treatment of acute psychosis in patients with schizophrenia. The regulatory requirements, including clinical trial design and primary endpoints, for approval of antipsychotic drugs for this indication are well understood and defined. Similarly, third-party clinical trial operators and contract research organizations have extensive experience conducting drug trials in schizophrenia. Finally, patients with schizophrenia in clinical trials are generally younger than patients suffering psychosis from other CNS disorders such as AD, which reduces the risk of comorbidities, and patients with schizophrenia also tend to have higher drug tolerability due to their prior treatment with antipsychotic drugs. We believe that these factors will help us to efficiently progress KarXT in this indication.

Schizophrenia

Schizophrenia is a chronic, severe and disabling brain disorder. In 2017, an estimated 2.7 million Americans, or approximately 0.5% to 1.0% of the U.S. population, had schizophrenia. Worldwide, it is estimated that schizophrenia affects over 21 million people. People with schizophrenia have a 10 to 15 year reduction in life expectancy compared to the general population, struggle to maintain employment or live independently and are often unable to maintain meaningful interpersonal relationships.

Psychosis is a prominent and debilitating symptom that occurs in schizophrenia. Psychotic symptoms, also known as positive symptoms, include hallucinations and delusions. Patients with schizophrenia also experience negative symptoms, such as apathy, reduced social drive, loss of motivation and lack of social interest. Schizophrenia is also often associated with significant cognitive impairment, which further limits a patient's ability to be gainfully employed and maintain relationships.

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Worldwide sales of antipsychotic drugs exceeded $11 billion in 2015 and are expected to exceed $14 billion by 2025, despite a highly generic market. Several branded market leading antipsychotic medicines have each achieved worldwide annual sales in excess of $5 billion. Despite the large number of antipsychotic drugs developed over the last 20 years, current medicines have undergone only modest innovation relative to first generation drugs developed in the 1950s.

Current antipsychotics have modest efficacy in many patients and significant side effects. At least half of patients fail to adequately respond to current antipsychotic drugs. Additionally, current treatments are often associated with severe side effects, including sedation, extrapyramidal side effects such as motor rigidity, tremors and slurred speech, and significant weight gain resulting in the complications of diabetes, hyperlipidemia, hypertension and cardiovascular disease. The clinical benefit of current antipsychotics is further limited by poor adherence. In a 1,493-patient clinical trial funded by the National Institutes of Health, approximately 75% of patients reported discontinuing their antipsychotic medication within 18 months of starting treatment.

Current antipsychotic treatments work primarily by inhibiting D2 dopamine receptors and are often used by physicians to address a wide range of disorders in addition to schizophrenia, including bipolar disorder and psychotic depression, as well as psychosis and agitation in elderly patients with dementia. These treatments are approved for the treatment of positive symptoms of schizophrenia, such as hallucinations and delusions, but there are no approved therapies for the treatment of negative and cognitive symptoms of schizophrenia. We believe there is a substantial need for a new antipsychotic drug that has an improved efficacy and side effect profile, and for a drug that can treat the negative and cognitive symptoms of the disease.

Previous Trials of Xanomeline and KarXT

Xanomeline's potential to treat psychosis and cognitive impairment is supported by data from two placebo-controlled third-party trials in psychosis in patients with schizophrenia and AD. Although these trials also revealed associated cholinergic side effects, the potential therapeutic benefit of xanomeline was observed in both trials. The use of trospium to reduce the peripheral cholinergic side effects of xanomeline, observed by the improved tolerability of KarXT in our Phase 1 clinical trials, prompted us to initiate a Phase 2 clinical trial of KarXT for the treatment of acute psychosis in patients with schizophrenia.

Our Phase 2 Clinical Trial for the Treatment of Acute Psychosis

In September 2018, we initiated a multi-site, double-blind, placebo-controlled, five week, inpatient Phase 2 clinical trial of KarXT in patients with schizophrenia with acute psychosis. We enrolled 182 patients in this trial and patients were randomized 1:1 to receive either KarXT or placebo. Patients were washed out of any existing antipsychotic medications before entering the five-week active treatment or placebo phase. After the wash-out period, patients began with either placebo or KarXT containing 50 mg xanomeline and 20 mg trospium (50/20 mg) BID. Patients receiving KarXT then increased their dose to 100/20 mg BID on day three and then physicians had the option to escalate to 125/30 mg BID starting on day eight if the 100/20 mg BID dose was well-tolerated. The primary endpoint in this trial was the change from baseline in PANSS total scores for KarXT versus placebo treated patients at week five. Our trial had the same fundamental design and primary endpoint as the previous xanomeline trial in psychosis in schizophrenia, which is also the design that has been used in pivotal trials for several currently approved antipsychotic medicines. Additional endpoints of our trial included changes in PANSS Marder Factor score (including the negative symptom factor), a cognitive battery and the clinical global impression (CGI-S).

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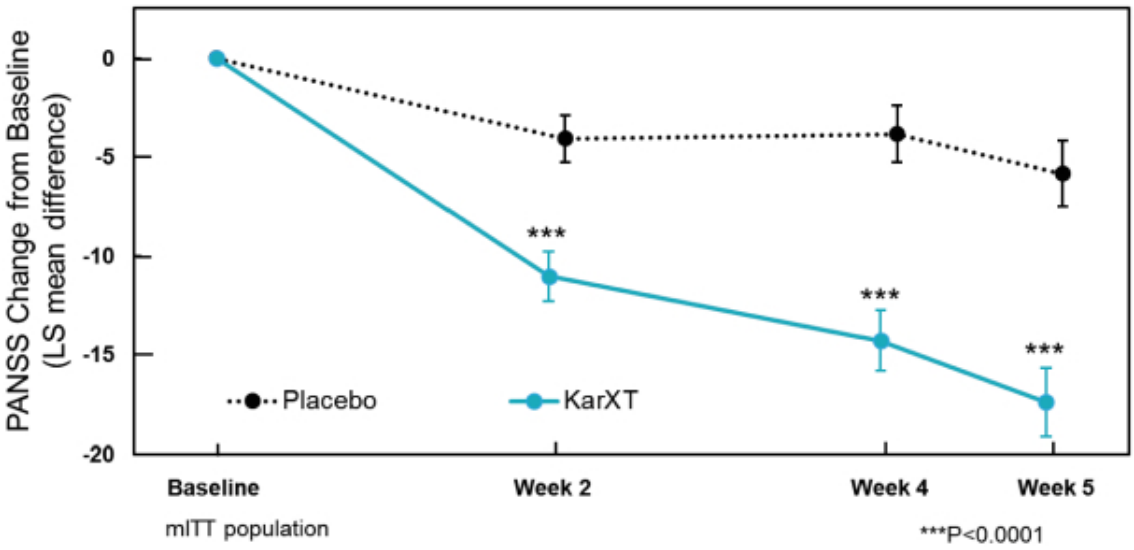
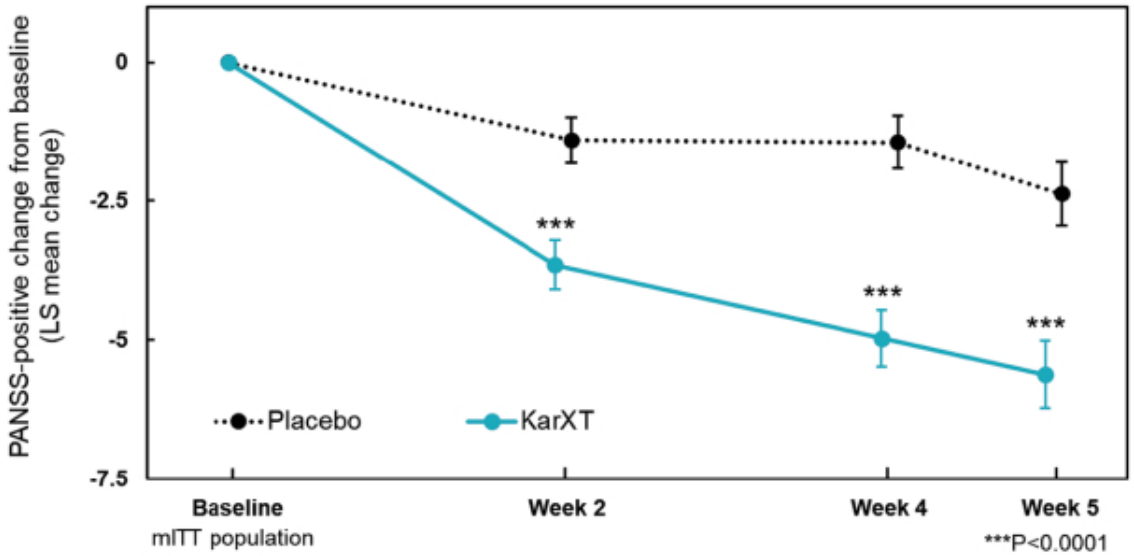
In November 2019, we announced topline results from our Phase 2 clinical trial of KarXT for the treatment of acute psychosis in patients with schizophrenia, in which KarXT met the trial's primary endpoint with a statistically significant (p<0.0001) and clinically meaningful 11.6 point mean reduction in total PANSS scores over placebo at week 5 (-17.4 KarXT vs. -5.9 placebo). We also observed a statistically significant 3.2 point mean reduction from baseline in the PANSS-positive subscale (-5.6 KarXT v. -2.4 placebo) and a statistically significant 2.3 point mean reduction from baseline in the PANSS-negative subscale (-3.2 KarXT v. 0.9 placebo) at week five (p<0.0001 and p<0.001, respectively). The total PANSS, PANSS-positive subscale, and the PANSS-negative subscale had statistically significant separation at every assessment throughout the trial.

Effect of KarXT on Total PANSS



Effect of KarXT on Positive PANSS



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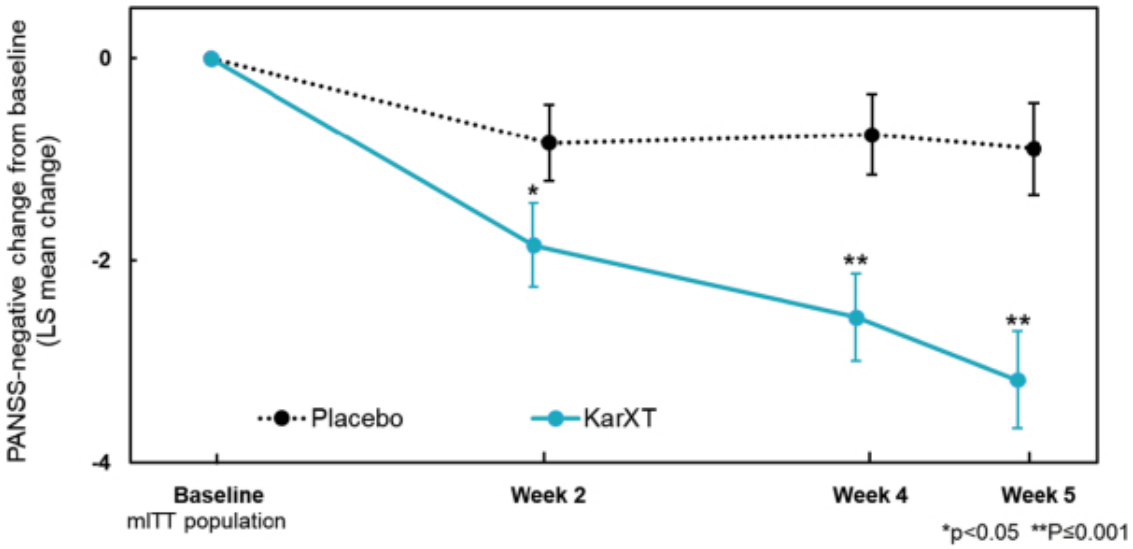
Effect of KarXT on Negative PANSS



KarXT was observed to be well tolerated in this Phase 2 trial. The overall discontinuation rate in the KarXT treatment arm was similar to placebo (20% on KarXT vs. 21% on placebo) and the number of discontinuations due to treatment emergent adverse events was equal in the two arms (n=2 on KarXT and n=2 on placebo). 91% of patients treated with KarXT escalated to the high dose of KarXT as part of the flexible dose design, where the choice to escalate was made by the site physician based on the tolerability of KarXT on an individual patient basis. 97% of placebo patients were dose escalated. There was also the option to de-escalate back to 100/20 mg BID KarXT dose if any tolerability issues emerged, and only 4% of patients were de-escalated in the KarXT arm compared to 1% on placebo.

The overall treatment emergent adverse event rate was 54% on KarXT and 43% on placebo. Occurrences of drowsiness, extrapyramidal side effects, such as tremors or slurred speech, or weight gain, which are adverse effects generally associated with current antipsychotic drugs, were similar similar to placebo. The most common adverse events were constipation, nausea, dry mouth, abdominal discomfort, and vomiting, all of which were mild or moderate in severity. There was no syncope, and there was no mean change in blood pressure. One patient in the KarXT group discontinued due to elevated gamma-glutamyl transferase. There was a 5.5 beats per minute peak mean placebo adjusted resting heart rate increase in the KarXT group, with a downward trend after week 2. One serious adverse event was observed in the KarXT treatment group, in which a patient discontinued and sought hospital care for worsening psychosis, meeting the regulatory definition of serious adverse event. The clinical trial administrator was not able to rule out that the serious adverse event was drug related, and as such, the serious adverse event was classified as being “possibly-drug related.” All other treatment emergent adverse events were mild or moderate.

Our Planned Clinical Trials for Acute Psychosis

We plan to initiate a Phase 3 clinical trial assessing KarXT for the treatment of acute psychosis in schizophrenia. We intend to hold an End-of-Phase 2 meeting with the FDA in the second quarter of 2020 to discuss our planned Phase 3 clinical trial development plan. Subject to FDA feedback, we expect to initiate a Phase 3 clinical trial for the treatment of psychosis in patients with schizophrenia by the end of 2020. Subject to feedback from the FDA, we anticipate the design of this trial to be substantially similar to that of our recently completed Phase 2 trial.

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Our Planned Clinical Trials for the Negative and Cognitive Symptoms of Schizophrenia

We plan to utilize the data from our Phase 2 clinical trial of KarXT for the treatment of psychosis in schizophrenia to help us guide KarXT's future development for negative and cognitive symptoms of schizophrenia, for which there are currently no approved treatments. We anticipate initiating a Phase 1b clinical trial to assess the safety and tolerability of KarXT for the treatment of the cognitive symptoms in the first half of 2020 and a Phase 1b clinical trial to assess the safety and tolerability of KarXT for the treatment of the negative symptoms in the first half of 2020.

KarXT for the Treatment of Psychosis in AD

Alzheimer's disease is an irreversible, progressive neurodegenerative brain disorder that slowly destroys memory and cognition and, eventually, the ability to carry out even the simplest of tasks. In the large and growing AD population, up to 50% of patients will experience psychosis and related behavioral symptoms at some point during the course of their disease, which often leads to institutional care in a hospital or nursing home. Based on third-party clinical trials with xanomeline and xanomeline's mechanisms of action, we believe KarXT has therapeutic potential to treat the psychosis and associated behavioral symptoms, including agitation, of patients with AD. We remain on track to initiate a Phase 1b clinical trial of KarXT in healthy elderly volunteers before the end of 2019 and expect topline results in the second half of 2020.

Alzheimer's Disease

According to the Alzheimer's Association, 5.7 million people in the United States are living with AD and it is currently the fifth leading cause of death in people 65 years of age or older. Alzheimer's disease is the most common cause of dementia among older adults and it has been estimated that 50 million people worldwide are living with AD and other forms of dementia. This number is expected to increase to 82 million by 2030 and to 152 million by 2050. While diagnostic criteria for AD mostly focus on the associated cognitive deficits, it is often the psychotic and behavioral symptoms that are most troublesome for caregivers and lead to poor quality of life for patients. Published studies have suggested that approximately 50% of patients with AD develop psychosis at some point during the course of their disease, commonly consisting of hallucinations, delusions and troublesome behavioral symptoms such as agitation. The diagnosis of AD psychosis is also associated with more rapid cognitive and functional decline and often requires institutionalization.

The market for branded AD therapeutics was estimated to be $8.5 billion in 2015 and is expected to grow to over $14 billion by 2022. All of the approved drugs for AD modestly improve cognition in AD, but to date, the FDA has not approved any drug to treat the psychotic or behavioral symptoms of AD. As symptoms progress and become more severe, physicians often resort to off-label use of antipsychotic medications to treat these patients. Current antipsychotic drugs are associated with a number of side effects including potentially irreversible movement disorders, weight gain, metabolic dysfunction and sedation, which can be more problematic in elderly patients with AD. In addition, antipsychotic drugs all have a "boxed warning" for increased mortality in the elderly and may exacerbate the cognitive impairment associated with AD. Accordingly, there remains a large unmet medical need in psychosis and the associated behavioral symptoms of patients with AD.

Our Planned Clinical Trials for AD

Based on Eli Lilly's Phase 2 clinical trial of xanomeline in patients with AD, and the improved tolerability profile of KarXT as compared to xanomeline, we remain on track to initiate a Phase 1b clinical trial in healthy elderly volunteers to assess the safety and tolerability of KarXT before the end of 2019 and expect topline results in the second half of 2020. We intend to use the data collected in our

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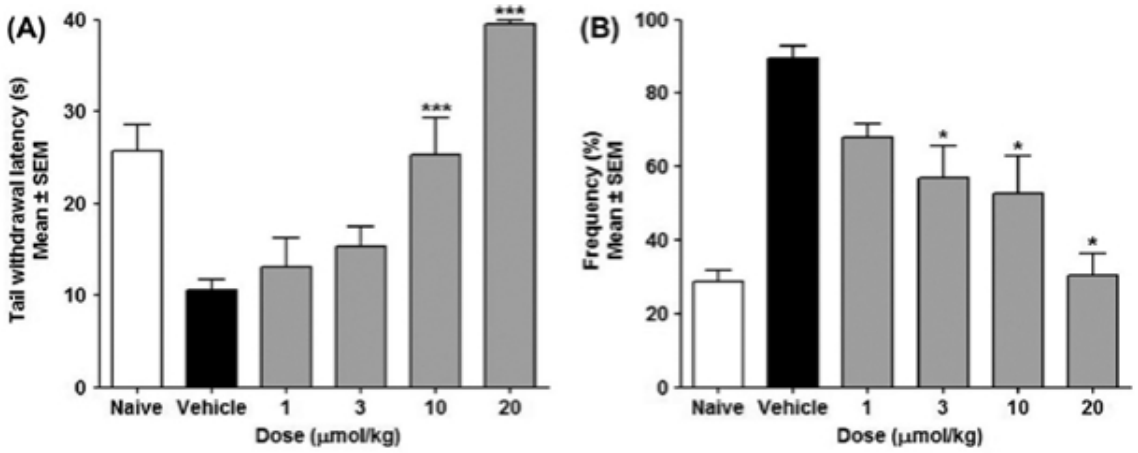
Phase 2 clinical trial for the treatment of acute psychosis in schizophrenia to inform our trials in AD and other diseases associated with psychotic and cognitive symptoms.

KarXT for Pain

A substantial body of literature shows that muscarinic receptor agonists inhibit the response to painful stimuli in a diverse set of animal pain models that are designed to be representative of post-operative, inflammatory and neuropathic pain. In several preclinical models of pain, treatment with xanomeline was observed to reduce pain in a dose-dependent manner. Confirmatory experiments demonstrated that the action of xanomeline in these pain models is attributable to its stimulation of M1 and M4 muscarinic receptors in the CNS and not to stimulation of muscarinic receptors in peripheral tissues. Importantly, these studies also showed that opiate receptors do not mediate the analgesic actions of xanomeline and therefore xanomeline and KarXT may be free of the abuse-liability of opioid-based pain medicines.

Effect of Xanomeline in Mouse Models of Pain



The figure in the left depicts the effect of increasing doses of xanomeline on the time it takes a mouse to withdraw its tail from a stimulus model of inflammatory pain. The figure on the right depicts the effect of increasing doses of xanomeline on the frequency of withdrawal from a skin stimulus in a model of neuropathic pain. Results are expressed as mean ± SEM. *P £ 0.05, ***P £ 0.001 (compared with vehicle-treated group).

We believe that these preclinical data of xanomeline in various animal pain models and other published results linking stimulation of muscarinic receptors to analgesia highlight the potential for KarXT to have therapeutic benefit in patients experiencing various types of pain including post-operative, inflammatory and neuropathic pain.

We remain on track to initiate a Phase 1b randomized, double-blind, placebo-controlled clinical trial in healthy volunteers to evaluate the effect of KarXT on experimentally induced pain before the end of 2019. This trial will evaluate laser-induced pain in healthy volunteers with data collection to include both self-reported pain and measurement of pain responses via quantitative-EEG. This experimental model of pain has been validated with well-known analgesic drugs and the trial is expected to generate data about the potential analgesic effect of KarXT for post-operative, inflammatory, and neuropathic pain. We plan to use this data to help us refine the optimal pain indication and dose for subsequent Phase 2 clinical trials. We expect topline data from this Phase 1b trial in mid-2020.

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Planned Additional Formulations of KarXT

We believe that additional formulations of KarXT have the potential to further improve the therapeutic window of KarXT and offer patient compliance advantages through decreased dosing frequency. Our ongoing research efforts include the development of advanced oral, long-acting injectable, transdermal and buccal formulations. We plan to have an additional formulation of KarXT in clinical trials in 2020.

Other Research Programs

We continue to build our early stage pipeline. We currently have a novel series of compounds focused on muscarinic receptor targets. In particular, we have synthesized lead compounds for further development as potential therapeutic agents in several CNS disorders, including schizophrenia, psychosis associated with AD, as well various forms of pain. We have completed in vitro screening for several compounds and advanced these lead compounds for further preclinical development. In vivo evaluation of these compounds in rodents is ongoing for these indications, and we expect to initiate IND-enabling studies in 2020. We believe we can optimize these compounds and advance their development through preclinical studies and into clinical development, given our expertise in this space. We continue to evaluate other opportunities focused on muscarinic and non-muscarinic targets.

Manufacturing and Supply

We do not own or operate, and currently have no plans to establish, any manufacturing facilities. We currently source all of our nonclinical and clinical compound supply through third-party contract manufacturing organizations, or CMOs.

For clinical supply, we use CMOs who act in accordance with the FDA's good laboratory practices, or GLP, and current good manufacturing practices, cGMP, for the manufacture of drug substance and product. Currently, we contract with Regis Technologies, Inc., for the manufacture of xanomeline and source trospium from Procos, S.p.A. We expect to rely on third parties for our manufacturing processes and the production of all clinical supply drug substance and drug product. We use additional contract manufacturers to fill, label, package, store and distribute investigational drug products. It is our intent to identify and qualify additional manufacturers to provide active pharmaceutical ingredient and fill-and-finish services prior to submission of a new drug application to the FDA for any product candidates that complete clinical development.

Competition

The biotechnology and pharmaceutical industries are characterized by rapidly advancing technologies, intense competition and a strong emphasis on proprietary products. We face potential competition from many different sources, including pharmaceutical and biotechnology companies, academic institutions and governmental agencies as well as public and private research institutions. Any product candidates that we successfully develop and commercialize, including KarXT, may compete with existing therapies and new therapies that may become available in the future.

Our competitors may have significantly greater financial resources, established presence in the market, expertise in research and development, manufacturing, preclinical and clinical testing, obtaining regulatory approvals and reimbursement and marketing approved products than we do. These competitors also compete with us in recruiting and retaining qualified scientific, sales, marketing and management personnel, establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs. Smaller or early-

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stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies.

The key competitive factors affecting the success of KarXT, and any other product candidates that we develop to address CNS disorders, if approved, are likely to be efficacy, safety, convenience, price, the level of generic competition and the availability of reimbursement from government and other third-party payors.

Psychosis related to schizophrenia

There are currently no FDA-approved drugs for the negative or cognitive symptoms of schizophrenia. The current standards of care for the psychotic symptoms of patients with schizophrenia are antipsychotic treatments that work primarily by inhibiting D2 dopamine receptors as their primary mechanism of action. These drugs include: Abilify, marketed by Bristol-Myers Squibb Company, Zyprexa, marketed by Eli Lilly, Vraylar, marketed by Allergan, Clozaril, marketed by Mylan Products Ltd., and Latuda, marketed by Sumitomo Dainippon Pharma Co., Ltd. Many of these drugs are prescribed for a variety of neuropsychiatric conditions, including bipolar disorder, depression and Tourette syndrome. Additionally, we are aware of several product candidates in clinical development that are designed to modulate dopamine and/or serotonin receptors including product candidates being developed by Intra-Cellular Therapies, Inc., Alkermes plc and ACADIA Pharmaceuticals Inc.

Psychosis related to AD

There are currently no approved treatments for psychosis related to AD. Patients with AD experiencing psychosis are commonly treated with antipsychotic medications that are indicated and approved for schizophrenia. Available treatments for AD patients are only indicated for enhancing cognition in AD patients, and include acetylcholinesterase inhibitors such as donepezil, galantamine, rivastigmine and memantine. These medications are available generically although specific dosage forms and combinations are proprietary and marketed by large pharmaceutical companies such as, Allergan, Janssen Pharmaceuticals NV, Novartis International AG and Pfizer Inc.

Pain

The current standard of care for neuropathic and inflammatory pain include opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), topical agents, anticonvulsants and antidepressants. We are aware of many FDA-approved drugs for the treatment of neuropathic and inflammatory pain, including Lyrica, marketed by Pfizer Inc., Suboxone, marketed by Reckitt Benckiser Group plc, Oxeota, marketed by Pfizer Inc., and OxyContin, marketed by Purdue Pharma.

Intellectual Property

We strive to protect the proprietary technologies that we believe are important to our business, including pursuing and maintaining patent protection intended to cover our product candidate and their methods of use, as well as other inventions that are important to our business. In addition to patent protection, we also rely on trade secrets to protect aspects of our business that we do not consider appropriate for patent protection.

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

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

Product Candidates

With regard to our KarXT product candidate, we exclusively license from PureTech Health LLC, or PureTech Health, a patent family comprising two issued U.S. patents with claims directed to an oral medicament comprising certain doses of xanomeline and certain doses of trospium chloride, two issued U.S. patents and one pending U.S. patent application with claims directed to methods for treating central nervous system disorders using an oral medicament comprising certain doses of xanomeline and certain doses of trospium chloride, issued patents in Canada and Europe, and a total of three foreign patent applications pending, one in each of Europe, Japan, and Hong Kong. The U.S. patents and the pending patent applications, if issued, are expected to expire in 2030 without taking into account a possible Patent Term Extension, or PTE, or any possible patent term adjustments. We also own one pending U.S. non-provisional patent application and one pending PCT application with claims directed to an oral pharmaceutical composition comprising xanomeline beads and trospium beads. Applications claiming priority to and the benefit of this provisional application, if issued, are expected to expire in 2039 without taking into account a possible PTE or any possible patent term adjustments. We also own four U.S. provisional patent applications with claims directed to compounds targeting muscarinic receptors and methods of treatment using such compounds. Applications claiming priority to and the benefit of these provisional applications, if issued, are expected to expire in 2040 without taking into account a possible PTE or any possible patent term adjustments. Our U.S. and foreign patent applications also disclose other muscarinic activators in combination with other muscarinic inhibitors for the treatment of CNS disorders.

License Agreements

License Agreement with Eli Lilly and Company

In May 2012, we entered into an exclusive license agreement, or the Lilly License Agreement, with Eli Lilly, pursuant to which Eli Lilly assigned to us all of its rights to certain patents (now expired), regulatory documentation, data records and materials related to xanomeline. We are also entitled to sublicense or otherwise transfer the rights granted in connection with the Lilly License Agreement.

Under the Lilly License Agreement, we are obligated to use commercially reasonable efforts to develop, manufacture, commercialize and seek and maintain regulatory approval for xanomeline, in any formulation, for use in humans.

We paid Eli Lilly an upfront payment of $100,000 and have agreed to make milestone payments to Eli Lilly of up to an aggregate of $16 million upon the achievement of specified regulatory milestones and up to an aggregate of $54 million in commercial milestones. In addition, we are obligated to pay Eli Lilly tiered royalties, at rates in the low to mid single-digit percentages, on the worldwide net sales of any commercialized product on a country-by-country basis until the expiration of the applicable royalty term, which is the longer of six years from the date of first commercial sale of each licensed product within a country or data exclusivity in such country. During the royalty term, Eli Lilly is prohibited from

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granting any third party rights to the patents, regulatory documentation, data records and materials that have been licensed to us under the Lilly License Agreement.

The Lilly License Agreement will expire on the later of (i) the expiration of the last-to-expire royalty term on a licensed product-by-licensed product basis or (ii) the date on which we have made all milestone payments pursuant to the terms of the Lilly License Agreement, unless terminated earlier by the parties. In no event will the term of the Lilly License Agreement exceed 15 years past the anniversary of the first commercial sale of a xanomeline product. We may terminate the Lilly License Agreement for any reason with proper prior notice to Eli Lilly. Either party may terminate the Lilly License Agreement upon an uncured material breach by the other party.

Patent License Agreement with PureTech Health LLC

In March 2011, we entered into an exclusive license agreement, or the Patent License Agreement, with PureTech Health, pursuant to which PureTech Health granted us an exclusive license to patent rights relating to combinations of a muscarinic activator with a muscarinic inhibitor for the treatment of central nervous system disorders.

In connection with the Patent License Agreement, we have agreed to make milestone payments to PureTech Health of up to an aggregate of $10 million upon the achievement of specified development and regulatory milestones. In addition, we are obligated to pay PureTech Health low single-digit royalties on the worldwide net sales of any commercialized product covered by the licenses granted under the Patent License Agreement. In the event that we sublicense any of the patent rights granted under the Patent License Agreement, we will be obligated to pay PureTech Health royalties within the range of 15% to 25% on any income we receive from the sublicensee, excluding royalties.

We may terminate the Patent License Agreement for any reason with proper prior notice to PureTech Health. Either party may terminate the Patent License Agreement upon an uncured material breach by the other party.

Government Regulation

Government authorities in the United States, at the federal, state and local level, and in other countries and jurisdictions, including the European Union, extensively regulate, among other things, the research, development, testing, manufacture, quality control, approval, packaging, storage, recordkeeping, labeling, advertising, promotion, distribution, marketing, post-approval monitoring and reporting, and import and export of pharmaceutical products. The processes for obtaining regulatory approvals in the United States and in foreign countries and jurisdictions, along with subsequent compliance with applicable statutes and regulations, require the expenditure of substantial time and financial resources.

Review and Approval of Drugs in the United States

In the United States, the FDA regulates drugs under the Federal Food, Drug, and Cosmetic Act, or FDCA, and its implementing regulations. The failure to comply with applicable U.S. requirements at any time during the product development process, approval process or after approval may subject an applicant and/or sponsor to a variety of administrative or judicial sanctions, including refusal by the FDA to approve pending applications, withdrawal of an approval, imposition of a clinical hold, issuance of warning letters and other types of letters, product seizures, total or partial suspension of production or distribution, injunctions, fines, refusals of government contracts, restitution, disgorgement of profits, or civil or criminal investigations and penalties brought by the FDA and the Department of Justice or other governmental entities. In addition, an applicant may need to recall a product.

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An applicant seeking approval to market and distribute a new drug product in the United States must typically undertake the following:

- completion of nonclinical, or preclinical, laboratory tests, animal studies and formulation studies in compliance with the FDA's good laboratory practice, or GLP, regulations;
- submission to the FDA of an investigational new drug application, or IND, which must take effect before human clinical trials may begin;
- approval by an independent Institutional Review Board, or IRB, representing each clinical site before each clinical trial may be initiated at that site;
- performance of adequate and well-controlled human clinical trials in accordance with good clinical practices, or GCPs, to establish the safety and efficacy of the proposed drug product for each indication;
- preparation and submission to the FDA of a new drug application, or NDA, and payment of user fees;
- review of the product by an FDA advisory committee, where appropriate or if applicable;
- satisfactory completion of one or more FDA inspections of the manufacturing facility or facilities at which the product, or components thereof, are produced to assess compliance with current Good Manufacturing Practice, or cGMP, requirements and to assure that the facilities, methods and controls are adequate to preserve the product's identity, strength, quality and purity;
- satisfactory completion of FDA audits of clinical trial sites to assure compliance with GCPs and the integrity of the clinical data;
- FDA review and approval of the NDA; and
- compliance with any post-approval requirements, including Risk Evaluation and Mitigation Strategies, or REMS, and post-approval studies required by the FDA.

Preclinical Studies

Before an applicant begins testing a compound in humans, the drug candidate enters the preclinical testing stage. Preclinical studies include laboratory evaluation of the purity and stability of the manufactured drug substance or active pharmaceutical ingredient and the formulated drug or drug product, as well as *in vitro* and animal studies to assess the safety and activity of the drug for initial testing in humans and to establish a rationale for therapeutic use. The conduct of preclinical studies is subject to federal regulations and requirements, including GLP regulations. Some long-term preclinical testing, such as animal tests of reproductive adverse events and carcinogenicity, may continue after the IND is submitted.

The IND and IRB Processes

An IND is an exemption from the FDCA that allows an unapproved drug to be shipped in interstate commerce for use in an investigational clinical trial and a request for FDA authorization to administer such investigational drug to humans. Such authorization must be secured prior to interstate shipment and administration of the investigational drug. In an IND, applicants must submit a protocol for each clinical trial and any subsequent protocol amendments. In addition, the results of the preclinical tests, manufacturing information, analytical data, any available clinical data or literature and plans for clinical trials, among other things, are submitted to the FDA as part of an IND. The FDA requires a 30-day waiting period after the filing of each IND before clinical trials may begin. At any time during this 30-day period, the FDA may raise concerns or questions about the conduct of the trials as

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outlined in the IND and impose a clinical hold. In this case, the IND sponsor and the FDA must resolve any outstanding concerns before clinical trials can begin.

Following commencement of a clinical trial under an IND, the FDA may also place a clinical hold or partial clinical hold on that trial. A clinical hold is an order issued by the FDA to the sponsor to delay a proposed clinical investigation or to suspend an ongoing investigation. A partial clinical hold is a delay or suspension of only part of the clinical work requested under the IND. No more than 30 days after imposition of a clinical hold or partial clinical hold, the FDA will provide the sponsor a written explanation of the basis for the hold. Following issuance of a clinical hold or partial clinical hold, an investigation may only resume after the FDA has notified the sponsor that the investigation may proceed. The FDA will base that determination on information provided by the sponsor correcting the deficiencies previously cited or otherwise satisfying the FDA that the investigation can proceed.

A sponsor may choose, but is not required, to conduct a foreign clinical study under an IND. When a foreign clinical study is conducted under an IND, all FDA IND requirements must be met unless waived. When the foreign clinical study is not conducted under an IND, the sponsor must ensure that the study is conducted in accordance with GCP, including review and approval by an independent ethics committee, or IEC, and informed consent from subjects. The GCP requirements are intended to help ensure the protection of human subjects enrolled in non-IND foreign clinical studies, as well as the quality and integrity of the resulting data. FDA must also be able to validate the data from the study through an on-site inspection if necessary.

In addition to the foregoing IND requirements, an IRB representing each institution participating in the clinical trial must review and approve the plan for any clinical trial before it commences at that institution, and the IRB must conduct continuing review of the study at least annually. The IRB must review and approve, among other things, the study protocol and informed consent information to be provided to study subjects. An IRB must operate in compliance with FDA regulations. An IRB can suspend or terminate approval of a clinical trial at its institution, or an institution it represents, if the clinical trial is not being conducted in accordance with the IRB's requirements or if the product candidate has been associated with unexpected serious harm to patients.

Additionally, some trials are overseen by an independent group of qualified experts organized by the trial sponsor, known as a data safety monitoring board or committee. This group provides authorization for whether or not a trial may move forward at designated check points based on access that only the group maintains to available data from the study. Suspension or termination of development during any phase of clinical trials can occur if it is determined that the subjects or patients are being exposed to an unacceptable health risk. Other reasons for suspension or termination may be made by us based on evolving business objectives and/or competitive climate.

Information about certain clinical trials must be submitted within specific timeframes to the National Institutes of Health, or NIH, for public dissemination on its ClinicalTrials.gov website.

Human Clinical Trials in Support of an NDA

Clinical trials involve the administration of the investigational product to human subjects under the supervision of qualified investigators in accordance with GCP requirements, which include, among other things, the requirement that all research subjects, or their legal representative, provide their informed consent in writing before their participation in any clinical trial. Clinical trials are conducted under written study protocols detailing, among other things, the inclusion and exclusion criteria, the objectives of the study, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated.

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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, in certain indications such as cancer, 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 and to determine optimal dosage.
- *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 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.
- *Phase 4*. Post-approval studies may be conducted after initial regulatory approval. These studies are used to gain additional experience from the treatment of patients in the intended therapeutic indication.

Progress reports detailing the results of the clinical trials must be submitted at least annually to the FDA. In addition, within 15 calendar days after the sponsor determines that the information qualifies for reporting, IND safety reports must be submitted to the FDA for any of the following: serious and unexpected suspected adverse reactions; findings from other studies or animal or *in vitro* testing that suggest a significant risk in humans exposed to the drug; and any clinically important increase in the case of a serious suspected adverse reaction over that listed in the protocol or investigator brochure. The sponsor also must notify the FDA of any unexpected fatal or life-threatening suspected adverse reaction within seven calendar days after the sponsor's initial receipt of the information. 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 can suspend or terminate approval of a clinical trial at its institution, or an institution it represents, 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. The FDA will typically inspect one or more clinical sites to assure compliance with GCP and the integrity of the clinical data submitted.

Concurrent with clinical trials, companies often complete additional animal studies and must also develop additional information about the chemistry and physical characteristics of the drug as well as finalize a process for manufacturing the product in commercial quantities in accordance with cGMP requirements. The manufacturing process must be capable of consistently producing quality batches of the drug candidate and, among other things, the applicant must develop methods for testing the identity, strength, quality, purity, and potency of the final drug. Additionally, appropriate packaging must be selected and tested and stability studies must be conducted to demonstrate that the drug candidate does not undergo unacceptable deterioration over its shelf life.

Combination Rule

The FDA's Combination Rule governing fixed combination drug products provides that two or more drugs may be combined in a single dosage form when each component contributes to the claimed effects and the dosage of each component (amount, frequency, duration) is such that the combination is safe and effective for a significant patient population requiring such concurrent therapy

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as defined in the labeling for the drug. This rule is meant to ensure that any fixed-dose combination drug provides an advantage to the patient over and above that obtained when one of the individual ingredients is used in the usual safe and effective dose.

Review of an NDA by the FDA

Assuming successful completion of required clinical testing and other requirements, the results of the preclinical studies and clinical trials, 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 drug product for one or more indications. Under federal law, the submission of most NDAs is additionally subject to a significant application user fee as well as annual prescription drug product program fees. These fees are typically increased annually. Certain exceptions and waivers are available for some of these fees.

The FDA conducts a preliminary review of an NDA within 60 days of its receipt, before accepting the NDA for filing, to determine whether the application is 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 has agreed to specified performance goals in the review process of NDAs. Applications for drugs containing new molecular entities are meant to be reviewed within ten months from the date of filing, and applications for "priority review" products containing new molecular entities are meant to be reviewed within six months of filing. The review process may be extended by the FDA for three additional months to consider new information or clarification provided by the applicant to address an outstanding deficiency identified by the FDA following the original submission.

During its review of an NDA, the FDA typically will inspect the facility or facilities where the product is or will be manufactured. These pre-approval inspections may cover all facilities associated with an NDA, including drug component manufacturing (such as active pharmaceutical ingredients), finished drug product manufacturing, and control testing laboratories. The FDA will not approve an NDA unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications.

In addition, as a condition of approval, the FDA may require an applicant to develop a REMS. REMS use risk minimization strategies beyond the professional labeling to ensure that the benefits of the product outweigh the potential risks. To determine whether a REMS is needed, the FDA will consider the size of the population likely to use the product, seriousness of the disease, expected benefit of the product, expected duration of treatment, seriousness of known or potential adverse events, and whether the product is a new molecular entity. REMS can include medication guides, physician communication plans for healthcare professionals, and elements to assure safe use, or ETASU. ETASU may include, but are not limited to, special training or certification for prescribing or dispensing, dispensing only under certain circumstances, special monitoring, and the use of patient registries. The FDA may require a REMS before approval or post-approval if it becomes aware of a serious risk associated with use of the product.

The FDA is required to refer an application for a novel drug to an advisory committee or explain why such referral was not made. Typically, 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

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FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions.

Fast Track, Breakthrough Therapy, and Priority Review

The FDA has a number of programs intended to facilitate and expedite development and review of new drugs if they are intended to address an unmet medical need in the treatment of a serious or life-threatening disease or condition. Three of these programs are referred to as fast track designation, breakthrough therapy designation, and priority review designation.

Specifically, the FDA may designate a product for Fast Track review if it is intended, whether alone or in combination with one or more other products, for the treatment of a serious or life-threatening disease or condition, and it demonstrates the potential to address unmet medical needs for such a disease or condition. For Fast Track products, sponsors may have greater interactions with the FDA and the FDA may initiate review of sections of a Fast Track product's application before the application is complete. This rolling review may be available if the FDA determines, after preliminary evaluation of clinical data submitted by the sponsor, that a Fast Track product may be effective. The sponsor must also provide, and the FDA must approve, a schedule for the submission of the remaining information and the sponsor must pay applicable user fees. However, the FDA's time period goal for reviewing a Fast Track application does not begin until the last section of the application is submitted. In addition, the Fast Track designation may be withdrawn by the FDA if the FDA believes that the designation is no longer supported by data emerging in the clinical trial process.

Second, a product may be designated as a Breakthrough Therapy if it is intended, either alone or in combination with one or more other products, to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the product may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. The FDA may take certain actions with respect to Breakthrough Therapies, including holding meetings with the sponsor throughout the development process; providing timely advice to the product sponsor regarding development and approval; involving more senior staff in the review process; assigning a cross-disciplinary project lead for the review team; and taking other steps to design the clinical trials in an efficient manner.

Third, the FDA may designate a product for priority review if it is a product that treats a serious or life-threatening disease or condition and, if approved, would provide a significant improvement in safety or effectiveness. The FDA determines, on a case-by-case basis, whether the proposed product represents a significant improvement when compared with other available therapies. Significant improvement may be illustrated by evidence of increased effectiveness in the treatment of a condition, elimination or substantial reduction of a treatment-limiting product reaction, documented enhancement of patient compliance that may lead to improvement in serious outcomes, and evidence of safety and effectiveness in a new subpopulation. A priority designation is intended to direct overall attention and resources to the evaluation of such applications, and to shorten the FDA's goal for taking action on a marketing application from ten months to six months.

Accelerated Approval Pathway

The FDA may grant accelerated approval to a product for a serious or life-threatening condition that provides meaningful therapeutic advantage to patients over existing treatments based upon a determination that the product has an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit or on an intermediate clinical endpoint that can be measured earlier than an effect on irreversible morbidity or mortality, or IMM, and that is reasonably likely to predict an effect on IMM or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the

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availability or lack of alternative treatments. Products granted accelerated approval must meet the same statutory standards for safety and effectiveness as those granted traditional approval.

For the purposes of accelerated approval, a surrogate endpoint is a marker, such as a laboratory measurement, radiographic image, physical sign, or other measure that is thought to predict clinical benefit, but is not itself a measure of clinical benefit. Surrogate endpoints can often be measured more easily or more rapidly than clinical endpoints. An intermediate clinical endpoint is a measurement of a therapeutic effect that is considered reasonably likely to predict the clinical benefit of a product, such as an effect on IMM. The FDA has limited experience with accelerated approvals based on intermediate clinical endpoints, but has indicated that such endpoints generally may support accelerated approval where the therapeutic effect measured by the endpoint is not itself a clinical benefit and basis for traditional approval, if there is a basis for concluding that the therapeutic effect is reasonably likely to predict the ultimate clinical benefit of a product.

The accelerated approval pathway is most often used in settings in which the course of a disease is long and an extended period of time is required to measure the intended clinical benefit of a product, even if the effect on the surrogate or intermediate clinical endpoint occurs rapidly.

The accelerated approval pathway is usually contingent on a sponsor's agreement to conduct, in a diligent manner, additional post-approval confirmatory studies to verify and describe the product's clinical benefit. As a result, a product 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, could result in the FDA's withdrawal of the approval and require the withdrawal of the product from the market on an expedited basis. All promotional materials for product candidates approved under accelerated regulations are subject to prior review by the FDA.

The FDA's Decision on an NDA

On the basis of the FDA's evaluation of the NDA and accompanying information, including the results of the inspection of the manufacturing facilities and select clinical trial sites, the FDA may issue an approval letter or a complete response letter. An approval letter authorizes commercial marketing of the product with specific prescribing information for specific indications. A complete response letter generally outlines the deficiencies in the submission and may require substantial additional testing or information in order for the FDA to reconsider the application. If a complete response letter is issued, the applicant may resubmit the NDA to address all of the deficiencies identified in the letter, withdraw the application, or request a hearing. If the applicant resubmits the NDA, only when the deficiencies have been addressed to the FDA's satisfaction will the FDA will issue an approval letter. The FDA has committed to reviewing such resubmissions in two or six months depending on the type of information included. Even with submission of this additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval.

If the FDA approves a product, it may limit the approved indications for use for 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 the drug's safety or effectiveness after approval, require testing and surveillance programs to monitor the product after commercialization, or impose other conditions, including distribution restrictions or other risk management mechanisms, including 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-market studies or surveillance programs.

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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, many 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 annual prescription drug product program fee requirements for certain marketed products.

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 and impose reporting and documentation requirements upon the NDA holder and any third-party manufacturers that the NDA holder 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 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 voluntary product recalls;
- fines, warning or untitled 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. However, companies may share truthful and not misleading information that is otherwise consistent with a product's FDA approved labeling. 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.

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Hatch-Waxman Amendments

Section 505 of the FDCA describes three types of marketing applications that may be submitted to the FDA to request marketing authorization for a new drug. A Section 505(b)(1) NDA is an application that contains full reports of investigations of safety and efficacy. A 505(b)(2) NDA is an application that contains full reports of investigations of safety and efficacy but where at least some of the information required for approval comes from investigations that were not conducted by or for the applicant and for which the applicant has not obtained a right of reference or use from the person by or for whom the investigations were conducted. This regulatory pathway enables the applicant to rely, in part, on the FDA's prior findings of safety and efficacy for an existing product, or published literature, in support of its application. Section 505(j) establishes an abbreviated approval process for a generic version of approved drug products through the submission of an Abbreviated New Drug Application, or ANDA. An ANDA provides for marketing of a generic drug product that has the same active ingredients, dosage form, strength, route of administration, labeling, performance characteristics and intended use, among other things, to a previously approved product, known as a reference listed drug, or RLD. ANDAs are termed "abbreviated" because they are generally not required to include preclinical (animal) and clinical (human) data to establish safety and efficacy. Instead, generic applicants must scientifically demonstrate that their product is bioequivalent to, or performs in the same manner as, the innovator drug through *in vitro*, *in vivo*, or other testing. The generic version must deliver the same amount of active ingredients into a subject's bloodstream in the same amount of time as the innovator drug and can often be substituted by pharmacists under prescriptions written for the reference listed drug.

Non-Patent Exclusivity

Under the Hatch-Waxman Amendments, the FDA may not approve (or in some cases accept) an ANDA or 505(b)(2) application until any applicable period of non-patent exclusivity for the RLD has expired. The FDCA provides a period of five years of non-patent data exclusivity for a new drug containing a new chemical entity, or NCE. For the purposes of this provision, an NCE is a drug that contains no active moiety that has previously been approved by the FDA in any other NDA. An active moiety is the molecule or ion responsible for the physiological or pharmacological action of the drug substance. In cases where such NCE exclusivity has been granted, an ANDA may not be filed with the FDA until the expiration of five years unless the submission is accompanied by a Paragraph IV certification, which states the proposed generic drug will not infringe one or more of the already approved product's listed patents or that such patents are invalid or unenforceable, in which case the applicant may submit its application four years following the original product approval.

The FDCA also provides for a period of three years of exclusivity for non-NCE drugs if the NDA or a supplement to the NDA includes reports of one or more new clinical investigations, other than bioavailability or bioequivalence studies, that were conducted by or for the applicant and are essential to the approval of the application or supplement. This three-year exclusivity period often protects changes to a previously approved drug product, such as a new dosage form, route of administration, combination or indication, but it generally would not protect the original, unmodified product from generic competition. Unlike five-year NCE exclusivity, an award of three-year exclusivity does not block the FDA from accepting ANDAs seeking approval for generic versions of the drug as of the date of approval of the original drug product; it only prevents FDA from approving such ANDAs.

Hatch-Waxman Patent Certification and the 30-Month Stay

In seeking approval of an NDA or a supplement thereto, NDA sponsors are required to list with the FDA each patent with claims that cover the applicant's product or an approved method of using the product. Upon approval, each of the patents listed by the NDA sponsor is published in the FDA's

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Approved Drug Products with Therapeutic Equivalence Evaluations, commonly known as the Orange Book. Upon submission of an ANDA or 505(b)(2) NDA, an applicant is required to certify to the FDA concerning any patents listed for the RLD in the Orange Book that:

- no patent information on the drug product that is the subject of the application has been submitted to the FDA;
- such patent has expired;
- the date on which such patent expires; or
- such patent is invalid, unenforceable or will not be infringed upon by the manufacture, use, or sale of the drug product for which the application is submitted.

Generally, the ANDA or 505(b)(2) NDA cannot be approved until all listed patents have expired, except where the ANDA or 505(b)(2) NDA applicant challenges a listed patent through the last type of certification, also known as a paragraph IV certification. If the applicant does not challenge the listed patents or indicates that it is not seeking approval of a patented method of use, the ANDA or 505(b)(2) NDA application will not be approved until all of the listed patents claiming the referenced product have expired. If the ANDA or 505(b)(2) NDA applicant has provided a paragraph IV certification the applicant must send notice of the paragraph IV certification to the NDA and patent holders once the application has been accepted for filing by the FDA. The NDA and patent holders may then initiate a patent infringement lawsuit in response to the notice of the paragraph IV certification. If the paragraph IV certification is challenged by an NDA holder or the patent owner(s) asserts a patent challenge to the paragraph IV certification, the FDA may not approve that application until the earlier of 30 months from the receipt of the notice of the paragraph IV certification, the expiration of the patent, when the infringement case concerning each such patent was favorably decided in the applicant's favor or settled, or such shorter or longer period as may be ordered by a court. This prohibition is generally referred to as the 30-month stay. In instances where an ANDA or 505(b)(2) NDA applicant files a paragraph IV certification, the NDA holder or patent owner(s) regularly take action to trigger the 30-month stay, recognizing that the related patent litigation may take many months or years to resolve. Thus, approval of an ANDA or 505(b)(2) NDA could be delayed for a significant period of time depending on the patent certification the applicant makes and the reference drug sponsor's decision to initiate patent litigation. If the drug has NCE exclusivity and the ANDA is submitted four years after approval, the 30-month stay is extended so that it expires seven and a half years after approval of the innovator drug, unless the patent expires or there is a decision in the infringement case that is favorable to the ANDA applicant before then.

Patent Term Restoration and Extension

A patent claiming a new drug product may be eligible for a limited patent term extension under the Hatch-Waxman Amendments, which permits a patent term restoration of up to seven and a half years for patent term lost during product development and the FDA regulatory review. The restoration period granted is typically one-half the time between the effective date of an IND and the submission date of an NDA, plus the time between the submission date of an NDA and the ultimate approval date, provided the sponsor acted with diligence. Patent term restoration cannot be used to extend the remaining term of a patent past a total of 14 years from the product's approval date. Only one patent applicable to an approved drug product is eligible for the extension, and the application for the extension must be submitted prior to the expiration of the patent in question and within 60 days of drug approval. A patent that covers multiple drugs for which approval is sought can only be extended in connection with one of the approvals. The U.S. Patent and Trademark Office reviews and approves the application for any patent term extension or restoration in consultation with the FDA.

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Review and Approval of Medicinal Products in the European Union

In order to market any product outside of the United States, a company must also comply with numerous and varying regulatory requirements of other countries and jurisdictions regarding quality, safety and efficacy and governing, among other things, clinical trials, marketing authorization, commercial sales and distribution of products. Whether or not it obtains FDA approval for a product, an applicant will need to obtain the necessary approvals by the comparable foreign regulatory authorities before it can commence clinical trials or marketing of the product in those countries or jurisdictions. Specifically, the process governing approval of medicinal products in the European Union generally follows the same lines as in the United States. It entails satisfactory completion of preclinical studies and adequate and well-controlled clinical trials to establish the safety and efficacy of the product for each proposed indication. It also requires the submission to the relevant competent authorities of a marketing authorization application, or MAA, and granting of a marketing authorization by these authorities before the product can be marketed and sold in the European Union.

Clinical Trial Approval

The Clinical Trials Directive 2001/20/EC, the Directive 2005/28/EC on Good Clinical Practice, or GCP, and the related national implementing provisions of the individual EU Member States govern the system for the approval of clinical trials in the European Union. Under this system, an applicant must obtain prior approval from the competent national authority of the EU Member States in which the clinical trial is to be conducted. Furthermore, the applicant may only start a clinical trial at a specific study site after the competent ethics committee has issued a favorable opinion. The clinical trial application must be accompanied by, among other documents, an investigational medicinal product dossier (the Common Technical Document) with supporting information prescribed by Directive 2001/20/EC, Directive 2005/28/EC, where relevant the implementing national provisions of the individual EU Member States and further detailed in applicable guidance documents.

In April 2014, the new Clinical Trials Regulation, (EU) No 536/2014 (Clinical Trials Regulation) was adopted. The Regulation is anticipated to apply in 2020. The Clinical Trials Regulation will be directly applicable in all the EU Member States, repealing the current Clinical Trials Directive 2001/20/EC. Conduct of all clinical trials performed in the European Union will continue to be bound by currently applicable provisions until the new Clinical Trials Regulation becomes applicable. The extent to which ongoing clinical trials will be governed by the Clinical Trials Regulation will depend on when the Clinical Trials Regulation becomes applicable and on the duration of the individual clinical trial. If a clinical trial continues for more than three years from the day on which the Clinical Trials Regulation becomes applicable the Clinical Trials Regulation will at that time begin to apply to the clinical trial.

The new Clinical Trials Regulation aims to simplify and streamline the approval of clinical trials in the European Union. The main characteristics of the regulation include: a streamlined application procedure via a single entry point, the “EU portal”; a single set of documents to be prepared and submitted for the application as well as simplified reporting procedures for clinical trial sponsors; and a harmonized procedure for the assessment of applications for clinical trials, which is divided in two parts. Part I is assessed by the competent authorities of all EU Member States in which an application for authorization of a clinical trial has been submitted (Member States concerned). Part II is assessed separately by each Member State concerned. Strict deadlines have been established for the assessment of clinical trial applications. The role of the relevant ethics committees in the assessment procedure will continue to be governed by the national law of the concerned EU Member State. However, overall related timelines will be defined by the Clinical Trials Regulation.

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Marketing Authorization

To obtain a marketing authorization for a product under European Union regulatory systems, an applicant must submit an MAA either under a centralized procedure administered by the European Medicines Agency, or EMA, or one of the procedures administered by competent authorities in the EU Member States (decentralized procedure or mutual recognition procedure). A marketing authorization may be granted only to an applicant established in the European Union. Regulation (EC) No 1901/2006 provides that prior to obtaining a marketing authorization in the European Union, applicants have to demonstrate compliance with all measures included in an EMA-approved Pediatric Investigation Plan, or PIP, covering all subsets of the pediatric population, unless the EMA has granted (1) a product-specific waiver, (2) a class waiver or (3) a deferral for one or more of the measures included in the PIP.

The centralized procedure provides for the grant of a single marketing authorization by the European Commission that is valid for all EU Member States and Iceland, Liechtenstein and Norway. Pursuant to Regulation (EC) No 726/2004, the centralized procedure is compulsory for specific products, including for medicines produced by certain biotechnological processes, products designated as orphan medicinal products, advanced therapy products and products with a new active substance indicated for the treatment of certain diseases, including products for the treatment of HIV or AIDS, cancer, diabetes, neurodegenerative diseases, auto-immune and other immune dysfunctions and viral diseases. For products with a new active substance indicated for the treatment of other diseases and products that are a significant therapeutic, scientific or technical innovation and whose authorization would be in the interest of public health at EU level, the centralized procedure is optional.

Under the centralized procedure, the Committee for Medicinal Products for Human Use, or the CHMP, established at the EMA is responsible for conducting the initial assessment of a product. The CHMP is also responsible for several post-authorization and maintenance activities, such as the assessment of modifications or extensions to an existing marketing authorization. Under the centralized procedure in the European Union, the maximum timeframe for the evaluation of an MAA is 210 days, excluding clock stops, when additional information or written or oral explanation is to be provided by the applicant in response to questions of the CHMP. Accelerated evaluation might be granted by the CHMP in exceptional cases, when a medicinal product is of major interest from the point of view of public health and in particular from the viewpoint of therapeutic innovation. If the CHMP accepts such request, the time limit of 210 days will be reduced to 150 days but it is possible that the CHMP can revert to the standard time limit for the centralized procedure if it considers that it is no longer appropriate to conduct an accelerated assessment. At the end of this period, the CHMP provides a scientific opinion on whether or not a marketing authorization should be granted in relation to a medicinal product. Within 67 days from the date of the CHMP Opinion, the European Commission will adopt its final decision on the marketing authorization application.

Unlike the centralized authorization procedure, the decentralized marketing authorization procedure requires a separate application to, and leads to separate approval by, the competent authorities of each EU Member State in which the product is to be marketed. This application is identical to the application that would be submitted to the EMA for authorization through the centralized procedure. The reference EU Member State prepares a draft assessment and drafts of the related materials within 120 days after receipt of a valid application. The resulting assessment report is submitted to the concerned EU Member States who, within 90 days of receipt, must decide whether to approve the assessment report and related materials. If a concerned EU Member State cannot approve the assessment report and related materials due to concerns relating to a potential serious risk to public health, disputed elements may be referred to the European Commission, whose decision is binding on all EU Member States.

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The mutual recognition procedure similarly is based on the acceptance by the competent authorities of the EU Member States of the marketing authorization of a medicinal product by the competent authorities of other EU Member States. The holder of a national marketing authorization may submit an application to the competent authority of an EU Member State requesting that this authority recognize the marketing authorization delivered by the competent authority of another EU Member State.

Regulatory Data Protection in the European Union

In the European Union, innovative medicinal products approved on the basis of a complete independent data package qualify for eight years of data exclusivity upon marketing authorization and an additional two years of market exclusivity pursuant to Directive 2001/83/EC. Regulation (EC) No 726/2004 repeats this entitlement for medicinal products authorized in accordance the centralized authorization procedure. Data exclusivity prevents applicants for authorization of generics of these innovative products from referencing the innovator's data to assess a generic (abbreviated) application for a period of eight years. During an additional two-year period of market exclusivity, a generic marketing authorization application can be submitted and authorized, and the innovator's data may be referenced, but no generic medicinal product can be placed on the European Union market until the expiration of the market exclusivity. The overall ten-year period will be extended to a maximum of 11 years if, during the first eight years of those ten years, the marketing authorization holder obtains an authorization for one or more new therapeutic indications which, during the scientific evaluation prior to their authorization, are held to bring a significant clinical benefit in comparison with existing therapies. Even if a compound is considered to be a new chemical entity so that the innovator gains the prescribed period of data exclusivity, another company nevertheless could also market another version of the product if such company obtained marketing authorization based on an MAA with a complete independent data package of pharmaceutical tests, preclinical tests and clinical trials.

Periods of Authorization and Renewals

A marketing authorization has an initial validity for five years in principle. The marketing authorization may be renewed after five years on the basis of a re-evaluation of the risk-benefit balance by the EMA or by the competent authority of the EU Member State. To this end, the marketing authorization holder must provide the EMA or the competent authority with a consolidated version of the file in respect of quality, safety and efficacy, including all variations introduced since the marketing authorization was granted, at least six months before the marketing authorization ceases to be valid. The European Commission or the competent authorities of the EU Member States may decide, on justified grounds relating to pharmacovigilance, to proceed with one further five year period of marketing authorization. Once subsequently definitively renewed, the marketing authorization shall be valid for an unlimited period. Any authorization which is not followed by the actual placing of the medicinal product on the European Union market (in case of centralized procedure) or on the market of the authorizing EU Member State within three years after authorization ceases to be valid (the so-called sunset clause).

Regulatory Requirements after a Marketing Authorization has been Obtained

In case an authorization for a medicinal product in the European Union is obtained, the holder of the marketing authorization is required to comply with a range of requirements applicable to the manufacturing, marketing, promotion and sale of medicinal products. These include:

- Compliance with the European Union's stringent pharmacovigilance or safety reporting rules must be ensured. These rules can impose post-authorization studies and additional monitoring obligations.

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- The manufacturing of authorized medicinal products, for which a separate manufacturer's license is mandatory, must also be conducted in strict compliance with the applicable European Union laws, regulations and guidance, including Directive 2001/83/EC, Directive 2003/94/EC, Regulation (EC) No 726/2004 and the European Commission Guidelines for Good Manufacturing Practice. These requirements include compliance with European Union cGMP standards when manufacturing medicinal products and active pharmaceutical ingredients, including the manufacture of active pharmaceutical ingredients outside of the European Union with the intention to import the active pharmaceutical ingredients into the European Union.
- The marketing and promotion of authorized drugs, including industry-sponsored continuing medical education and advertising directed toward the prescribers of drugs and/or the general public, are strictly regulated in the European Union notably under Directive 2001/83/EC, as amended, and EU Member State laws.

Brexit and the Regulatory Framework in the United Kingdom

On June 23, 2016, the electorate in the United Kingdom voted in favor of leaving the European Union, commonly referred to as "Brexit". Thereafter, on March 29, 2017, the country formally notified the European Union of its intention to withdraw pursuant to Article 50 of the Lisbon Treaty. The withdrawal of the United Kingdom from the European Union will take effect either on the effective date of the withdrawal agreement or, in the absence of agreement, two years after the United Kingdom provides a notice of withdrawal pursuant to the EU Treaty. Since the regulatory framework for pharmaceutical products in the United Kingdom covering quality, safety and efficacy of pharmaceutical products, clinical trials, marketing authorization, commercial sales and distribution of pharmaceutical products is derived from European Union directives and regulations, Brexit could materially impact the future regulatory regime which applies to products and the approval of product candidates in the United Kingdom. It remains to be seen how, if at all, Brexit will impact regulatory requirements for product candidates and products in the United Kingdom.

European Data Collection Regulation

In the event we decide to conduct clinical trials in the European Union, we may be subject to additional privacy restrictions. The collection and use of personal health information in the European Union is governed by the provisions of the Data Protection Directive, and as of May 25, 2018, the General Data Protection Regulation, or GDPR. This directive imposes several requirements relating to the consent of the individuals to whom the personal data relates, the information provided to the individuals, notification of data processing obligations to the competent national data protection authorities and the security and confidentiality of the personal data. The GDPR also imposes strict rules on the transfer of personal data out of the EU to the United States. Failure to comply with the requirements of the Data Protection Directive (which governs the collection and use of personal health data in the European Union), the GDPR, and the related national data protection laws of the EU Member States may result in fines and other administrative penalties. The GDPR introduced new data protection requirements in the EU and substantial fines for breaches of the data protection rules. The GDPR regulations may impose additional responsibility and liability in relation to personal data that we process and we may be required to put in place additional mechanisms ensuring compliance with the new data protection rules. This may be onerous and adversely affect our business, financial condition, results of operations and prospects.

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Healthcare and Privacy Laws and Regulation

Healthcare providers and third-party payors play a primary role in the recommendation and prescription of drug products that are granted regulatory approval. Arrangements with providers, consultants, third-party payors and customers are subject to broadly applicable fraud and abuse, anti-kickback, false claims laws, reporting of payments to physicians and teaching hospitals and patient privacy laws and regulations and other healthcare laws and regulations that may constrain our business and/or financial arrangements. Restrictions under applicable federal and state healthcare and privacy laws and regulations, include the following:

- the federal Anti-Kickback Statute, which prohibits, among other things, persons and entities from knowingly and willfully soliciting, offering, paying, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward either the referral of an individual for, or the purchase, order or recommendation of, any good or service, for which payment may be made, in whole or in part, under a federal healthcare program such as Medicare and Medicaid; a person or entity need not have actual knowledge of the federal Anti-Kickback Statute or specific intent to violate it in order to have committed a violation. Violations are subject to civil and criminal fines and penalties for each violation, plus up to three times the remuneration involved, imprisonment, and exclusion from government healthcare programs. In addition, the government may assert that a claim that includes items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the civil False Claims Act;
- the federal civil and criminal false claims laws, including the civil False Claims Act, or FCA, and civil monetary penalties laws, which prohibit individuals or entities from, among other things, knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false, fictitious or fraudulent; knowingly making a false statement or record material to a false or fraudulent claim or obligation to pay or transmit money or property to the federal government; or knowingly concealing or knowingly and improperly avoiding or decreasing an obligation to pay money to the federal government. Manufacturers can be held liable under the FCA even when they do not submit claims directly to government payors if they are deemed to “cause” the submission of false or fraudulent claims. The FCA also permits a private individual acting as a “whistleblower” to bring actions on behalf of the federal government alleging violations of the FCA and to share in any monetary recovery;
- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which created additional federal civil and criminal laws that prohibit, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program or knowingly and willfully falsifying, concealing or covering up by any trick or device a material fact or making any materially false 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;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH and their respective implementing regulations, including the Final Omnibus Rule published in January 2013, which impose requirements on certain covered healthcare providers, health plans, and healthcare clearinghouses as well as their respective business associates that perform services for them that involve the use, or disclosure of, individually identifiable health information, relating to the privacy, security and transmission of individually identifiable health information. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or

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injunctions in federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions;

- the federal transparency requirements known as the federal Physician Payments Sunshine Act, under the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, or collectively the Affordable Care Act, which requires certain manufacturers of drugs, devices, biologics and medical supplies to report annually to the Centers for Medicare & Medicaid Services, or CMS, within the United States Department of Health and Human Services, or HHS, information related to payments and other transfers of value made by that entity to physicians and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members;
- analogous state and foreign laws and regulations, such as state anti-kickback and false claims laws, which may apply to healthcare items or services that are reimbursed by non-governmental third-party payors, including private insurers;
- many state laws govern the privacy of personal information in specified circumstances, for example, in California the California Consumer Privacy Act ("CCPA"), which will go into effect on January 1, 2020, establishes a new privacy framework for covered businesses by creating an expanded definition of personal information, establishing new data privacy rights for consumers in the State of California, imposing special rules on the collection of consumer data from minors, and creating a new and potentially severe statutory damages framework for violations of the CCPA and for businesses that fail to implement reasonable security procedures and practices to prevent data breaches. While clinical trial data and information governed by HIPAA are currently exempt from the current version of the CCPA, other personal information may be applicable and possible changes to the CCPA may broaden its scope; and
- some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government in addition to requiring manufacturers to report information related to payments to physicians and other healthcare providers, marketing expenditures, and drug pricing information. Certain state and local laws require the registration of pharmaceutical sales representatives. State and foreign laws, including for example the European Union General Data Protection Regulation, also govern the privacy and security of health information in some circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

Pharmaceutical Insurance Coverage and Healthcare Reform

In the United States and markets in other countries, patients who are prescribed treatments for their conditions and providers performing the prescribed services generally rely on third-party payors to reimburse all or part of the associated healthcare costs. Thus, even if a product candidate is approved, sales of the product will depend, in part, on the extent to which third-party payors, including government health programs in the United States such as Medicare and Medicaid, commercial health insurers and managed care organizations, provide coverage, and establish adequate reimbursement levels for, the product. In the United States, no uniform policy of coverage and reimbursement for drug products exists among third-party payors. Therefore, coverage and reimbursement for drug products can differ significantly from payor to payor. The process for determining whether a third-party payor will provide coverage for a product may be separate from the process for setting the price or reimbursement rate that the payor will pay for the product once coverage is approved. Third-party payors are increasingly challenging the prices charged, examining the medical necessity, and reviewing the cost-effectiveness of medical products and services and imposing controls to manage costs. Third-party payors may limit coverage to specific products on an approved list, also known as a formulary, which might not include all of the approved products for a particular indication.

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In order to secure coverage and reimbursement for any product that might be approved for sale, a company may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of the product, in addition to the costs required to obtain FDA or other comparable regulatory approvals. Additionally, companies may also need to provide discounts to purchasers, private health plans or government healthcare programs. Nonetheless, product candidates may not be considered medically necessary or cost effective. A decision by a third-party payor not to cover a product could reduce physician utilization once the product is approved and have a material adverse effect on sales, results of operations and financial condition. Additionally, a third-party payor's decision to provide coverage for a product does not imply that an adequate reimbursement rate will be approved. Further, one payor's determination to provide coverage for a product does not assure that other payors will also provide coverage and reimbursement for the product, and the level of coverage and reimbursement can differ significantly from payor to payor.

The containment of healthcare costs has become a priority of federal, state and foreign governments, and the prices of products have been a focus in this effort. Governments have shown significant interest in implementing cost-containment programs, including price controls, restrictions on reimbursement and requirements for 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 a company's revenue generated from the sale of any approved products. Coverage policies and third-party payor reimbursement rates may change at any time. Even if favorable coverage and reimbursement status is attained for one or more products for which a company or its collaborators receive regulatory approval, less favorable coverage policies and reimbursement rates may be implemented in the future.

There have been a number of federal and state proposals during the last few years regarding the pricing of pharmaceutical products, limiting coverage and the amount of reimbursement for drugs and other medical products, government control and other changes to the healthcare system in the United States. For example, in March 2010, the United States Congress enacted the Affordable Care Act, which, among other things, includes contains to the coverage and payment for products under government health care programs. The Affordable Care Act includes provisions of importance to our potential product candidates, including among other things, that:

- created an annual, nondeductible fee on any entity that manufactures or imports specified branded prescription drugs and biologic products, apportioned among these entities according to their market share in certain government healthcare programs;
- expanded eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to certain individuals with income at or below 133% of the federal poverty level, thereby potentially increasing a manufacturer's Medicaid rebate liability;
- expanded manufacturers' rebate liability under the Medicaid Drug Rebate Program by increasing the minimum rebate for both branded and generic drugs and revising the definition of "average manufacturer price," or AMP, for calculating and reporting Medicaid drug rebates on outpatient prescription drug prices;
- addressed a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted or injected;
- expanded the types of entities eligible for the 340B drug discount program;
- established the Medicare Part D coverage gap discount program by requiring manufacturers to provide a 50% point-of-sale-discount, which was increased to 70% by the Bipartisan Budget Act of 2018 (as of January 1, 2019), off the negotiated price of applicable brand drugs to

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eligible beneficiaries during their coverage gap period as a condition for the manufacturers' outpatient drugs to be covered under Medicare Part D; and

- 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.

Some of the provisions of the Affordable Care Act have yet to be implemented, and there have been judicial and Congressional challenges to certain provisions of the Affordable Care Act, as well as recent efforts by the Trump administration to repeal or replace certain aspects of the Affordable Care Act. Since January 2017, President Trump has signed two Executive Orders and other directives designed to delay the implementation of certain provisions of the Affordable Care Act. Concurrently, Congress has considered legislation that would repeal or repeal and replace all or part of the Affordable Care Act. While Congress has not passed comprehensive repeal legislation, it has enacted laws that modify certain provisions of the Affordable Care Act such as removing penalties, starting January 1, 2019, for not complying with the Affordable Care Act's individual mandate to carry health insurance, delaying the implementation of certain Affordable Care Act-mandated fees, and increasing the point-of-sale discount that is owed by pharmaceutical manufacturers who participate in Medicare Part D. On December 14, 2018, a Texas U.S. District Court Judge ruled that the Affordable Care Act is unconstitutional in its entirety because the "individual mandate" was repealed by Congress as part of the Tax Cuts and Jobs Act of 2017. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the Affordable Care Act will impact the Affordable Care Act.

Other legislative changes have been proposed and adopted in the United States since the Affordable Care Act was enacted. In August 2011, the Budget Control Act of 2011, among other things, created measures for spending reductions by Congress. A Joint Select Committee on Deficit Reduction, tasked with recommending a targeted deficit reduction of at least $1.2 trillion for the years 2013 through 2021, was unable to reach required goals, thereby triggering the legislation's automatic reduction to several government programs. This includes aggregate reductions of Medicare payments to providers of 2% per fiscal year, which went into effect in April 2013 and, due to subsequent legislative amendments to the statute, will remain in effect through 2027 unless additional Congressional action is taken. In January 2013, President Obama signed into law the American Taxpayer Relief Act of 2012, which, among other things, further reduced Medicare payments to several providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years.

In addition, recently there has been heightened governmental scrutiny over the manner in which manufacturers set prices for their commercial products, which has resulted in several Congressional inquiries and proposed and enacted state and federal 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 pharmaceutical products. For example, at the federal level, the Trump administration released a "Blueprint" to lower drug prices and reduce out of pocket costs of drugs that contains additional proposals to increase drug manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products, and reduce the out of pocket costs of drug products paid by consumers. While some proposed measures may require additional authorization to become effective, Congress and the Trump administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. For example, on September 25, 2019, the Senate Finance Committee introduced the Prescription Drug Pricing Reduction Action of 2019, a bill intended to reduce Medicare and Medicaid prescription drug prices. The proposed legislation would restructure the Part D benefit, modify payment methodologies

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for certain drugs, and impose an inflation cap on drug price increases. An even more restrictive bill, the Lower Drug Costs Now Act of 2019, was introduced in the House of Representatives on September 19, 2019, and would require the Department of Health and Human Services (HHS) to directly negotiate drug prices with manufacturers. It is unclear whether either of these bills will make it through both chambers and be signed into law, and if either is enacted, what effect it would have on our business. Individual states in the United States have also increasingly passed legislation and implemented regulations designed to control pharmaceutical product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing.

Outside the United States, ensuring coverage and adequate payment for a product also involves challenges. Pricing of prescription pharmaceuticals is subject to government control in many countries. Pricing negotiations with government authorities can extend well beyond the receipt of regulatory approval for a product and may require a clinical trial that compares the cost-effectiveness of a product to other available therapies. The conduct of such a clinical trial could be expensive and result in delays in commercialization.

In the European Union, pricing and reimbursement schemes vary widely from country to country. Some countries provide that products may be marketed only after a reimbursement price has been agreed. Some countries may require the completion of additional studies that compare the cost-effectiveness of a particular product candidate to currently available therapies or so-called health technology assessments, in order to obtain reimbursement or pricing approval. For example, the European Union provides options for its member states to restrict the range of products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. European Union member states may approve a specific price for a product or it may instead adopt a system of direct or indirect controls on the profitability of the company placing the product on the market. Other member states allow companies to fix their own prices for products, but monitor and control prescription volumes and issue guidance to physicians to limit prescriptions. Recently, many countries in the European Union have increased the amount of discounts required on pharmaceuticals and these efforts could continue as countries attempt to manage healthcare expenditures, especially in light of the severe fiscal and debt crises experienced by many countries in the European Union. The downward pressure on healthcare costs in general, particularly prescription products, has become intense. As a result, increasingly high barriers are being erected to the entry of new products. Political, economic and regulatory developments may further complicate pricing negotiations, and pricing negotiations may continue after reimbursement has been obtained. Reference pricing used by various European Union member states, and parallel trade, i.e., arbitrage between low-priced and high-priced member states, can further reduce prices. There can be no assurance that any country that has price controls or reimbursement limitations for pharmaceutical products will allow favorable reimbursement and pricing arrangements for any products, if approved in those countries.

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Legal Proceedings

We are not currently subject to any material legal proceedings.

Facilities

Our offices are located in Boston, Massachusetts and consist of approximately 7,000 square feet of leased office space. The lease expires in February 2023. We believe that our facilities are adequate for our current needs and that suitable additional or substitute space would be available if needed.

Employees

As of November 1, 2019, we had 19 full-time employees, including a total of eight employees with M.D. and/or Ph.D. degrees. Of our workforce, ten employees are directly engaged in research and development with the rest providing administrative, business and operations support. None of our employees are represented by labor unions or covered by collective bargaining agreements. We consider the relationship with our employees to be good.

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MANAGEMENT

The following table sets forth the name, age as of November 1, 2019, and position of each of our executive officers and directors.

Name	Age	Position
Executive Officers		
Steven Paul, M.D.	68	Chief Executive Officer, President and Chairman
Andrew Miller, Ph.D.	38	Chief Operating Officer
Stephen Brannan, M.D.	62	Chief Medical Officer
Troy Ignelzi	52	Chief Financial Officer
Non-Employee Directors		
Bharat Chowrira, J.D., Ph.D.(1)(3)	54	Director
Edmund Harrigan, M.D.(2)	66	Director
James Healy, M.D., Ph.D.(1)	54	Director
Jeffrey Jonas, M.D.(3)	66	Director
Robert Nelsen(2)	56	Director
Atul Pande, M.D.(2)	65	Director
Heather Preston, M.D.(1)(3)	53	Director

(1) Member of audit committee.
(2) Member of compensation committee.
(3) Member of nominating and corporate governance committee.

Executive Officers

Steven Paul, M.D. has served as our Chairman and Chief Executive Officer since August 2018 and as a member of our board of directors since March 2018. Previously, Dr. Paul was the President and Chief Executive Officer of Voyager Therapeutics, Inc. from September 2014 to August 2018. Dr. Paul also serves as a venture partner at Third Rock Ventures, LLC, a life sciences venture capital firm. Together with Third Rock, Dr. Paul co-founded Sage Therapeutics, Inc. and Voyager Therapeutics, Inc. From August 2010 to September 2014, Dr. Paul was a professor of neuroscience, psychiatry and pharmacology at Weill Cornell Medical College. Prior to that, from 1993 to 2010, Dr. Paul held several key positions at Eli Lilly and Company, or Eli Lilly, including Executive Vice President for Science and Technology, President of the Lilly Research Laboratories, Vice President of Neuroscience (CNS) Research and Group Vice President of Discovery Research. Prior to Eli Lilly, from 1988 to 1993, Dr. Paul served as the Scientific Director of the National Institute of Mental Health, or NIMH. From 1982 to 1988 Dr. Paul served as a laboratory branch chief and tenured investigator at NIMH. Dr. Paul also served as Medical Director in the Commissioned Corps of the United States Public Health Service. Dr. Paul is an elected fellow of the American Association for the Advancement of Science and a member of the National Academy of Medicine. Dr. Paul is currently on the board of directors or is a trustee of several organizations, including Sage Therapeutics, Inc. (NASDAQ: SAGE), Voyager Therapeutics, Inc. (NASDAQ: VYGR), Alnylam Pharmaceuticals, Inc. (NASDAQ: ALNY) and the Foundation for the National Institutes of Health, or FNIH. In the past five years, Dr. Paul also served on the board of Sigma Aldrich Corporation (NASDAQ: SIAL). Dr. Paul was appointed by the Secretary of the Department of Health and Human Services as a member of the advisory committee to the Director of the NIH from 2001 to 2006. Dr. Paul was also a member of the National Advisory Mental Health Council (2008-2012) and is board certified by the American Board of Psychiatry and Neurology. Dr. Paul received his B.A. in Biology and Psychology from Tulane University, and his M.S. and M.D. degrees from the Tulane University School of Medicine. Our board of directors believes that Dr. Paul is qualified to serve on our board of directors due to his extensive career in neuroscience and his

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leadership and managerial experiences at various pharmaceutical and biotechnology companies and healthcare organizations.

Andrew Miller, Ph.D. has served as our Chief Operating Officer since August 2018 and served as a member of our board of directors from April 2012 to March 2019. Dr. Miller was our founder and prior to serving as our Chief Operating Officer, he was our President and Chief Executive Officer from July 2016 to August 2018. From August 2008 to July 2016, Dr. Miller held several positions at PureTech Health plc, last serving as a Vice President, Venture Partner at PureTech Health plc, and in such capacity served as Chief Operating Officer of Tal Medical and the acting Chief Operating Officer of Entrega, Inc. He is currently a member of the board of directors of Entrega, Inc. Dr. Miller received a B.S. in Chemical Engineering from the University of Illinois with highest honors and completed his Ph.D. in Chemical Engineering at the Massachusetts Institute of Technology.

Stephen Brannan, M.D. has served as our Chief Medical Officer since March 2017. From July 2016 to February 2017, Dr. Brannan was an independent consultant. Prior to that, he served as the Vice President Clinical Research and Medical Affairs at Forum Pharmaceuticals Inc. from August 2015 to June 2016. From May 2011 to August 2015, Dr. Brannan served as the Therapeutic Head of Neuroscience at Takeda Pharmaceutical Company. Dr. Brannan has been active in the development of multiple important central nervous system treatments including Cymbalta, Exelon Patch, Trintellix, and VNS for Treatment Resistant Depression while holding various roles at Forum, Takeda, Novartis, Cyberonics, and Eli Lilly. Prior to joining the pharmaceutical industry, Dr. Brannan worked on the faculty at the University of Texas Health Science Center at San Antonio (UTHSCSA). Dr. Brannan trained in psychiatry at UTHSCSA, received his A.B. from Harvard College and holds a M.D. degree from the University of Texas Health Science Center at Dallas (Southwestern Medical School).

Troy Ignelzi has served as our Chief Financial Officer since March 2019. Prior to that, Mr. Ignelzi was the Chief Financial Officer of scPharmaceuticals Inc. from March 2016 to February 2019, and provided consulting services to scPharmaceuticals Inc. in February and March 2016. Mr. Ignelzi previously served as Chief Financial Officer and as a member of the executive leadership teams at Juventas Therapeutics Inc., a privately held biotechnology company, from October 2014 to February 2016. From October 2013 to October 2014, Mr. Ignelzi served as Senior Vice President—Operations and Business Development of Pharmalex GmbH. Prior to Pharmalex, Mr. Ignelzi was Vice President—Business Development at Esperion Therapeutics, Inc., a public pharmaceutical company, from January 2009 to September 2013. Mr. Ignelzi served as Vice President, Business Development & Strategic Planning at Insys Therapeutics, Inc. a specialty pharmaceutical company from February 2007 to February 2009. Previously, Mr. Ignelzi had served as a specialty senior sales representative at Eli Lilly, from February 2002 to August 2005. Mr. Ignelzi holds a B.S. in Accounting from Ferris State University.

Non-Employee Directors

Bharat Chowrira, J.D., Ph.D. has served as a member of our board of directors since March 2017. Dr. Chowrira has been the President and Chief of Business and Strategy at PureTech Health plc since March 2017. Prior to joining PureTech Health plc, Dr. Chowrira was the President of Synlogic, Inc., a biopharmaceutical company focused on developing synthetic microbiome-based therapeutics, from September 2015 to February 2017, where he oversaw and managed corporate and business development, alliance management, financial, human resources, intellectual property and legal operations. Prior to that, Dr. Chowrira was the Chief Operating Officer of Auspex Pharmaceuticals, Inc. from October 2013 to July 2015, which was acquired by Teva Pharmaceuticals Ltd. in the spring of 2015. Previously, he was President and Chief Executive Officer of Addex Therapeutics Ltd., a biotechnology company publicly-traded on the SIX Swiss Exchange, from August 2011 to July 2013.

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Prior to that Dr. Chowrira held various leadership and management positions at Nektar Therapeutics (COO), Merck & Co (VP), Sirna Therapeutics (GC; acquired by Merck &Co) and Ribozyme Pharmaceuticals (chief patent counsel). Dr. Chowrira is currently a member of the board of directors of Akili Interactive Labs, Vedanta Biosciences and Vor Biopharma. Dr. Chowrira received a J.D. from the University of Denver's Sturm College of Law, a Ph.D. in Molecular Biology from the University of Vermont College of Medicine, an M.S. in Molecular Biology from Illinois State University and a B.S. in Microbiology from the UAS, Bangalore, India. Our board of directors believes that Dr. Chowrira is qualified to serve on our board of directors due to his extensive management experience in the biotechnology sector.

Edmund Harrigan, M.D. has served as a member of our board of directors since March 2011. Dr. Harrigan served in a variety of roles at Pfizer Inc. from March 2003 to July 2015, most recently serving as Senior Vice President of Worldwide Safety and Regulatory. Dr. Harrigan's previous executive leadership roles at Pfizer included serving as Senior Vice President, Head of Worldwide Business Development, Senior Vice President, Head of Worldwide Regulatory Affairs and Quality Assurance, and Vice President, Head of Neuroscience and Ophthalmology. Before entering the pharmaceutical industry in 1990, Dr. Harrigan was a practicing neurologist for seven years. He currently serves on the Board of Directors of Acadia Pharmaceuticals, Inc. (NASDAQ: ACAD), Bellicum Pharmaceuticals, Inc. (NASDAQ: BLCM) and PhaseBio Pharmaceuticals, Inc. (NASDAQ: PHAS). Dr. Harrigan earned his B.A. degree in Chemistry from St. Anselm College and holds an M.D. from the University of Massachusetts at Worcester. Our board of directors believes that Dr. Harrigan is qualified to serve on our board of directors due to his scientific and business experience in the pharmaceutical and healthcare industries.

James Healy, M.D., Ph.D. has served on our board of directors since June 2019. Dr. Healy has been a General Partner of Sofinnova Investments (formerly Sofinnova Ventures), a biotech investment firm, since June 2000. Prior to June 2000, Dr. Healy held various positions at Sanderling Ventures, Bayer Healthcare Pharmaceuticals (as successor to Miles Laboratories) and ISTA Pharmaceuticals, Inc. Dr. Healy is currently on the board of directors of Ascendis Pharma A/S (NASDAQ: ASND), Coherus BioSciences, Inc. (NASDAQ: CHRS), Iterum Therapeutics, PLC (NASDAQ: ITRM), Natera, Inc. (NASDAQ: NTRA), NuCana PLC (NASDAQ: NCNA), ObsEva SA (NASDAQ: OBSV) and Y-mAbs Therapeutics, Inc. (NASDAQ: YMAB) and several private companies. Previously, he served as a board member of Amarin Corporation, Auris Medical Holding AG, Edge Therapeutics, Inc., Hyperion Therapeutics, Inc., InterMune, Inc., Anthera Pharmaceuticals, Inc., Durata Therapeutics, Inc., CoTherix, Inc., Movetis NV and several private companies. In 2011, Dr. Healy won the IBF Risk Innovator Award and was named as one of the industry's top leading Life Science investors in 2013 by Forbes Magazine. Dr. Healy received an M.D. and a Ph.D. in Immunology from Stanford University School of Medicine and holds a B.A. in Molecular Biology and a B.A. in Scandinavian Studies from the University of California, Berkeley. Our board of directors believes that Dr. Healy is qualified to serve on our board of directors due to his experience working with and serving on the boards of directors of life sciences companies and his experience working in the venture capital industry.

Jeffrey Jonas, M.D. has served as a member of our board of directors since October 2018. Dr. Jonas has been the Chief Executive Officer and President and a member of the Board of Directors of Sage Therapeutics, Inc. since August 2013. From November 2012 to August 2013, Dr. Jonas served as the President of the Regenerative Medicine Division of Shire plc, or Shire, and from July 2008 to November 2012 as Senior Vice President of Research and Development, Pharmaceuticals at Shire. From February 2007 to July 2008, Dr. Jonas served as the Executive Vice President of Ionis Pharmaceuticals, Inc., formerly known as ISIS Pharmaceuticals, Inc. and from January 2002 to January 2007 as Chief Medical Officer and Executive Vice President of Forest Laboratories, Inc. and from 1991 to 1996 in senior-level positions at Upjohn Laboratories. Dr. Jonas also founded AVAX Technologies, Inc. and SCEPTOR Industries, Inc., where he served as the Chief Executive Officer,

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President and a Director. Dr. Jonas received his B.A. from Amherst College and M.D. from Harvard Medical School. He completed a residency in psychiatry at Harvard Medical School, and he served as Chief Resident in psychopharmacology at McLean Hospital, Harvard Medical School. Our board of directors believes that Dr. Jonas is qualified to serve on our board of directors due to his more than 20 years of experience on both the scientific and business sides of the pharmaceutical and healthcare industries, particularly in the Central Nervous System (CNS) field.

Robert Nelsen has served as a member of our board of directors since August 2018. Mr. Nelsen co-founded ARCH Venture Partners in 1986 and currently serves as a Managing Director. Mr. Nelsen currently serves on boards of directors of Denali Therapeutics, Inc. (NASDAQ: DNLI) and Unity Biotechnology, Inc. (NASDAQ: UBX) and on the boards of a number of private companies. Mr. Nelsen served on the boards of Agios Pharmaceuticals Inc. (NASDAQ: AGIO) from 2007 to 2017, Fate Therapeutics, Inc. (NASDAQ: FATE) from 2007 to 2014, Syros Pharmaceuticals, Inc. (NASDAQ: SYRS) from 2012 to 2018, Sage Therapeutics, Inc. (NASDAQ: SAGE) from 2013 to 2016, Juno Therapeutics, Inc. (NASDAQ: JUNO) from 2013 to 2018, when it was acquired by Celgene Corporation, Bellerophon Therapeutics, Inc. (NASDAQ: BLPH) from 2014 to 2015, Sienna Biopharmaceuticals, Inc. (NASDAQ: SNNA) from 2015 to 2018 and Gossamer Bio, Inc. from 2017 to 2018, prior to its initial public offering. He previously served as a Trustee of the Fred Hutchinson Cancer Research Institute, the Institute for Systems Biology, and was a director of the National Venture Capital Association. Mr. Nelsen holds an M.B.A. from the University of Chicago and a B.S. from the University of Puget Sound with majors in Economics and Biology. Our board of directors believes that Mr. Nelsen is qualified to serve on our board of directors due to his venture capital experience in the biotechnology industry.

Atul Pande, M.D. has served on our board of directors since June 2019. Dr. Pande has served as Chief Medical Advisor of PureTech Health plc since February 2018, and previously served as its Chief Medical Officer since February 2017 and a Senior Advisor from July 2016 through February 2017. Dr. Pande has also served as President and Chief Executive Officer of Verity BioConsulting LLC, a drug development consulting firm since 2014. He previously served as Chief Medical Officer of Tal Medical, Inc., a clinical-stage medical device company, from December 2014 to December 2017. From 2007 to April 2014, Dr. Pande was Senior Vice President and Senior Advisor, Pharmaceutical R&D at GlaxoSmithKline plc, a pharmaceutical company. He has also held senior roles at Pfizer Inc., Parke-Davis/Warner-Lambert, a subsidiary of Pfizer Inc. and Lilly Research Laboratories, a division of Eli Lilly & Co., all of which are pharmaceutical companies. Dr. Pande is also a non-executive board member of Autifony Therapeutics Limited, a biotechnology company, and Axovant Sciences Ltd. (NASDAQ: AXGT) and serves on the Scientific Advisory Boards of Cennerv Pharma PTE LTD and Centrexion Corporation. Dr. Pande received his MBBS (Bachelor of Medicine, Bachelor of Surgery) and his M.D. from the University of Lucknow, India and completed his research fellowship training in psychiatry at the University of Michigan Medical School and his postgraduate specialty training and psychiatry residency program at Western University. Our board of directors believes that Dr. Pande is qualified to serve on our board of directors due to his significant medical background and extensive experience in the life science industry.

Heather Preston, M.D. has served as a member of our board of directors since March 2019. Dr. Preston has been the Managing Partner of Pivotal bioVenture Partners since July 2018, and previously she was a Firm Partner and Managing Director of TPG Biotech, a biotechnology venture capital firm, from May 2005 to July 2018. Prior to joining TPG Biotech, Dr. Preston was a medical device and biotechnology venture capital investor at JP Morgan Partners, LLC, and an Entrepreneur-in-Residence at New Enterprise Associates, a diversified venture capital firm. Before her investing career, she spent five years as a leader of the healthcare practice at Mckinsey & Co., advising large pharmaceutical and biotechnology companies on strategic issues. Dr. Preston holds a B.Sc.Hons degree in biochemistry from the University of London and an M.B.B.Chir degree in medicine

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from the University of Oxford. After leaving Oxford, Dr. Preston completed a post-doctoral fellowship in molecular biology at the Dana Farber Cancer Institute, Harvard University. Dr. Preston is trained in Internal Medicine at the Massachusetts General Hospital and then sub-specialized in Gastroenterology and Hepatology at U.C.S.F. She currently serves on the boards of directors of Otonomy, Inc., Oxford BioMedica plc and Entasis Therapeutics Holdings Inc., previously served on the board of directors of Alder Biopharmaceuticals Inc. and Albireo Pharma, Inc. and currently serves on the boards of directors of a number of private companies. Our board of directors believes that Dr. Preston is qualified to serve on our board of directors due to her experience working with and serving on the boards of directors of life sciences companies and her experience working in the venture capital industry.

Board Composition and Election of Directors

Board Composition

Our board of directors currently consists of eight members. Our amended and restated certificate of incorporation and bylaws provide that the authorized number of directors may be changed only by resolution of our board of directors. Our certificate of incorporation and bylaws also provide that our directors may be removed only for cause by the affirmative vote of the holders of at least 75% of our shares of capital stock present in person or by proxy and entitled to vote, and that any vacancy on our board of directors, including a vacancy resulting from an enlargement of our board of directors, may be filled only by vote of a majority of our directors then in office.

We have no formal policy regarding board diversity. Our priority in selection of board members is identification of members who will further the interests of our stockholders through his or her established record of professional accomplishment, the ability to contribute positively to the collaborative culture among board members, knowledge of our business and understanding of the competitive landscape.

Staggered Board

In accordance with the terms of our certificate of incorporation and bylaws, our board of directors is divided into three classes, Class I, Class II and Class III, with members of each class serving staggered three-year terms, as follows:

- the Class I directors are Bharat Chowrira, J.D., Ph.D. and Heather Preston, M.D., and their term will expire at the annual meeting of stockholders to be held in 2020;
- the Class II directors are Jeffrey Jonas, M.D., James Healy, M.D., Ph.D. and Robert Nelsen, and their term will expire at the annual meeting of stockholders to be held in 2021; and
- the Class III directors are Edmund Harrigan, M.D., Atul Pande, M.D. and Steven Paul, M.D., and their term will expire at the annual meeting of stockholders to be held in 2022.

Upon the expiration of the term of a class of directors, directors in that class will be eligible to be elected for a new three-year term at the annual meeting of stockholders in the year in which their term expires. Our amended and restated certificate of incorporation and amended and restated bylaws provide that the number of our directors shall be fixed from time to time by a resolution of the majority of our board of directors.

The division of our board of directors into three classes with staggered three-year terms may delay or prevent stockholder efforts to effect a change of our management or a change in control.

Director Independence

Our board of directors has determined that each of Drs. Chowrira, Healy, Harrigan, Pande and Preston and Mr. Nelson is an “independent director” as defined under applicable Nasdaq rules,

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including, in the case of the members of our audit committee, other than Dr. Chowrira, independence criteria set forth in Rule 10A-3 under the Securities Exchange Act of 1934, as amended, or the Exchange Act, and in the case of all the members of our compensation committee, the independence criteria set forth in Rule 10C-1 under the Exchange Act. In making such determination, our board of directors considered the relationships that each such non-employee 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 non-employee director. Dr. Paul is not an independent director under these rules because he is our President and Chief Executive Officer. Dr. Jonas is not an independent director under these rules because Dr. Paul serves on the compensation committee of Sage Therapeutics, Inc., where Dr. Jonas serves as the Chief Executive Officer.

There are no family relationships among any of our directors or executive officers.

Board Leadership Structure and Board's Role in Risk Oversight

Our board of directors is currently chaired by Steven Paul, M.D. Our corporate governance guidelines provide that, if the Chairman of the board of directors is a member of management or does not otherwise qualify as independent, the independent directors of the board may or may not elect a lead independent director. Our corporate governance guidelines further provide the flexibility for our board of directors to modify our leadership structure in the future, as it deems appropriate.

Risk is inherent with every business, and how well a business manages risk can ultimately determine its success. We face a number of risks, including risks relating to our financial condition, development and commercialization activities, operations, strategic direction and intellectual property as more fully discussed under "Risk Factors" in this prospectus. Management is responsible for the day-to-day management of risks we face, while our board of directors, as a whole and through its committees, has responsibility for the oversight of risk management. In its risk oversight role, our board of directors has the responsibility to satisfy itself that the risk management processes designed and implemented by management are adequate and functioning as designed.

The role of the board of directors in overseeing the management of our risks is conducted primarily through committees of the board of directors, as disclosed in the descriptions of each of the committees below and in the charters of each of the committees. The full board of directors (or the appropriate board committee in the case of risks that are under the purview of a particular committee) discusses with management our major risk exposures, their potential impact on us, and the steps we take to manage them. When a board committee is responsible for evaluating and overseeing the management of a particular risk or risks, the chairman of the relevant committee reports on the discussion to the full board of directors during the committee reports portion of the next board meeting. This enables the board of directors and its committees to coordinate the risk oversight role, particularly with respect to risk interrelationships.

Board Committees

Our board of directors has established an audit committee, a compensation committee and a nominating and corporate governance committee. Each of these committees operates under a charter that has been approved by our board of directors.

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Audit Committee

The members of our audit committee are Bharat Chowrira, J.D., Ph.D., James Healy, M.D., Ph.D. and Heather Preston, M.D., and Dr. Healy is the chair of the audit committee. Our audit committee's responsibilities include:

- appointing, approving the compensation of, and assessing the independence of our independent registered public accounting firm;
- pre-approving auditing and permissible non-audit services, and the terms of such services, to be provided by our independent registered public accounting firm;
- reviewing the overall audit plan with our independent registered public accounting firm and members of management responsible for preparing our financial statements;
- reviewing and discussing with management and our independent registered public accounting firm our annual and quarterly financial statements and related disclosures as well as critical accounting policies and practices used by us;
- coordinating the oversight and reviewing the adequacy of our internal control over financial reporting;
- establishing policies and procedures for the receipt and retention of accounting-related complaints and concerns;
- recommending based upon the audit committee's review and discussions with management and our independent registered public accounting firm whether our audited financial statements shall be included in our Annual Report on Form 10-K;
- monitoring the integrity of our financial statements and our compliance with legal and regulatory requirements as they relate to our financial statements and accounting matters;
- preparing the audit committee report required by SEC rules to be included in our annual proxy statement;
- reviewing all related person transactions for potential conflict of interest situations and approving all such transactions; and
- reviewing quarterly earnings releases.

All audit and non-audit services, other than *de minimis* non-audit services, to be provided to us by our independent registered public accounting firm must be approved in advance by our audit committee.

Our board of directors has determined that Dr. Healy is an "audit committee financial expert" as defined in applicable SEC rules and that each of the members of our audit committee possesses the financial sophistication required for audit committee members under Nasdaq rules. 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

The members of our compensation committee are Edmund Harrigan, M.D., Robert Nelsen and Atul Pande, M.D., and Dr. Harrigan is the chair of the compensation committee. Our compensation committee's responsibilities include:

- annually reviewing and approving corporate goals and objectives relevant to the compensation of our Chief Executive Officer;

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- evaluating the performance of our Chief Executive Officer in light of such corporate goals and objectives and determining the compensation of our Chief Executive Officer;
- reviewing and approving the compensation of our other executive officers;
- reviewing and establishing our overall management compensation, philosophy and policy;
- overseeing and administering our compensation and similar plans;
- evaluating and assessing potential and current compensation advisors in accordance with the independence standards identified in the applicable Nasdaq rules;
- retaining and approving the compensation of any compensation advisors;
- reviewing and making recommendations to our board of directors about our policies and procedures for the grant of equity-based awards;
- evaluating and making recommendations to the board of directors about director compensation;
- preparing the compensation committee report required by SEC rules, if and when required, to be included in our annual proxy statement; and
- reviewing and approving the retention or termination of any consulting firm or outside advisor to assist in the evaluation of compensation matters.

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

The members of our nominating and corporate governance committee are Bharat Chowrira, J.D., Ph.D., Jeffrey Jonas, M.D. and Heather Preston, M.D., and Dr. Preston is the chair of the nominating and corporate governance committee. Our nominating and corporate governance committee's responsibilities include:

- developing and recommending to the board of directors criteria for board and committee membership;
- establishing procedures for identifying and evaluating board of director candidates, including nominees recommended by stockholders;
- reviewing the size and composition of the board of directors to ensure that it is composed of members containing the appropriate skills and expertise to advise us;
- identifying individuals qualified to become members of the board of directors;
- recommending to the board of directors the persons to be nominated for election as directors and to each of the board's committees;
- developing and recommending to the board of directors a code of business conduct and ethics and a set of corporate governance guidelines; and
- overseeing the evaluation of our board of directors and management.

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.

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Compensation Committee Interlocks and Insider Participation

Dr. Paul currently serves as a member of the board of directors and a member of the compensation committee of Sage Therapeutics, Inc. Jeffrey Jonas, one of our directors, serves as the Chief Executive Officer. None of our other executive officers serves, or in the past year has served, as a member of the board of directors or compensation committee, or other committee serving an equivalent function, of any other entity that has one or more of its executive officers serving as a member of our board of directors or our compensation committee. None of the members of our compensation committee is, or has ever been, an officer or employee of our company.

Code of Business Conduct and Ethics

We maintain a written code of business conduct and ethics that applies to our directors, officers and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. The code of business conduct and ethics is available on our website at www.karunatx.com. If we make any substantive amendments to, or grant any waivers from, the code of business conduct and ethics for any officer or director, we will disclose the nature of such amendment or waiver on our website or in a current report on Form 8-K.

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EXECUTIVE COMPENSATION

This section describes the material elements of compensation awarded to, earned by or paid to each of our named executive officers for the year ended December 31, 2018. We are an "emerging growth company," within the meaning of the JOBS Act, and have elected to comply with the reduced compensation disclosure requirements available to emerging growth companies under the JOBS Act. Our named executive officers for 2018 were Steven Paul, Andrew Miller and Stephen Brannan.

Summary Compensation Table

The following table sets forth information regarding compensation awarded to, earned by or paid to our named executive officers during 2018.

Name and Principal Position	Year	Salary ($)	Option Awards ($)(1)	Non-Equity Incentive Compensation ($)(2)	All Other Compensation ($)(3)	Total ($)
Steven Paul, M.D.(4) *Chief Executive Officer, President and Chairman*	2018	204,567	660,811	102,284	6,137	973,799
Andrew Miller, Ph.D. *Chief Operating Officer*	2018	262,485	112,527	191,870(5)	8,250	575,132
Stephen Brannan, M.D. *Chief Medical Officer*	2018	316,510	87,909	94,953	8,250	507,622

(1) The amounts reported in the "Option Awards" column reflects the aggregate grant date fair value of share-based compensation awarded during the year computed in accordance with the provisions of Financial Accounting Standards Board Accounting Standards Codification, or ASC, Topic 718. See Note 2 to our financial statements appearing at the end of this prospectus regarding assumptions underlying the valuation of equity awards.

(2) Amounts reported reflect the annual cash incentive bonus paid based upon achievement of certain corporate performance objectives described below under "Annual Cash Incentive Bonus."

(3) Amounts reported reflect our matching contributions to 401(k) plans.

(4) Dr. Paul commenced employment with us in 2018 and, accordingly, his base salary and non-equity incentive compensation amounts have been prorated to reflect his partial year of service. Dr. Paul received two option awards in April 2018 as compensation for his services as our director, and a third option award in August 2018 in connection with his election as our Chief Executive Officer and President. These awards are described in greater detail below under "Outstanding Equity Awards at 2018 Year End."

(5) Amount includes a bonus of $100,000 in connection with the closing of our Series A financing.

Narrative to Summary Compensation Table

Base Salary. Each named executive officer's base salary is a fixed component of annual compensation for performing specific duties and functions, and has been established by our board of directors taking into account each individual's roles, responsibilities, skills and expertise. In 2018, we paid annual base salaries of $375,000, $262,485 and $316,510 to each of Drs. Paul, Miller and Brannan, respectively.

Annual Cash Incentive Bonus. Our annual bonus program is intended to reward our named executive officers for meeting individual and/or corporate performance goals for a fiscal year. In the

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first quarter of 2018, our Board of Directors set our corporate performance goals for 2018, which goals related to product development, funding and corporate development, and other general corporate goals. For 2018, the target bonus for Dr. Paul was 50 percent of his base salary, for Dr. Miller 35 percent of his base salary and for Dr. Brannan, 30 percent of his base salary. In March 2019, our Board of Directors determined that the Company had achieved its corporate goals at 100%.

Long-Term Equity Incentive. Although we do not have a formal policy with respect to the grant of equity incentive awards to our named executive officers, we believe that equity grants provide our named executive officers with a strong link to our long-term performance, create an ownership culture and help to align the interests of our named executive officers and our stockholders. In addition, we believe that equity grants with a time-based vesting feature promote executive retention because this feature incents our named executive officers to remain in our employment during the vesting period. We also believe that equity grants with performance-based vesting incent our executives to achieve specified performance goals. Our board of directors intends to periodically review the equity incentive compensation of our named executive officers and from time to time may grant equity incentive awards to them in the form of stock options.

In April 2018, the board of directors granted Dr. Paul an option to purchase 71,628 shares of our common stock and a second option to purchase 64,466 shares of our common stock, in each case, in connection with his services as our director. In August 2018, in connection with his election as our President and Chief Executive Officer the board of directors granted Dr. Paul an option to purchase 784,555 shares of our common stock. Also in August 2018, our board of directors granted Dr. Miller an option to purchase 107,142 shares of our common stock in connection with his election as our Chief Operating Officer. The board of directors granted Dr. Brannan an option to purchase 63,589 shares of our common stock in September 2018.

Outstanding Equity Awards at 2018 Year End

The following table sets forth information regarding outstanding equity awards held by our named executive officers as of December 31, 2018:

Name	Number of Securities Underlying Unexercised Options Exercisable (#)	Number of Securities Underlying Unexercised Options Unexercisable (#)	Option Exercise Price ($/share)	Option Expiration Date
Steven Paul, M.D.	292,207(1)	-	0.11	3/3/2021
	11,937(2)	59,691	7.04	4/29/2028
	-(3)	64,466	7.04	4/29/2028
	156,910(4)	627,645	7.27	8/8/2028
Andrew Miller, Ph.D.	17,857(5)	-	2.92	5/30/2026
	100,445(6)	60,269	2.92	10/11/2026
	14,285(7)	92,857	7.27	8/8/2028
Stephen Brannan, M.D.	33,481(8)	55,804	5.45	6/1/2027
	-(9)	63,589	7.27	8/8/2028

(1) This option was granted on March 4, 2011 and vested as to 20% of the shares on the date of grant, with an additional 20% vesting on each anniversary thereof.

(2) This option was granted on April 30, 2018 and vests as to 1/6th of the shares underlying the option award on each six month anniversary of February 28, 2018. Pursuant to Dr. Paul's employment agreement, this option shall accelerate in full in the event Dr. Paul's employment is terminated in certain circumstances within 12 months following a change in control.

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(3) This option was granted on April 30, 2018 and, while no shares were vested as of December 31, 2018, the award vested in full upon the closing of our Series B financing in March 2019.
(4) This option was granted on August 9, 2018 and vests as to 1/30th of the shares underlying the option award on each one month anniversary of June 15, 2018. An additional 274,594 shares vested upon closing of our Series B financing in March 2019, and an additional 50% of those shares that remain unvested upon closing of our initial public offering vested upon closing of the offering. Pursuant to Dr. Paul's employment agreement, this option shall accelerate in full in the event Dr. Paul's employment is terminated in certain circumstances within 12 months following a change in control.
(5) This option was granted on May 31, 2016 and was vested in full on the date of grant.
(6) This option was granted on October 12, 2016 and vested as to 1/16th of the shares underlying the option award on July 18, 2016 and as to an additional 1/16th of the shares on each three month anniversary thereof. Following a change in control, 50% of the then-unvested shares underlying this option shall accelerate and vest in full as of such date.
(7) This option was granted on August 9, 2018 and vests as to 1/30th of the shares underlying the option award on each one month anniversary of August 15, 2018. Pursuant to Dr. Miller's offer letter, in the event Dr. Miller's employment terminates in certain circumstances following a change in control, 50% of the then-unvested shares underlying this option shall accelerate and vest in full as of such date.
(8) This option was granted on June 2, 2017 and vested as to 25% of the shares on March 1, 2018 and as to an additional 12.5% on each six month anniversary thereof. Pursuant to Dr. Brannan's offer letter, in the event Dr. Brannan's employment terminates in certain circumstances following a change in control, 50% of the then-unvested shares underlying this option shall accelerate and vest in full as of such date.
(9) This option was granted on August 9, 2018 and vests as to 12.5% on each six month anniversary of August 8, 2018.

Employment Arrangements with our Named Executive Officers

In connection with our initial public offering in July 2019, we entered into new employment agreements with each of our named executive officers, which became effective upon closing of our initial public offering. The key terms of the employment agreements are described below.

Steven Paul, M.D.

Under the amended and restated employment agreement, Dr. Paul's base salary was initially set at $500,000, which will be reviewed annually by our compensation committee, and he will be eligible to earn annual incentive compensation with a target amount equal to 50% of his base salary. Dr. Paul is also eligible to participate in the employee benefit plans available to our employees, including our stock option plan, subject to the terms of those plans.

Dr. Paul's employment agreement provides that, in the event that his employment is terminated by us without "cause" (as defined in his employment agreement) or Dr. Paul resigns for "good reason" (as defined in his employment agreement), subject to the execution and effectiveness of a separation agreement, including a general release of claims in our favor, he will be entitled to receive (i) an amount equal to 12 months of his base salary, payable in substantially equal installments over 12 months following his termination, (ii) his pro-rated target bonus, (iii) acceleration of vesting of all time-based stock options and other stock-based awards held by Dr. Paul that would have vested in the 12 months following his termination, and (iv) if Dr. Paul elects continuation of health coverage under COBRA, continued health coverage at the active employees' rate until the earlier of 12 months following his termination, the date he becomes eligible for group medical benefits with another employer or the end of his COBRA health continuation period. In lieu of the payments and benefits

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described in the preceding sentence, in the event that Dr. Paul's employment is terminated by us without cause or Dr. Paul resigns for good reason, in either case within 12 months following a "change in control" (as defined in his employment agreement), subject to the execution and effectiveness of a separation agreement, including a general release of claims in our favor, he will be entitled to receive (i) an amount equal to 18 months of his base salary, plus 150% of his annual target bonus, (ii) full acceleration of vesting of all time-based stock options and other stock-based awards held by Dr. Paul on the termination date, and (iii) if Dr. Paul elects continuation of health coverage under COBRA, continued health coverage at the active employees' rate until the earlier of 18 months following his termination, the date he becomes eligible for group medical benefits with another employer or the end of Dr. Paul's COBRA health continuation period.

The payments and benefits provided to Dr. Paul under his employment agreement in connection with a change in control may not be eligible for a federal income tax deduction for the Company pursuant to Section 280G of the Code. These payments and benefits also may be subject to an excise tax under Section 4999 of the Code. If the payments or benefits payable to Dr. Paul in connection with a change in control would be subject to the excise tax on golden parachutes imposed under Section 4999 of the Code, then those payments or benefits will be reduced if such reduction would result in a higher net after-tax benefit to such officer.

In addition, Dr. Paul has executed an Employee Invention and Non-Disclosure Agreement and a Non-Competition and Non-Solicitation Agreement which contain certain restrictive covenants, including, among other things, non-competition and non-solicitation provisions that apply during the term of Dr. Paul's employment and for 12 months thereafter.

Andrew Miller, Ph.D.

Under the amended and restated employment agreement, Dr. Miller's base salary was initially set at $400,000, which will be reviewed annually by our compensation committee, and he will be eligible to earn annual incentive compensation with a target amount equal to 40% of his base salary. Dr. Miller is also eligible to participate in the employee benefit plans available to our employees, including our stock option plan, subject to the terms of those plans.

Dr. Miller's employment agreement provides that, in the event that his employment is terminated by us without "cause" (as defined in his employment agreement) or Dr. Miller resigns for "good reason" (as defined in his employment agreement), subject to the execution and effectiveness of a separation agreement, including a general release of claims in our favor, he will be entitled to receive (i) an amount equal to nine months of his base salary, payable in substantially equal installments over nine months following his termination, (ii) his pro-rated target bonus, and (iii) if Dr. Miller elects continuation of health coverage under COBRA, continued health coverage at the active employees' rate until the earlier of nine months following his termination, the date he becomes eligible for group medical benefits with another employer or the end of Dr. Miller's COBRA health continuation period. In lieu of the payments and benefits described in the preceding sentence, in the event that Dr. Miller's employment is terminated by us without cause or Dr. Miller resigns for good reason, in either case within 12 months following a "change in control" (as defined in his employment agreement), subject to the execution and effectiveness of a separation agreement, including a general release of claims in our favor, he will be entitled to receive (i) an amount equal to 12 months of his base salary, plus his annual target bonus, (ii) full acceleration of vesting of all time-based stock options and other stock-based awards held by Dr. Miller on the termination date, and (iii) if Dr. Miller elects continuation of health coverage under COBRA, continued health coverage at the active employees' rate until the earlier of 12 months following his termination, the date he becomes eligible for group medical benefits with another employer or the end of Dr. Miller's COBRA health continuation period.

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The payments and benefits provided to Dr. Miller under his employment agreement in connection with a change in control may not be eligible for a federal income tax deduction for the Company pursuant to Section 280G of the Code. These payments and benefits also may be subject to an excise tax under Section 4999 of the Code. If the payments or benefits payable to Dr. Miller in connection with a change in control would be subject to the excise tax on golden parachutes imposed under Section 4999 of the Code, then those payments or benefits will be reduced if such reduction would result in a higher net after-tax benefit to such officer.

In addition, Dr. Miller has executed an Employee Invention and Non-Disclosure Agreement and a Non-Competition and Non-Solicitation Agreement which contain certain restrictive covenants, including, among other things, non-competition and non-solicitation provisions that apply during the term of Dr. Miller's employment and for 12 months thereafter.

Stephen Brannan, M.D.

Under the amended and restated employment agreement, Dr. Brannan's base salary was initially set at $400,000, which will be reviewed annually by our compensation committee, and he will be eligible to earn annual incentive compensation with a target amount equal to 35% of his base salary. Dr. Brannan is also eligible to participate in the employee benefit plans available to our employees, including our stock option plan, subject to the terms of those plans.

Dr. Brannan's employment agreement provides that, in the event that his employment is terminated by us without "cause" (as defined in his employment agreement) or Dr. Brannan resigns for "good reason" (as defined in his employment agreement), subject to the execution and effectiveness of a separation agreement, including a general release of claims in our favor, he will be entitled to receive (i) an amount equal to nine months of his base salary, payable in substantially equal installments over nine months following his termination, (ii) his pro-rated target bonus, and (iii) if Dr. Brannan elects continuation of health coverage under COBRA, continued health coverage at the active employees' rate until the earlier of nine months following his termination, the date he becomes eligible for group medical benefits with another employer or the end of Dr. Brannan's COBRA health continuation period. In lieu of the payments and benefits described in the preceding sentence, in the event that Dr. Brannan's employment is terminated by us without cause or Dr. Brannan resigns for good reason, in either case within 12 months following a "change in control" (as defined in his employment agreement), subject to the execution and effectiveness of a separation agreement, including a general release of claims in our favor, he will be entitled to receive (i) an amount equal to 12 months of his base salary, plus his annual target bonus, (ii) full acceleration of vesting of all time-based stock options and other stock-based awards held by Dr. Brannan on the termination date, and (iii) if Dr. Brannan elects continuation of health coverage under COBRA, continued health coverage at the active employees' rate until the earlier of 12 months following his termination, the date he becomes eligible for group medical benefits with another employer or the end of Dr. Brannan's COBRA health continuation period.

The payments and benefits provided to Dr. Brannan under his employment agreement in connection with a change in control may not be eligible for a federal income tax deduction for the Company pursuant to Section 280G of the Code. These payments and benefits also may be subject to an excise tax under Section 4999 of the Code. If the payments or benefits payable to Dr. Brannan in connection with a change in control would be subject to the excise tax on golden parachutes imposed under Section 4999 of the Code, then those payments or benefits will be reduced if such reduction would result in a higher net after-tax benefit to such officer.

In addition, Dr. Brannan has executed an Employee Invention and Non-Disclosure Agreement and a Non-Competition and Non-Solicitation Agreement which contain certain restrictive covenants,

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including, among other things, non-competition and non-solicitation provisions that apply during the term of Dr. Brannan's employment and for 12 months thereafter.

Prior Employment Arrangements With Our Named Executive Officers

The key terms of the employment agreements that we were party to prior to our initial public offering are described below. These agreement were replaced with the employment agreements described above and are no longer in effect.

Steven Paul, M.D.

In August 2018, we entered into an employment agreement with Dr. Paul. The employment agreement establishes Dr. Paul's title, his base annual salary of $475,000, his eligibility for an annual bonus, and his eligibility for benefits made available to employees generally and also provides for certain benefits upon termination of his employment under specified conditions. Our board of directors has determined that Dr. Paul is eligible to receive an annual bonus of up to 50% of his base salary.

Under the terms of his employment agreement, if Dr. Paul's employment is terminated by us without "cause" or by Dr. Paul for "good reason," each as defined in his employment agreement, and subject to Dr. Paul's execution of a general release of potential claims against us, we have agreed to pay Dr. Paul an amount equal to twelve months of his then-current base salary and a pro-rated portion of his annual performance bonus for the calendar year in which his employment was terminated. Dr. Paul's employment agreement further provides that upon such termination, all outstanding equity awards held by Dr. Paul which would have vested in the twelve month period following his termination shall immediately accelerate and become fully exercisable as of the date of termination.

In the event that Dr. Paul's employment is terminated by us without cause or by Dr. Paul for good reason within twelve months following a "change in control," as defined in Dr. Paul's employment agreement, and subject to Dr. Paul's execution of a general release of potential claims against us, then in lieu of the benefits described in the prior paragraph, Dr. Paul shall be entitled to a lump sum in cash in an amount equal to 1.5 times his then-current base salary plus his target annual performance bonus for the calendar year in which his employment was terminated. Additionally, upon such termination, all outstanding equity awards held by Dr. Paul shall accelerate in full.

Dr. Paul's employment agreement also provides that upon closing of any equity financing (including securities convertible into equity), up to and including this offering (and the exercise of any over-allotment option), Dr. Paul shall receive an additional stock option such that Dr. Paul's fully diluted share ownership will not be less than 8.5% after giving effect to such financing. In the event that we terminate Dr. Paul's employment without cause or Dr. Paul terminates his employment for good reason within three months of the closing of this offering, Dr. Paul's employment agreement requires us to grant to Dr. Paul an additional option such that Dr. Paul's fully diluted share ownership will not be less than 8.5% after giving effect to this offering. Any options granted to Dr. Paul in connection with this offering will have an exercise price equal to the public offering price and a vesting commencement date of June 15, 2018. The options will vest ratably over 30 months from the vesting commencement date. Dr. Paul's right to maintain a fully diluted share ownership of not less than 8.5% will terminate immediately following this offering.

Dr. Paul also entered into an employee invention and non-disclosure agreement and a non-competition and non-solicitation agreement with us in August 2018 which provide that he will (1) not compete with us during his employment and for a period of one year after the termination of his employment, (2) not solicit our employees, independent contractors or customers during his employment and for a period of one year after the termination of his employment, (3) protect our

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confidential and proprietary information and (4) assign to us related intellectual property developed during the course of his employment.

Andrew Miller, Ph.D.

In August 2018, we entered into an offer letter with Dr. Miller. The offer letter establishes Dr. Miller's title, his base salary, his eligibility for an annual bonus, and his eligibility for benefits made available to employees generally and also provides for certain benefits upon termination of his employment under specified conditions. Our board of directors has determined that Dr. Miller is eligible to receive an annual bonus of up to 35% of his base salary. Dr. Miller's offer letter also provided that Dr. Miller would receive an additional bonus of $100,000 upon closing of a subsequent equity financing, which Dr. Miller earned upon completion of our Series A financing in August 2018 and our Series B financing in March 2019.

Under the terms of his offer letter, if Dr. Miller's employment is terminated by us without "cause" or by Dr. Miller for "good reason," each as defined in his offer letter, and subject to Dr. Miller's execution of a general release of potential claims against us, we have agreed to pay Dr. Miller an amount equal to six months of his then-current base salary and a pro-rated portion of his annual performance bonus for the calendar year in which his employment was terminated.

In the event that Dr. Miller's employment is terminated by us without cause or by Dr. Miller for good reason, following a "change in control," as defined in Dr. Miller's offer letter, and subject to Dr. Miller's execution of a general release of potential claims against us, then upon such termination, 50% of the shares underlying the option to purchase 107,142 shares of our common stock granted to Dr. Miller on August 9, 2018 that remain unvested as of his termination date shall become fully vested and exercisable as of such date.

Dr. Miller also entered into an employee invention and non-disclosure agreement and a non-competition and non-solicitation agreement with us in August 2018 which provide that he will (1) not compete with us during his employment and for a period of one year after the termination of his employment, (2) not solicit our employees, independent contractors or customers during his employment and for a period of one year after the termination of his employment, (3) protect our confidential and proprietary information and (4) assign to us related intellectual property developed during the course of his employment.

Stephen Brannan, M.D.

In February 2017, we entered into an offer letter with Dr. Brannan. The offer letter establishes Dr. Brannan's title, his base salary, his eligibility for an annual bonus, and his eligibility for benefits made available to employees generally. Our board of directors has determined that Dr. Brannan is eligible to receive an annual bonus of up to 30% of his base salary.

Under the terms of his offer letter, if Dr. Brannan's employment is terminated by us without "cause" or by Dr. Brannan for "good reason," each as defined in his offer letter, and subject to Dr. Brannan's execution of a general release of potential claims against us, we have agreed to pay Dr. Brannan an amount equal to four months of his then-current base salary.

In the event that Dr. Brannan's employment is terminated by us without cause or by Dr. Brannan for good reason following a "change in control," as defined in Dr. Brannan's offer letter, and subject to Dr. Brannan's execution of a general release of potential claims against us, then upon such termination, 50% of the shares underlying the option to purchase 89,285 shares of our common stock granted to Dr. Brannan on June 2, 2017 that remain unvested as of his termination date shall become fully vested and exercisable as of such date.

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Dr. Brannan also entered into an employee invention and non-disclosure agreement and a non-competition and non-solicitation agreement with us in February 2017 which provide that he will (1) not compete with us during his employment and for a period of one year after the termination of his employment, (2) not solicit our employees, independent contractors or customers during his employment and for a period of one year after the termination of his employment, (3) protect our confidential and proprietary information and (4) assign to us related intellectual property developed during the course of his employment.

Stock Option and Other Compensation Plans

The three equity incentive plans described in this section are our 2009 stock incentive plan, as amended, or the 2009 Plan, our 2019 Stock Option and Incentive Plan, or the 2019 Plan, and our 2019 Employee Stock Purchase Plan, or the ESPP. Prior to our initial public offering in June 2019, we granted awards to eligible participants under the 2009 Plan. Following our initial public offering, we grant awards to eligible participants only under the 2019 Plan.

2009 Stock Incentive Plan

The 2009 Plan was adopted by our board of directors and approved by our stockholders in July 2009 and amended by our board and stockholders in March 2011, July 2018 and March 2019. The 2009 Plan provides for the grant of incentive stock options, nonqualified stock options, restricted stock awards, restricted stock units, stock appreciation rights and other stock-based awards. Our employees, officers, directors, consultants and advisors are eligible to receive awards under the 2009 Plan; however, incentive stock options may only be granted to our employees. Our board of directors, or a committee appointed by our board, administers the 2009 Plan and, subject to any limitations set forth in the 2009 Plan, will select the recipients of awards and determine:

- the number of shares of common stock covered by options and the dates upon which those options become exercisable;
- the type of options to be granted;
- the exercise prices of options;
- the duration of options; and
- the number of shares of common stock subject to any restricted stock or other stock-based awards and the terms and conditions of those awards, including the issue price, conditions for repurchase or forfeiture and repurchase price.

If our board of directors delegates authority to an executive officer to grant awards under the 2009 Plan, the executive officer has the power to make awards to employees and officers, except executive officers. Our board of directors will fix the terms of the awards to be granted by such executive officer, including the exercise price of such awards, and the maximum number of shares subject to awards that such executive officer may make.

The 2009 Plan provides that a maximum of 3,911,138 shares of our common stock are authorized for issuance under the plan. Our board of directors may amend, suspend, or terminate the 2009 Plan at any time.

Upon the occurrence of any stock split, reverse stock split, stock dividend, recapitalization, combination of shares, reclassification of shares, spinoff, or other similar change in capitalization or event, or any dividend or distribution to holders of our common stock other than an ordinary cash

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dividend, under the terms of the 2009 Plan, we are required to equitably adjust (or make substitute awards, if applicable), in the manner determined by our board of directors:

- the number and class of securities available under the 2009 plan;
- the number and class of securities and exercise price per share of each outstanding option;
- the share and per-share provisions and the measurement price of each outstanding stock appreciation right;
- the number of shares subject to and the repurchase price per share subject to each outstanding restricted stock award; and
- the share and per-share-related provisions and the purchase price, if any, of each outstanding other stock-based award.

Upon the occurrence of a merger or consolidation of our company with or into another entity as a result of which all of our common stock is converted into or exchanged for the right to receive cash, securities, or other property or is cancelled; any transfer or disposition of all of our common stock for cash, securities, or other property pursuant to a share exchange or other transaction; or a liquidation or dissolution of our company, our board of directors may, on such terms as our board of directors determines (except to the extent specifically provided otherwise in an applicable award agreement or other agreement between us and the plan participant), take any one or more of the following actions pursuant to the 2009 Plan, as to some or all outstanding awards, other than restricted stock awards:

- provide that awards shall be assumed, or substantially equivalent awards shall be substituted, by the acquiring or succeeding corporation (or an affiliate thereof);
- upon written notice to a plan participant, provide that the participant's unexercised awards will terminate immediately prior to the consummation of such transaction unless exercised by the participant (to the extent then exercisable) within a specified period;
- provide that outstanding awards shall become exercisable, realizable or deliverable, or restrictions applicable to an award shall lapse, in whole or in part, prior to or upon such transaction;
- in the event of a transaction under the terms of which holders of common stock will receive upon consummation thereof a cash payment for each share surrendered in the transaction, make or provide for a cash payment to a plan participant;
- provide that, in connection with a liquidation of dissolution of the company, awards shall convert into the right to receive liquidation proceeds; or
- any combination of the foregoing.

Our board of directors is not obligated under the 2009 Plan to treat all awards, all awards held by a participant, or all awards of the same type, identically.

Upon the occurrence of any corporate transaction described above, other than our liquidation or dissolution, our repurchase and other rights under each outstanding restricted stock award will continue for the benefit of our successor and will, unless our board of directors determines otherwise, apply to the cash, securities, or other property which our common stock was converted into or exchanged for in the transaction in the same manner and to the same extent as they applied to the common stock subject to the restricted stock award; provided, however, that the board may provide termination or deemed satisfaction of such repurchase or other rights under the restricted stock award agreement, either initially or by amendment, or provide for forfeiture of such restricted stock if issued at no cost. Upon our liquidation or dissolution, except to the extent specifically provided to the contrary in

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the restricted stock award agreement or any other agreement between the plan participant and us, all restrictions and conditions on all restricted stock awards then outstanding will automatically be deemed terminated or satisfied.

Our board of directors, in its sole discretion, may accelerate the exercisability of any option or time at which any restrictions shall lapse or be removed from any restricted stock award, as the case may be.

2019 Stock Option and Incentive Plan

Our 2019 Stock Option and Incentive Plan, or our 2019 Plan, was adopted by our board of directors in May 2019, and approved by our stockholders in June 2019. Our 2019 Plan replaced our 2009 Plan as our board of directors has determined not to make additional awards under that plan following the consummation of our initial public offering. Our 2019 Plan allows the compensation committee to make equity-based incentive awards to our officers, employees, directors and other key persons (including consultants).

We initially reserved 1,709,832 shares of our common stock, or the Initial Limit, for the issuance of awards under our 2019 Plan, plus the shares of common stock remaining available for issuance under our 2009 Plan. This limit is subject to adjustment in the event of a stock split, stock dividend or other change in our capitalization. Our 2019 Plan provides that the number of shares reserved and available for issuance thereunder will automatically increase on January 1, 2019 and each January 1 thereafter by 4% of the number of shares of common stock outstanding on the immediately preceding December 31 or such lesser number of shares determined by the compensation committee, or the Annual Increase.

The shares we issue under our 2019 Plan will be authorized but unissued shares or shares that we reacquire. The shares of common stock underlying any awards that are forfeited, cancelled, held back upon exercise or settlement of an award to satisfy the exercise price or tax withholding, reacquired by us prior to vesting, satisfied without the issuance of stock, expire or are otherwise terminated (other than by exercise) under our 2019 Plan and our 2014 Plan will be added back to the shares of common stock available for issuance under our 2019 Plan.

The maximum number of shares that may be issued as incentive stock options may not exceed the Initial Limit, cumulatively increased on January 1, 2020 and on each January 1 thereafter by the lesser of the Annual Increase, or 854,916 shares.

Our 2019 Plan is administered by our compensation committee. Our compensation committee has full power to select, from among the individuals eligible for awards, the individuals to whom awards will be granted, to make any combination of awards to participants, and to determine the specific terms and conditions of each award, subject to the provisions of our 2019 Plan. Persons eligible to participate in our 2019 Plan will be those full or part-time officers, employees, non-employee directors, and other key persons (including consultants) as selected from time to time by our compensation committee in its discretion.

Our 2019 Plan permits the granting of both options to purchase common stock intended to qualify as incentive stock options under Section 422 of the U.S. Internal Revenue Code of 1986, as amended, or the Code, and options that do not so qualify. The option exercise price of each option will be determined by our compensation committee but may not be less than 100% of the fair market value of our common stock on the date of grant. The term of each option will be fixed by our compensation committee and may not exceed ten years from the date of grant. Our compensation committee will determine at what time or times each option may be exercised.

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Our compensation committee may award stock appreciation rights subject to such conditions and restrictions as it may determine. Stock appreciation rights entitle the recipient to shares of common stock equal to the value of the appreciation in our stock price over the exercise price. The exercise price may not be less than 100% of the fair market value of our common stock on the date of grant. The term of each stock appreciation right will be fixed by our compensation committee and may not exceed ten years from the date of grant. Our compensation committee will determine at what time or times each stock appreciation right may be exercised.

Our compensation committee may award restricted shares of common stock and restricted stock units to participants subject to such conditions and restrictions as it may determine. These conditions and restrictions may include the achievement of certain performance goals and/or continued employment with us through a specified vesting period. Our compensation committee may also grant shares of common stock that are free from any restrictions under our 2019 Plan. Unrestricted stock may be granted to participants in recognition of past services or for other valid consideration and may be issued in lieu of cash compensation due to such participant.

Our compensation committee may grant performance share awards to participants that entitle the recipient to receive awards of common stock upon the achievement of certain performance goals and such other conditions as our compensation committee may determine. Our compensation committee may grant dividend equivalent rights to participants that entitle the recipient to receive credits for dividends that would be paid if the recipient had held a specified number of shares of common stock.

Our compensation committee may grant cash bonuses under our 2019 Plan to participants, subject to the achievement of certain performance goals.

Our 2019 Plan provides that upon the effectiveness of a “sale event,” as defined in our 2019 Plan, an acquirer or successor entity may assume, continue or substitute outstanding awards under our 2019 Plan. To the extent that awards granted under our 2019 Plan are not assumed or continued or substituted by the successor entity, except as may be otherwise provided in the relevant award certificate, all awards with time-based vesting, conditions or restrictions shall become fully vested and nonforfeitable as of the effective time of the sale event, and all awards with conditions and restrictions relating to the attainment of performance goals may become vested and nonforfeitable in connection with a sale event in the compensation committee’s discretion or to the extent specified in the relevant award certificate. Upon the effective time of the sale event, all outstanding awards granted under our 2019 Plan shall terminate. In the event of such termination, individuals holding options and stock appreciation rights will be permitted to exercise such options and stock appreciation rights (to the extent exercisable) within a specified period of time prior to the sale event. In addition, in connection with the termination of our 2019 Plan upon a sale event, we may make or provide for a payment, in cash or in kind, to participants holding vested and exercisable options and stock appreciation rights equal to the difference between the per share cash consideration payable to stockholders in the sale event and the exercise price of the options or stock appreciation rights and we may make or provide for a payment, in cash or in kind, to participants holding other vested awards.

Our board of directors may amend or discontinue our 2019 Plan and our compensation committee may amend or cancel outstanding awards for purposes of satisfying changes in law or any other lawful purpose, but no such action may adversely affect rights under an award without the holder’s consent. Certain amendments to our 2019 Plan require the approval of our stockholders.

No awards may be granted under our 2019 Plan after the date that is ten years from the effective date of our 2019 Plan.

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2019 Employee Stock Purchase Plan

In May 2019, our board of directors adopted our 2019 Employee Stock Purchase Plan, or the ESPP, which was approved by our shareholders in June 2019. Our ESPP initially reserves and authorizes the issuance of up to a total of 213,729 shares of common stock to participating employees. Our ESPP provides that the number of shares reserved and available for issuance will automatically increase on each January 1, beginning on January 1, 2020 and ending on January 1, 2029, by the lesser of (i) 641,187 shares of common stock, (ii) 1.0% of the outstanding shares of common stock on the immediately preceding December 31 or (iii) such lesser number of shares as determined by the administrator of our ESPP. This number is subject to adjustment in the event of a stock split, stock dividend or other change in our capitalization.

All employees whose customary employment is for more than 20 hours a week are eligible to participate in our ESPP. Any employee who owns 5% or more of the voting power or value of our shares of common stock is not eligible to purchase shares under our ESPP.

We will make one or more offerings each year to our employees to purchase shares under our ESPP. Offerings will usually begin on each January 1 and July 1 and will continue for six-month periods, referred to as offering periods. Each eligible employee may elect to participate in any offering by submitting an enrollment form at least 15 business days before the relevant offering date.

Each employee who is a participant in our ESPP may purchase shares by authorizing payroll deductions of up to 15% of his or her eligible compensation during an offering period. Unless the participating employee has previously withdrawn from the offering, his or her accumulated payroll deductions will be used to purchase shares of common stock on the last business day of the offering period at a price equal to 85% of the fair market value of the shares on the first business day or the last business day of the offering period, whichever is lower, provided that no more than $25,000 worth of shares of common stock, valued at the start of the purchase period (or such lesser number of shares determined by the administrator) may be purchased by any one employee during each offering period. Under applicable tax rules, an employee may purchase no more than $25,000 worth of shares of common stock, valued at the start of the purchase period, under our ESPP in any calendar year.

The accumulated payroll deductions of any employee who is not a participant on the last day of an offering period will be refunded. An employee's rights under our ESPP terminate upon voluntary withdrawal from the plan or when the employee ceases employment with us for any reason.

Our ESPP may be terminated or amended by our board of directors at any time. An amendment that increases the number of shares of common stock authorized under our ESPP and certain other amendments require the approval of our stockholders.

Senior Executive Cash Incentive Bonus Plan

In May 2019, our board of directors adopted the Senior Executive Cash Incentive Bonus Plan, or the Bonus Plan. Our Bonus Plan provides for bonus payments based upon the attainment of performance targets established by our compensation committee. The payment targets will be related to financial and operational measures or objectives with respect to our company, or the Corporate Performance Goals, as well as individual performance objectives. Our compensation committee may select Corporate Performance Goals from among the following: cash flow (including, but not limited to, operating cash flow and free cash flow); revenue; corporate revenue; earnings before interest, taxes, depreciation and amortization; net income (loss) (either before or after interest, taxes, depreciation and/or amortization); changes in the market price of our common stock; economic value-added; development, clinical, regulatory or commercial milestones; acquisitions or strategic transactions;

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operating income (loss); return on capital, assets, equity, or investment; stockholder returns; return on sales; gross or net profit levels; productivity; expense efficiency; margins; operating efficiency; customer satisfaction; working capital; earnings (loss) per share of our common stock; bookings, new bookings or renewals; sales or market shares; number of customers; number of new customers or customer references; operating income and/or net annual recurring revenue, any of which may be measured in absolute terms, as compared to any incremental increase, in terms of growth, as compared to results of a peer group, against the market as a whole, compared to applicable market indices and/or measured on a pre-tax or post-tax basis. Each executive officer who is selected to participate in our Bonus Plan will have a target bonus opportunity set for each performance period. The bonus formulas will be adopted in each performance period by the compensation committee and communicated to each executive. The Corporate Performance Goals will be measured at the end of each performance period after our financial reports have been published. If the Corporate Performance Goals and individual performance objectives are met, payments will be made as soon as practicable following the end of each performance period. Subject to the rights contained in any agreement between the executive officer and us, an executive officer must be employed by us on the bonus payment date to be eligible to receive a bonus payment. Our Bonus Plan also permits the compensation committee to approve additional bonuses to executive officers in its sole discretion.

401(k) Retirement Plan

We participate in a 401(k) retirement plan sponsored by PureTech Health, our shareholder, which is intended to be a tax-qualified defined contribution plan under Section 401(k) of the Internal Revenue Code. In general, all of our employees are eligible to participate, beginning two months after the commencement of their employment. The 401(k) plan includes a salary deferral arrangement pursuant to which participants may elect to reduce their current compensation by up to the statutorily prescribed limit and have the amount of the reduction contributed to the 401(k) plan. We currently contribute to each employee's 401(k) account, in the first quarter of each year, 3% of his or her eligible earnings from the prior year.

Limitations on Liability and Indemnification

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to our directors, officers or controlling persons, 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 plan, without further direction from the director or officer. The director or officer may amend or terminate the plan in some circumstances. Our directors and executive officers may also buy or sell additional shares outside of a Rule 10b5-1 plan when they are not in possession of material, nonpublic information.

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DIRECTOR COMPENSATION

The following table sets forth information regarding compensation earned by our non-employee directors during the year ended December 31, 2018. We reimburse non-employee members of our board of directors for reasonable travel expenses. The compensation of our Chief Executive Officer, President and Chairman and our Chief Operating Officer are discussed above in the "Executive Compensation" section.

Name	Fees earned or paid in cash($)	Option Awards($)	Total
Bharat Chowrira, J.D., Ph.D.	-	-	-
Eric Elenko, Ph.D.(1)	-	-	-
Edmund Harrigan, M.D.(2)	25,000	-	25,000
Jeffrey Jonas, M.D.(3)	11,250	221,496(4)	232,746
Joep Muijrers, Ph.D.(1)	-	-	-
Stephen Muniz, J.D.(5)	-	-	-
Robert Nelsen, M.B.A.	-	-	-
Atul Pande, M.D.(6)	25,000	-	25,000
Bennett Shapiro(7)	10,000(8)	-	10,000

(1) Drs. Elenko and Muijrers resigned from our board of directors effective June 27, 2019.

(2) As of December 31, 2018, Dr. Harrigan held unexercised stock options to purchase an aggregate of 142,112 shares of our common stock. Dr. Harrigan also receives an annual payment of $25,000 pursuant to an advisor agreement, dated May 25, 2017.

(3) Dr. Jonas joined our board of directors in October 2018. Pursuant to his board agreement, he is entitled to a fee of $45,000 per year in consideration for his services as a member of our board. As of December 3, 2018, Dr. Jonas held unexercised stock options to purchase an aggregate of 61,322 shares of our common stock.

(4) This option was granted on October 1, 2018 in connection with Dr. Jonas's election to our board of directors and vests as to 12.5% of the shares on each six month anniversary of September 20, 2018.

(5) Mr. Muniz resigned as a director effective March 21, 2019.

(6) As of December 31, 2018, Dr. Pande held unexercised stock options to purchase an aggregate of 35,714 shares of our common stock. Dr. Pande resigned as a director effective March 15, 2019. Dr. Pande will join our board of directors effective immediately after the effectiveness of the registration statement of which this prospectus forms a part.

(7) Dr. Shapiro resigned as a director effective March 21, 2019.

(8) Represents amount paid to Dr. Shapiro for his service as a director by our stockholder, PureTech Health LLC, which fees were reimbursed by us to PureTech Health LLC.

Prior to our initial public offering in June 2019, we did not have a formal non-employee director compensation policy. We paid Dr. Harrigan an annual fee of $25,000 in consideration for his services as a member of our board and, until their resignation from our board in March 2019, we paid Dr. Pande an annual fee of $25,000. We paid Dr. Jonas an annual fee of $45,000 in consideration for his services as a member of our board, and we granted him an option to purchase 47,218 shares of our common stock in October 2018 in connection with his election to the board. We also reimburse our non-employee directors for reasonable travel and out-of-pocket expenses incurred in connection with attending board of directors and committee meetings.

Non-Employee Director Compensation Policy

Our board of directors has adopted a Non-Employee Director Compensation Policy. The policy is designed to ensure that the compensation aligns the directors' interests with the long-term interests of

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the stockholders, that the structure of the compensation is simple, transparent and easy for stockholders to understand and that our directors are fairly compensated. Employee directors will not receive additional compensation for their services as directors.

Under the policy, upon initial election or appointment to the board of directors, new non-employee directors will receive a one-time stock option grant to purchase 32,500 shares of our common stock, which will vest in equal monthly installments over three years. In each subsequent year of a non-employee director's tenure, the director will receive an annual equity grant of options to purchase 16,250 shares of our common stock, which vests in full upon the earlier to occur of the first anniversary of the grant date or the date of the next annual meeting of stockholders. If either an initial equity award or an annual equity award is in the form of a nonqualified stock option, then the exercise price will equal the fair market value of our common stock, as measured by reference to market quotations on Nasdaq, as of the grant date. Vesting of any equity award will cease if a director resigns from our board of directors or otherwise ceases to serve as a director, unless the board of directors determines that circumstances warrant continuation of vesting.

In addition, each non-employee director is paid an annual retainer of $35,000 for their services. Such cash retainers are paid quarterly, and may be pro-rated based on the number of actual days served by the director during such calendar quarter.

Committee members also receive additional annual retainers. These additional payments for service on a committee are due to the workload and broad-based responsibilities of the committees. These committee retainers are as follows:

Committee	Member Annual Fee	Chairman Additional Annual Fee
Audit Committee	$ 7,500	$ 15,000
Compensation Committee	$ 5,000	$ 10,000
Nominating and Corporate Governance Committee	$ 4,000	$ 8,000

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CERTAIN RELATIONSHIPS AND RELATED PARTY TRANSACTIONS

Other than the compensation agreements and other arrangements described under “Executive Compensation” and “Director Compensation” in this prospectus and the transactions described below, since January 1, 2016, there has not been and there is not currently proposed, any transaction or series of similar transactions to which we were, or will be, a party in which the amount involved exceeded, or will exceed, $120,000 and in which any director, executive officer, holder of five percent or more of any class of our capital stock or any member of the immediate family of, or entities affiliated with, any of the foregoing persons, had, or will have, a direct or indirect material interest.

We believe the terms obtained or consideration that we paid or received, as applicable, in connection with the transactions described below were comparable to terms available or the amounts that we would pay or receive, as applicable, in arm’s-length transactions.

Issuance of Common Stock Warrant

In October 2016, we issued a warrant, or the Warrant, to purchase 19,998 shares of our common stock at a price of $2.92 per share to PureTech Health LLC, or PureTech Health. On July 31, 2018, PureTech Health partially exercised the Warrant and purchased 12 shares of common stock for an aggregate exercise price of $37.90. On March 18, 2019, PureTech Health exercised the remaining portion of the Warrant and purchased 19,986 shares for an aggregate exercise price of $58,328.

Issuance of Convertible Promissory Notes to PureTech Health

On August 31, 2017, we issued a convertible promissory note, or the Initial August 2017 Note, to PureTech Health in the principal amount of $345,819. On the same date, we issued a second convertible promissory note, or the Second August 2017 Note, and together with the Initial August 2017 Note, the 2017 Notes, to PureTech Health in the principal amount of up to $6.5 million. The Second August 2017 Note was payable in installments, with $3.5 million of the note drawn down upon execution of the note and an additional $3.0 million drawn down upon our receipt of permission from the FDA to dose a second cohort in our Phase 2 clinical trial and confirmation that a material adverse event had not occurred. This second draw down occurred in January 2018. In June 2018, we issued an additional convertible promissory note to PureTech Health in the principal amount of $4.0 million, or the 2018 Note. The 2017 Notes and the 2018 Note accrued interest at a rate of 10% per year and the 2017 Notes converted at a 25% discount in our Series A preferred stock financing, as further described below, and the 2018 Notes converted at no discount.

Wellcome Trust Funding Agreement

In July 2015, we entered into a company funding agreement, or the 2015 Wellcome Funding Agreement, with The Wellcome Trust Limited, or Wellcome Trust, pursuant to which we were eligible to receive $3.8 million in gross proceeds upon the achievement of specified milestones. As of December 31, 2017, we had received the full amount of gross proceeds under the 2015 Wellcome Funding Agreement. In June 2018, we entered into another company funding agreement with Wellcome Trust, or the 2018 Wellcome Funding Agreement, to receive up to $8.0 million in gross proceeds upon the achievement of specified milestones. Pursuant to the 2018 Wellcome Funding Agreement, we received $2.0 million in July 2018, $2.7 million in November 2018, $1.6 million in March 2019 and $1.6 million in April 2019. The 2015 Wellcome Funding Agreement and 2018 Wellcome Funding Agreement are together referred to as the Wellcome Funding Agreements.

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The outstanding principal under the Wellcome Funding Agreements is convertible into shares of our preferred stock upon certain events, including equity financings, and the discount applied to conversion of the outstanding principal upon an equity financing is 20% for the 2015 Wellcome Funding Agreement and adjusts from 0% to 25% for the 2018 Wellcome Funding Agreement, based on when such conversion occurs, with the discount increasing as time elapses from the effective date of the applicable Wellcome Funding Agreement.

In August 2018, the outstanding $3.8 million principal balance under the 2015 Wellcome Funding Agreement as well as the initial $2.0 million principal balance under the 2018 Wellcome Funding Agreement were converted to Series A preferred stock in connection with our Series A preferred stock financing, as further described below.

We received an additional $2.7 million, $1.6 million and $1.6 million in November 2018, March 2019 and April 2019, respectively, pursuant to the 2018 Wellcome Funding Agreement, all of which converted into Series B preferred stock in our Series B preferred stock financing at either a 15% or 25% discount in March and April 2019, as further described below. We are eligible to receive up to an aggregate of $128,855 in future funding under the terms of the 2018 Wellcome Funding Agreement, which would be payable at our option upon the achievement of a specified clinical milestone.

Series A Preferred Stock Financing

In August 2018, we issued and sold an aggregate of 3,126,700 shares of Series A preferred stock at a price per share of $13.46, for an aggregate purchase price of approximately $42.1 million. Included in this amount was approximately $26.1 million of outstanding principal, interest and discount on convertible promissory notes issued between May 2011 and June 2018, including the 2017 Notes, and the outstanding principal amount under the Wellcome Funding Agreements, all of which converted into Series A preferred stock in this financing in accordance with their terms.

The following table sets forth the aggregate cash purchase price of the Series A preferred stock purchased by our directors, executive officers and 5% stockholders and their affiliates and the number of shares of our Series A preferred stock issued in consideration of such amounts.

Name	Cash Purchase Price	Number of Shares of Series A Preferred Stock
ARCH Venture Fund IX, L.P.	$ 7,500,000	557,207
ARCH Venture Fund IX Overage, L.P.	$ 7,500,000	557,206
Steven Paul, M.D.	$ 1,000,000	74,294
Total	$ 16,000,000	1,188,707

The following table sets forth the aggregate principal and interest under the 2017 Notes and the Wellcome Funding Agreements converted by PureTech Health and Wellcome Trust, respectively, as 5% stockholder, and the number of shares of our Series A preferred stock issued upon conversion of such securities.

Name	Principal, Interest and Discount	Number of Shares of Series A Preferred Stock Issued Upon Conversion
PureTech Health LLC	$ 18,155,036	1,348,814
The Wellcome Trust Limited	$ 6,811,097	506,025

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Series B Preferred Stock Financing

In March and April 2019, we issued and sold an aggregate of 5,422,845 shares of Series B preferred stock at a price per share of $15.14, for an aggregate purchase price of approximately $82.1 million. Included in this amount was approximately $5.8 million of outstanding principal loaned to us subsequent to the Series A financing pursuant to the Wellcome Funding Agreements, which converted into Series B preferred stock in this financing at either a 15% or 25% discount in accordance with the terms of the Wellcome Funding Agreements.

Name	Cash Purchase Price	Number of Shares of Series B Preferred Stock
PureTech Health LLC	$ 5,000,000	330,250
ARCH Venture Fund IX, L.P.	$ 10,000,000	660,502
ARCH Venture Fund IX Overage, L.P.	$ 10,000,000	660,501
Sofinnova Venture Partners X, L.P.	$ 12,000,000	792,602
Total	$ 37,000,000	2,443,855

The following table sets forth the aggregate principal and interest under the Wellcome Funding Agreements converted by The Wellcome Trust, as a 5% stockholder, and the number of shares of our Series B preferred stock issued upon conversion.

Name	Aggregate Principal and Discount	Number of Shares of Series B Preferred Stock Issued Upon Conversion
The Wellcome Trust Limited	$ 7,101,977	469,087

Initial Public Offering

On July 2, 2019, we closed our initial public offering, pursuant to which we issued and sold 6,414,842 shares of our common stock, including full exercise of the underwriters' over-allotment option to purchase an additional 836,718 shares, at a public offering price of $16.00 per share. The following table sets forth the aggregate cash purchase price of the common stock purchased by our directors, executive officers and 5% stockholders and their affiliates and the number of shares of our common stock issued in consideration of such amounts. Such purchases were made through the underwriters at the initial public offering price of $16.00 per share.

Name	Cash Purchase Price	Number of Shares of Common Stock
ARCH Venture Fund IX, L.P.	$ 1,600,000.00	100,000
ARCH Venture Fund IX Overage, L.P.	$ 1,600,000.00	100,000
Pivotal bioVenture Partners Fund I, L.P.	$ 7,040,000.00	440,000
Sofinnova Venture Partners X, L.P.	$ 11,200,000.00	700,000
Total	$ 21,440,000.00	1,340,000

Patent License Agreement with PureTech Health LLC

In March 2011, we entered into an exclusive license agreement, or the Patent License Agreement, with PureTech Health, pursuant to which PureTech Health granted us an exclusive license to patents relating to combinations of a muscarinic activator with a muscarinic inhibitor for the treatment of central nervous system disorders. In connection with the Patent License Agreement, we have agreed to make milestone payments to PureTech Health of up to an aggregate of $10.0 million

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upon the achievement of specified developmental, regulatory and commercial milestones. In addition, we are obligated to pay PureTech Health low single-digit royalties on the worldwide net sales of any commercialized product covered by the licenses granted under the Patent License Agreement. In the event that we sublicense any of the patent rights granted under the Patent License Agreement, we will be obligated to pay PureTech Health royalties within the range of 15-25% on any income we receive from the sublicensee, excluding royalties. We have not paid any fees to date to PureTech Health to date pursuant to the Patent License Agreement.

Pursuant to an allocation agreement, dated March 4, 2011 between PureTech Health and Edmund Harrigan, M.D., a member of our board of directors and our Chief Executive Officer from January 2011 until February 2012, Dr. Harrigan will receive an amount equal to less than 2.0% of any consideration we pay to PureTech Health pursuant to the terms of the Patent License Agreement.

PureTech Health Shared Resources

PureTech Health is a founder of our company and in that capacity has provided us with strategic medical, clinical and scientific advice pursuant to a business services, personnel and information management agreement. In addition, we currently share administrative resources with PureTech Health, including human resources support, and we partake in various insurance and benefit plans maintained by PureTech Health. In the years ended December 31, 2016, 2017 and 2018, PureTech Health has invoiced us at cost for such services, with such amounts totaling $156,000, $221,000 and
$216,000, respectively. In addition, PureTech Health periodically invoices us for reimbursement of out of pocket expenses reasonably incurred on our behalf in connection with providing such business services.

Investors' Rights Agreement

We are a party to an amended and restated investors' rights agreement, dated as of March 15, 2019, with holders of our preferred stock, including some of our 5% stockholders and entities affiliated with our directors. Such holders consisted of entities affiliated with PureTech Health, ARCH Ventures, Wellcome Trust and Sofinnova Investments, each a 5% stockholder. Each of PureTech Health and ARCH Ventures has appointed representatives to our board of directors. The investor rights agreement provides these holders the right to demand that we file a registration statement or request that their shares be covered by a registration statement that we are otherwise filing. See "Description of Capital Stock—Registration Rights" for additional information regarding these registration rights.

Voting Agreement

We were a party to an amended and restated voting agreement, dated as of March 15, 2019, with holders of our preferred stock, including some of our 5% stockholders and entities affiliated with our directors. Such holders consisted of entities affiliated with PureTech Health, ARCH Ventures, Wellcome Trust and Sofinnova Investments, each a 5% stockholder. Each of PureTech Health and ARCH Ventures have appointed representatives to our board of directors. The voting agreement provided the holders the right to elect certain directors to the Board. Pursuant to the voting agreement, we agreed to appoint to our board of directors three representatives designated by PureTech Health, who were Bharat Chowrira, Eric Elenko and Joep Muijrers, and one representative designated by an entity affiliated with ARCH Ventures, who is Robert Nelsen. The voting agreement terminated upon completion of our initial public offering.

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Right of First Refusal and Co-Sale Agreement

We were a party to an amended and restated right of first refusal and co-sale agreement, dated as March 15, 2019, with holders of our preferred stock, including some of our 5% stockholders and entities affiliated with our directors. Such holders consisted of entities affiliated with PureTech Health, ARCH Ventures, Wellcome Trust and Sofinnova Investments, each a 5% stockholder. Each of PureTech Health and ARCH Ventures appointed representatives to our board of directors. The right of first refusal and co-sale agreement provided the key holders the right to purchase all or any portion of transfer stock, as well as the right of co-sale and participate in any proposed transfers. The agreement terminated upon completion of our initial public offering.

Employment Agreements

See the “Executive Compensation—Agreements with Our Named Executive Officers” section of this prospectus for a further discussion of these arrangements.

Indemnification Agreements

Our certificate of incorporation provides that we will indemnify our directors and officers to the fullest extent permitted by Delaware law. In addition, we have entered into indemnification agreements with each of our officers and directors that may be broader in scope than the specific indemnification provisions contained in the Delaware General Corporation Law. See “Executive Compensation—Limitations on Liability and Indemnification” for additional information regarding these agreements.

Policies and Procedures for Related Person Transactions

Our board of directors reviews and approves transactions with directors, officers and holders of 5% or more of our voting securities and their affiliates, each a related party. Prior to this offering, the material facts as to the related party’s relationship or interest in the transaction are disclosed to our board of directors prior to their consideration of such transaction, and the transaction is not considered approved by our board of directors unless a majority of the directors who are not interested in the transaction approve the transaction. Further, when stockholders are entitled to vote on a transaction with a related party, the material facts of the related party’s relationship or interest in the transaction are disclosed to the stockholders, who must approve the transaction in good faith.

We have adopted a written related party transactions policy that such transactions must be approved by our audit committee. Pursuant to this policy, the audit committee has the primary responsibility for reviewing and approving or disapproving “related party transactions,” which are transactions between us and related persons in which the aggregate amount involved exceeds or may be expected to exceed $120,000 and in which a related person has or will have a direct or indirect material interest. For purposes of this policy, a related person will be defined as a director, executive officer, nominee for director, or greater than 5% beneficial owner of our common stock, in each case since the beginning of the most recently completed year, and their immediate family members. Our audit committee charter provides that the audit committee shall review and approve or disapprove any related party transactions.

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PRINCIPAL STOCKHOLDERS

The following table sets forth information with respect to the beneficial ownership of our common stock as of November 1, 2019 by:

- each of our directors;
- each of our named executive officers;
- all of our directors and executive officers as a group; and
- each person, or group of affiliated persons, who is known by us to beneficially own more than 5% of our common stock.

The column entitled "Percentage of Shares Beneficially Owned—Before Offering" is based on a total of 23,412,754 shares of our common stock deemed outstanding as of November 1, 2019. The column entitled "Percentage of Shares Beneficially Owned—After Offering" is based on 26,012,754 shares of our common stock to be outstanding after this offering, including the 2,600,000 shares of our common stock that we are selling in this offering, but not including any additional shares issuable upon exercise of outstanding options or any exercise by the underwriters of their option to purchase additional shares.

Beneficial ownership is determined in accordance with the rules and regulations of the SEC and includes voting or investment power with respect to our common stock. Shares of our common stock subject to options that are currently exercisable or exercisable within 60 days after November 1, 2019 are considered outstanding and beneficially owned by the person holding the options for the purpose of calculating the percentage ownership of that person but not for the purpose of calculating the percentage ownership of any other person. Except as otherwise noted, the persons and entities in this table have sole voting and investment power with respect to all of the shares of our common stock beneficially owned by them, subject to community property laws, where applicable. Except as otherwise set forth below, the address of the beneficial owner is c/o Karuna Therapeutics, Inc., 33 Arch Street, Suite 3110, Boston, Massachusetts 02110.

		Percentage of Shares Beneficially Owned	
Name of Beneficial Owner	Shares Beneficially Owned	Before Offering	After Offering
5% Stockholders			
PureTech Health LLC(1)	7,395,397	31.6%	28.4%
ARCH Ventures(2)	3,362,872	14.4%	12.9%
Sofinnova Investments(3)	1,729,352	7.4%	6.6%
The Wellcome Trust Limited(4)	1,266,376	5.4%	4.9%
Named Executive Officers and Directors			
Steven Paul, M.D.(5)	2,523,513	9.8%	8.9%
Andrew Miller, Ph.D.(6)	325,280	1.4%	1.2%
Stephen Brannan, M.D.(7)	83,061	*	*
Bharat Chowrira, J.D., Ph.D.	10,000	*	*
Edmund Harrigan, M.D.(8)	127,483	*	*
James Healy(9)	1,729,352	7.4%	6.6%
Jeffrey Jonas, M.D.(10)	15,329	*	*
Robert Nelsen	-	-	-
Atul Pande(11)	28,571	*	*
Heather Preston, M.D.	-	-	-
All Current Executive Officers and Directors as a Group (12 persons)	4,846,816	18.3%	16.7%

* Represents beneficial ownership of less than 1% of our outstanding stock.

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(1) Voting and investment power over the shares held by PureTech Health LLC is exercised by its parent entity, PureTech Health plc. The board of directors of PureTech Health plc consists of Mr. Joichi Ito, Dr. Raju Kucherlapati, Dr. John LaMattina, Dr. Robert Langer, Dame Marjorie Scardino, Dr. Bennett Shapiro, Mr. Christopher Viehbacher, Ms. Daphne Zohar and Mr. Stephen Muniz. None of the members of the board of directors of PureTech Health plc or PureTech Health LLC has individual voting or investment power with respect to such shares. The address for PureTech Health LLC and the individuals listed above is c/o PureTech Health LLC, 6 Tide Street, Boston, MA 02210.

(2) The address of ARCH Ventures is 8755 W. Higgins Road, Suite 1025, Chicago, IL 60631.

(3) All shares held by Sofinnova Venture Partners X, L.P. (“SVP X”). Sofinnova Management X, L.L.C. (“SM X”), the general partner of SVP X, may be deemed to have sole voting power, and Dr. Michael F. Powell, Dr. James I. Healy, and Dr. Anand Mehra, the managing members of SM X, may be deemed to have shared power to vote these shares. Such individuals disclaim beneficial ownership of such shares except to the extent of their pecuniary interest therein. The address of Sofinnova Investments is 3000 Sand Hill Road, Building 4, Suite 250 Menlo Park, CA 94025.

(4) The address of The Wellcome Trust Limited is 215 Euston Road, London NW1 2BE UK.

(5) Consists of (a) 106,485 shares of common stock and (b) 2,417,028 shares of common stock issuable upon the exercise of options exercisable within 60 days after November 1, 2019.

(6) Consists of 325,280 shares of common stock issuable upon the exercise of options exercisable within 60 days after November 1, 2019.

(7) Consists of 83,061 shares of common stock issuable upon the exercise of options exercisable within 60 days after November 1, 2019.

(8) Consists of 127,483 shares of common stock issuable upon the exercise of options exercisable within 60 days after November 1, 2019.

(9) Consists of the shares set forth in footnote (3) above. Dr. Healy is a managing partner of SM X and a member of our board of directors.

(10) Consists of 15,329 shares of common stock issuable upon the exercise of options exercisable within 60 days after November 1, 2019.

(11) Consists of 28,571 shares of common stock issuable upon the exercise of options exercisable within 60 days after November 1, 2019.

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DESCRIPTION OF CAPITAL STOCK

General

Our authorized capital stock consists of 150,000,000 shares of common stock, par value $0.0001 per share, and 10,000,000 shares of preferred stock, par value $0.0001 per share, all of which shares of preferred stock are undesignated.

As of September 30, 2019, 23,412,754 shares of our common stock were outstanding and held by 30 common shareholders of record.

Common Stock

The holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of the stockholders. The holders of our common stock do not have any cumulative voting rights. Holders of our common stock are entitled to receive ratably any dividends declared by our board of directors out of funds legally available for that purpose, subject to any preferential dividend rights of any outstanding preferred stock. Our common stock has no preemptive rights, conversion rights or other subscription rights or redemption or sinking fund provisions.

In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in all assets remaining after payment of all debts and other liabilities and any liquidation preference of any outstanding preferred stock. The shares to be issued by us in this offering will be, when issued and paid for, validly issued, fully paid and non-assessable.

Preferred Stock

Our board of directors has the authority, without further action by our stockholders, to issue up to 10,000,000 shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences, sinking fund terms and the number of shares constituting, or the designation of, such series, any or all of which may be greater than the rights of common stock. The issuance of our preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon our liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change in control of our company or other corporate action.

Registration Rights

The holders of 15,879,157 shares of our common stock are entitled to rights with respect to the registration of these securities under the Securities Act. These rights are provided under the terms of an amended and restated investors' rights agreement, or the investors' rights agreement, between us and holders of our preferred stock. The investors' rights agreement includes demand registration rights, short-form registration rights and piggyback registration rights. All fees, costs and expenses of underwritten registrations under this agreement will be borne by us and all selling expenses, including underwriting discounts and selling commissions, will be borne by the holders of the shares being registered.

Demand Registration Rights

At any time after December 24, 2019, the holders of 15,879,157 shares of our common stock are entitled to demand registration rights. Under the terms of the investors' rights agreement, we will be

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required, upon the written request of the holders of at least 40% of our outstanding registrable securities, as defined in the investors' rights agreement, or a lesser percent if the total amount of registrable shares requested to be registered has an anticipated aggregate offering price to the public, net of selling expenses, of least $10.0 million, to file a registration statement and use commercially reasonable efforts to effect the registration of all or a portion of their registrable securities for public resale. We are required to effect only two registrations pursuant to this provision of the investors' rights agreement.

Short-Form Registration Rights

Pursuant to the investor rights agreement, if we are eligible to file a registration statement on Form S-3, upon the written request of the holders of our outstanding registrable securities, as defined in the investors' rights agreement, may demand in writing that we register their registrable securities under the Securities Act so long as the total amount of registrable shares requested to be registered has an anticipated aggregate offering price to the public, net of selling expenses, of least $5.0 million. We are required to effect only two registrations in any twelve month period pursuant to this provision of the investors' rights agreement. The right to have such shares registered on Form S-3 is further subject to other specified conditions and limitations.

Piggyback Registration Rights

Pursuant to the investors' rights agreement, if we register any of our securities either for our own account or for the account of other security holders, the holders of these shares are entitled to include their shares in the registration. Subject to certain exceptions contained in the investors' rights agreement, we and the underwriters may limit the number of shares included in the underwritten offering to the number of shares which we and the underwriters determine in our sole discretion will not jeopardize the success of the offering. In connection with this offering, the holders of registrable securities were entitled to, and the necessary percentage of holders waived, their rights to notice of this offering and to include their shares of registrable securities in this offering.

Indemnification

Our investor rights agreement contains customary cross-indemnification provisions, under which we are obligated to indemnify holders of registrable securities in the event of material misstatements or omissions in the registration statement attributable to us, and they are obligated to indemnify us for material misstatements or omissions attributable to them.

Expiration of Registration Rights

The demand registration rights and short form registration rights granted under the investor rights agreement will terminate on June 27, 2024.

Anti-Takeover Effects of our Certificate of Incorporation and Bylaws and Delaware Law

Our certificate of incorporation and bylaws include a number of provisions that may have the effect of delaying, deferring or preventing another party from acquiring control of us and encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Board Composition and Filling Vacancies

Our certificate of incorporation provides for the division of our board of directors into three classes serving staggered three-year terms, with one class being elected each year. Our certificate of

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incorporation also provides that directors may be removed only for cause and then only by the affirmative vote of the holders of 75% or more of the shares then entitled to vote at an election of directors. Further, any vacancy on our board of directors, however occurring, including a vacancy resulting from an increase in the size of our board, may only be filled by the affirmative vote of a majority of our directors then in office even if less than a quorum. The classification of directors, together with the limitations on removal of directors and treatment of vacancies, has the effect of making it more difficult for stockholders to change the composition of our board of directors.

No Written Consent of Stockholders

Our certificate of incorporation provides that all stockholder actions are required to be taken by a vote of the stockholders at an annual or special meeting, and that stockholders may not take any action by written consent in lieu of a meeting. This limit may lengthen the amount of time required to take stockholder actions and would prevent the amendment of our bylaws or removal of directors by our stockholders without holding a meeting of stockholders.

Meetings of Stockholders

Our certificate of incorporation and bylaws provide that only a majority of the members of our board of directors then in office may call special meetings of stockholders and only those matters set forth in the notice of the special meeting may be considered or acted upon at a special meeting of stockholders. Our bylaws limit the business that may be conducted at an annual meeting of stockholders to those matters properly brought before the meeting.

Advance Notice Requirements

Our bylaws establish advance notice procedures with regard to stockholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our stockholders. These procedures provide that notice of stockholder proposals must be timely given in writing to our corporate secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary date of the annual meeting for the preceding year. Our bylaws specify the requirements as to form and content of all stockholders' notices. These requirements may preclude stockholders from bringing matters before the stockholders at an annual or special meeting.

Amendment to Certificate of Incorporation and Bylaws

Any amendment of our certificate of incorporation must first be approved by a majority of our board of directors, and if required by law or our certificate of incorporation, must thereafter be approved by a majority of the outstanding shares entitled to vote on the amendment and a majority of the outstanding shares of each class entitled to vote thereon as a class, except that the amendment of the provisions relating to stockholder action, board composition, limitation of liability and the amendment of our bylaws and certificate of incorporation must be approved by not less than 75% of the outstanding shares entitled to vote on the amendment, and not less than 75% of the outstanding shares of each class entitled to vote thereon as a class. Our bylaws may be amended by the affirmative vote of a majority of the directors then in office, subject to any limitations set forth in the bylaws; and may also be amended by the affirmative vote of at least 75% of the outstanding shares entitled to vote on the amendment, or, if our board of directors recommends that the stockholders approve the amendment, by the affirmative vote of the majority of the outstanding shares entitled to vote on the amendment, in each case voting together as a single class.

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Undesignated Preferred Stock

Our certificate of incorporation provides for 10,000,000 authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of our stockholders, our board of directors could cause shares of preferred stock to be issued without stockholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent stockholder or stockholder group. In this regard, our certificate of incorporation grants our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Exclusive Jurisdiction for Certain Actions

Our bylaws provide that, unless we consent in writing to an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for state law claims for (i) any derivative action or proceeding brought on our behalf, (ii) any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers and employees to us or our stockholders, (iii) any action asserting a claim arising pursuant to any provision of the Delaware General Corporation Law, our certificate of incorporation or our bylaws, or (iv) any action asserting a claim that is governed by the internal affairs doctrine, in each case subject to the Court of Chancery having personal jurisdiction over the indispensable parties named as defendants therein. This provision will not apply to actions arising under the Securities Act or the Exchange Act. Although we believe this provision benefits us by providing increased consistency in the application of Delaware law in the types of lawsuits to which it applies, the provision may have the effect of discouraging lawsuits against our directors and officers. The enforceability of similar exclusive forum provisions in other companies' bylaws has been challenged in legal proceedings, and it is possible that a court could rule that this provision in our bylaws is inapplicable or unenforceable.

Section 203 of the Delaware General Corporation Law

We are subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions:

- before the stockholder became interested, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances, but not the outstanding voting stock owned by the interested stockholder; or
- at or after the time the stockholder became interested, the business combination was approved by our board of directors and authorized at an annual or special meeting of the stockholders by

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the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

- Section 203 defines a business combination to include:
- any merger or consolidation involving the corporation and the interested stockholder; any sale, transfer, lease, pledge or other disposition involving the interested stockholder of 10% or more of the assets of the corporation; subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;
- subject to exceptions, any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder; and
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges or other financial benefits provided by or through the corporation.

In general, Section 203 defines an interested stockholder as any entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by the entity or person.

Nasdaq Global Market Listing

Our common stock is listed on The Nasdaq Global Market under the trading symbol “KRTX.”

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company, LLC.

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SHARES ELIGIBLE FOR FUTURE SALE

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 September 30, 2019, upon the completion of this offering 26,012,754 shares of our common stock will be outstanding, assuming (i) no exercise of the underwriters' option to purchase additional shares from us and (ii) no exercise of outstanding options.

All of the shares sold in this offering will be freely tradable in the public market without restriction or further registration under the Securities Act, unless held by our affiliates, as that term is defined under Rule 144 under the Securities Act, or subject to lock-up agreements. The outstanding 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 their offer and sale are registered under the Securities Act or if the offer and sale of those securities qualify for an exemption from registration, including exemptions provided by Rules 144 or 701 promulgated under the Securities Act, summarized below.

Rule 144

In general, under Rule 144, any person who is not our affiliate and has not been our affiliate at any time during the preceding three months and has held their shares for at least six months, including the holding period of any prior owner other than one of our affiliates, may sell shares without restriction, subject to the availability of current public information about us. In addition, under Rule 144, any person who is not our affiliate and has not been our affiliate at any time during the preceding three months and has held their shares for at least one year, including the holding period of any prior owner other than one of our affiliates, would be entitled to sell an unlimited number of shares immediately upon the closing of this offering without regard to whether current public information about us is available.

A person who is our affiliate or who was our affiliate at any time during the preceding three months may sell any unrestricted securities, as well as restricted securities that the person has beneficially owned for at least six months, including the holding period of any prior owner other than one of our affiliates, under Rule 144. Affiliates selling restricted or unrestricted securities may sell a number of shares within any three-month period that does not exceed the greater of:

- 1% of the number of shares then outstanding, which will equal approximately 260,127 shares immediately after this offering, assuming no exercise of the underwriters' option to purchase additional shares; or
- the average weekly trading volume of our common stock on The Nasdaq Global Market during the four calendar weeks preceding the filing of a notice on Form 144 with respect to the sale.

Sales under Rule 144 by our affiliates are also subject to manner of sale provisions and notice requirements and to the availability of current public information about us.

Notwithstanding the availability of Rule 144, the holders of substantially all of our restricted shares have entered into lock-up agreements as described below and their restricted shares will become eligible for sale at the expiration of the restrictions set forth in those agreements.

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Rule 701

In general, under Rule 701 of the Securities Act, any of our employees, consultants or advisors, other than our affiliates, who purchased shares from us in connection with a qualified compensatory stock plan or other written agreement is eligible to resell these shares 90 days after the date of this prospectus in reliance on Rule 144, but without compliance with the holding period requirements of Rule 144 and without regard to the volume of such sales or the availability of public information about us.

However, substantially all Rule 701 shares are subject to lock-up agreements as described below and under “Underwriting” included elsewhere in this prospectus and will become eligible for sale upon the expiration of the restrictions set forth in those agreements.

Lock-Up Agreements

In connection with this offering, we, and our directors, officers and certain affiliates, such directors, officers and affiliates beneficially holding an aggregate of 9,476,064 shares, have agreed that for a period of 90 days following the date of this prospectus, subject to specified exceptions, we or they will not offer, sell, contract to sell, pledge or otherwise dispose of, directly or indirectly, any shares of our common stock or securities convertible into or exchangeable or exercisable for any shares of our common stock without prior consent of Goldman Sachs & Co. LLC and Citigroup Global Markets Inc. See the section titled “Underwriters” for a more complete description of the lock-up agreements with the underwriters.

In connection with our initial public offering, we, along with our officers, directors, and holders of substantially all of our capital stock, stock options and other securities convertible into, exercisable or exchangeable for our capital stock outstanding immediately prior to the closing of our initial public offering entered into market stand-off agreements with us and have entered into lock-up agreements with the underwriters, subject to certain exceptions, not to dispose of or hedge any of their common stock or securities convertible into or exchangeable for shares of common stock up to and through December 24, 2019, except with the prior written consent of Goldman Sachs & Co. LLC and Citigroup Global Markets Inc. The underwriters intend to waive, with respect to the shares being sold in this offering, the restrictions under these lock-up agreements applicable to us for purposes of this offering.

Registration Rights

Certain holders of our securities are entitled to various rights with respect to registration of their shares under the Securities Act. Registration of these shares under the Securities Act would result in these shares becoming fully tradable without restriction under the Securities Act immediately upon the effectiveness of the registration. See the section entitled “Description of Capital Stock—Registration Rights” appearing elsewhere in this prospectus for more information.

Equity Incentive Plans

We have filed a registration statement on Form S-8 under the Securities Act to register our shares issued or reserved for issuance under our equity incentive plans. Accordingly, shares registered under the registration statement are available for sale in the open market, unless such shares are subject to vesting restrictions with us or the lock-up restrictions described above.

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MATERIAL U.S. FEDERAL INCOME TAX CONSIDERATIONS FOR NON-U.S. HOLDERS OF COMMON STOCK

The following discussion is a summary of the material U.S. federal income tax considerations applicable to non-U.S. holders (as defined below) with respect to their ownership and disposition of shares of our common stock issued pursuant to this offering. For purposes of this discussion, a non-U.S. holder means a beneficial owner of our common stock that is for U.S. federal income tax purposes:

- a non-resident alien individual;
- a foreign corporation or any other foreign organization taxable as a corporation for U.S. federal income tax purposes; or
- a foreign estate or trust, the income of which is not subject to U.S. federal income tax on a net income basis.

This discussion does not address the tax treatment of partnerships or other entities that are pass-through entities for U.S. federal income tax purposes or persons that hold their common stock through partnerships or other pass-through entities. A partner in a partnership or other pass-through entity that will hold our common stock should consult his, her or its tax advisor regarding the tax consequences of acquiring, holding and disposing of our common stock through a partnership or other pass-through entity, as applicable.

This discussion is based on current provisions of the U.S. Internal Revenue Code of 1986, as amended, which we refer to as the Code, existing and proposed U.S. Treasury Regulations promulgated thereunder, current administrative rulings and judicial decisions, all as in effect as of the date of this prospectus and, all of which are subject to change or to differing interpretation, possibly with retroactive effect. Any such change or differing interpretation could alter the tax consequences to non-U.S. holders described in this prospectus. There can be no assurance that the Internal Revenue Service, which we refer to as the IRS, will not challenge one or more of the tax consequences described herein. We assume in this discussion that a non-U.S. holder holds shares of our common stock as a capital asset within the meaning of Section 1221 of the Code, generally property held for investment.

This discussion does not address all aspects of U.S. federal income taxation that may be relevant to a particular non-U.S. holder in light of that non-U.S. holder's individual circumstances nor does it address any U.S. state, local or non-U.S. taxes, the alternative minimum tax, or the Medicare tax on net investment income, the rules regarding qualified small business stock within the meaning of Section 1202 of the Code, or any other aspect of any U.S. federal tax other than the income tax . This discussion also does not consider any specific facts or circumstances that may apply to a non-U.S. holder and does not address the special tax rules applicable to particular non-U.S. holders, such as:

- insurance companies;
- tax-exempt or governmental organizations;
- financial institutions;
- brokers or dealers in securities;
- regulated investment companies;
- pension plans;
- "controlled foreign corporations," "passive foreign investment companies," and corporations that accumulate earnings to avoid U.S. federal income tax;

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- "qualified foreign pension funds," or entities wholly owned by a "qualified foreign pension fund";
- persons deemed to sell our common stock under the constructive sale provisions of the Code;
- persons who own, or are deemed to own, more than 5% of our capital stock (except to the extent specifically set forth below);
- persons that hold our common stock as part of a straddle, hedge, conversion transaction, synthetic security or other integrated investment; and
- certain U.S. expatriates.

This discussion is for general information only and is not tax advice. Accordingly, all prospective non-U.S. holders of our common stock should consult their tax advisors with respect to the U.S. federal, state, local and non-U.S. tax consequences of the purchase, ownership and disposition of our common stock.

Distributions on Our Common Stock

Distributions, if any, on our common stock will constitute dividends for U.S. federal income tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. If a distribution exceeds our current and accumulated earnings and profits, the excess will be treated as a tax-free return of the non-U.S. holder's investment, up to such holder's tax basis in the common stock. Any remaining excess will be treated as capital gain, subject to the tax treatment described below in "Gain on Sale or Other Taxable Disposition of Our Common Stock." Any such distributions will also be subject to the discussions below under the sections titled "Backup Withholding and Information Reporting" and "Withholding and Information Reporting Requirements—FATCA."

Subject to the discussion in the following two paragraphs in this section, dividends paid to a non-U.S. holder generally will be subject to withholding of U.S. federal income tax at a 30% rate or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence. Dividends that are treated as effectively connected with a trade or business conducted by a non-U.S. holder within the United States and, if an applicable income tax treaty so provides, that are attributable to a permanent establishment or a fixed base maintained by the non-U.S. holder within the United States, are generally exempt from the 30% withholding tax if the non-U.S. holder satisfies applicable certification and disclosure requirements. However, such U.S. effectively connected income, net of specified deductions and credits, is taxed at the same graduated U.S. federal income tax rates applicable to United States persons (as defined in the Code). Any U.S. effectively connected income received by a non-U.S. holder that is a corporation may also, under certain circumstances, be subject to an additional "branch profits tax" at a 30% rate or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder's country of residence.

A non-U.S. holder of our common stock who claims the benefit of an applicable income tax treaty between the United States and such holder's country of residence generally will be required to provide a properly executed IRS Form W-8BEN or W-8BEN-E (or successor form) to the applicable withholding agent and satisfy applicable certification and other requirements. Non-U.S. holders are urged to consult their tax advisors regarding their entitlement to benefits under a relevant income tax treaty. A non-U.S. holder that is eligible for a reduced rate of U.S. withholding tax under an income tax treaty may obtain a refund or credit of any excess amounts withheld by timely filing a U.S. tax return with the IRS.

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Gain on Sale or Other Taxable Disposition of Our Common Stock

Subject to the discussions below under “Backup Withholding and Information Reporting” and “Withholding and Information Reporting Requirements—FATCA,” a non-U.S. holder generally will not be subject to any U.S. federal income tax on any gain realized upon such holder’s sale or other taxable disposition of shares of our common stock unless:

- the gain is effectively connected with the non-U.S. holder’s conduct of a U.S. trade or business and, if an applicable income tax treaty so provides, is attributable to a permanent establishment or a fixed-base maintained by such non-U.S. holder in the United States, in which case the non-U.S. holder generally will be taxed on a net income basis at the graduated U.S. federal income tax rates applicable to United States persons (as defined in the Code) and, if the non-U.S. holder is a foreign corporation, the branch profits tax described above in “Distributions on Our Common Stock” also may apply;
- the non-U.S. holder is a nonresident alien individual who is present in the United States for 183 days or more in the taxable year of the disposition and certain other conditions are met, in which case the non-U.S. holder will be subject to a 30% tax (or such lower rate as may be specified by an applicable income tax treaty between the United States and such holder’s country of residence) on the net gain derived from the disposition, which may be offset by certain U.S. source capital losses of the non-U.S. holder, if any (even though the individual is not considered a resident of the United States), provided that the non-U.S. holder has timely filed U.S. federal income tax returns with respect to such losses; or
- we are, or have been, at any time during the five-year period preceding such sale or other taxable disposition (or the non-U.S. holder’s holding period, if shorter) a “U.S. real property holding corporation,” unless our common stock is regularly traded on an established securities market and the non-U.S. holder holds no more than 5% of our outstanding common stock, directly or indirectly, actually or constructively, during the shorter of the 5-year period ending on the date of the disposition or the period that the non-U.S. holder held our common stock. Generally, a corporation is a U.S. real property holding corporation only if the fair market value of its U.S. real property interests equals or exceeds 50% of the sum of the fair market value of its worldwide real property interests plus its other assets used or held for use in a trade or business. Although there can be no assurance, we do not believe that we are, or have been, a U.S. real property holding corporation, or that we are likely to become one in the future. No assurance can be provided that our common stock will be regularly traded on an established securities market for purposes of the rules described above.

Backup Withholding and Information Reporting

We must report annually to the IRS and to each non-U.S. holder the gross amount of the distributions on our common stock paid to such holder and the tax withheld, if any, with respect to such distributions. Non-U.S. holders may have to comply with specific certification procedures to establish that the holder is not a United States person (as defined in the Code) in order to avoid backup withholding at the applicable rate with respect to dividends on our common stock. Dividends paid to non-U.S. holders subject to withholding of U.S. federal income tax, as described above in “Distributions on Our Common Stock,” generally will be exempt from U.S. backup withholding.

Information reporting and backup withholding will generally apply to the proceeds of a disposition of our common stock by a non-U.S. holder effected by or through the U.S. office of any broker, U.S. or foreign, unless the holder certifies its status as a non-U.S. holder and satisfies certain other requirements, or otherwise establishes an exemption. Generally, information reporting and backup withholding will not apply to a payment of disposition proceeds to a non-U.S. holder where the

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transaction is effected outside the United States through a non-U.S. office of a broker. However, for information reporting purposes, dispositions effected through a non-U.S. office of a broker with substantial U.S. ownership or operations generally will be treated in a manner similar to dispositions effected through a U.S. office of a broker. Non-U.S. holders should consult their tax advisors regarding the application of the information reporting and backup withholding rules to them. Copies of information returns may be made available to the tax authorities of the country in which the non-U.S. holder resides or is incorporated under the provisions of a specific treaty or agreement. Backup withholding is not an additional tax. Any amounts withheld under the backup withholding rules from a payment to a non-U.S. holder can be refunded or credited against the non-U.S. holder's U.S. federal income tax liability, if any, provided that an appropriate claim is filed with the IRS in a timely manner.

Withholding and Information Reporting Requirements—FATCA

Provisions of the Code commonly referred to as the Foreign Account Tax Compliance Act, or FATCA, generally impose a U.S. federal withholding tax at a rate of 30% on payments of dividends on our common stock paid to a foreign entity unless (i) if the foreign entity is a "foreign financial institution," such foreign entity undertakes certain due diligence, reporting, withholding, and certification obligations, (ii) if the foreign entity is not a "foreign financial institution," such foreign entity identifies certain of its U.S. investors, if any, or (iii) the foreign entity is otherwise exempt under FATCA. Such withholding may also apply to gross proceeds from the sale or other disposition of our common stock, although under recently proposed U.S. Treasury Regulations, no withholding would apply to such gross proceeds. The preamble to the proposed regulations specifies that taxpayers (including withholding agents) are permitted to rely on the proposed regulations pending finalization. Under certain circumstances, a non-U.S. holder may be eligible for refunds or credits of this withholding tax. An intergovernmental agreement between the United States and an applicable foreign country may modify the requirements described in this paragraph. Non-U.S. holders should consult their tax advisors regarding the possible implications of this legislation on their investment in our common stock and the entities through which they hold our common stock, including, without limitation, the process and deadlines for meeting the applicable requirements to prevent the imposition of the 30% withholding tax under FATCA.

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UNDERWRITING

We and the underwriters named below have entered into an underwriting agreement with respect to the shares being offered. Subject to certain conditions, each underwriter has severally agreed to purchase the number of shares indicated in the following table. Goldman Sachs & Co. LLC and Citigroup Global Markets Inc. are the representatives of the underwriters.

Underwriters	Number of Shares
Goldman Sachs & Co. LLC	1,105,000
Citigroup Global Markets Inc.	949,000
Stifel, Nicolaus & Company, Incorporated	364,000
JMP Securities LLC	182,000
Total	2,600,000

The underwriters are committed to take and pay for all of the shares being offered, if any are taken, other than the shares covered by the option described below unless and until this option is exercised. 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 have an option to buy up to an additional 390,000 shares from us. They may exercise that option for 30 days. If any shares are purchased pursuant to this option, the underwriters will severally purchase shares in approximately the same proportion as set forth in the table above.

The following table shows the per share and total underwriting discounts and commissions to be paid to the underwriters by us. Such amounts are shown assuming both no exercise and full exercise of the underwriters' option to purchase up to 390,000 additional shares from us.

	No Exercise	Full Exercise
Per Share	$ 5.76	$ 5.76
Total	$ 14,976,000.00	$ 17,222,400.00

Shares sold by the underwriters to the public will initially be offered at the public offering price set forth on the cover of this prospectus. Any shares sold by the underwriters to securities dealers may be sold at a discount of up to $3.46 per share from the public offering price. After the initial offering of the shares, the representatives may change the offering price and the other selling terms. The offering of the shares by the underwriters is subject to receipt and acceptance and subject to the underwriters' right to reject any order in whole or in part. Sales of shares made outside of the United States may be made by affiliates of the underwriters.

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 and our officers, directors, and certain affiliates, such directors, officers and affiliates beneficially holding an aggregate of 9,476,064 shares, have agreed or will agree with the underwriters, subject to certain exceptions, not to dispose of or hedge any of our or their common stock or securities convertible into or exchangeable for shares of common stock during the period from the date of this

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prospectus continuing through the date 90 days after the date of this prospectus, except with the prior written consent of Goldman Sachs & Co. LLC and Citigroup Global Markets Inc. See the section of this prospectus titled “Shares Eligible for Future Sale” for a discussion of certain transfer restrictions.

Our common stock is listed on The Nasdaq Global Market under the symbol “KRTX.”

In connection with the offering, the underwriters may purchase and sell shares of our common stock in the open market. These transactions may include short sales, stabilizing transactions and purchases to cover positions created by short sales. Short sales involve the sale by the underwriters of a greater number of shares than they are required to purchase in the offering, and a short position represents the amount of such sales that have not been covered by subsequent purchases. A “covered short position” is a short position that is not greater than the amount of additional shares for which the underwriters’ option described above may be exercised. The underwriters may cover any covered short position by either exercising their option to purchase additional shares or purchasing shares in the open market. In determining the source of shares to cover the covered short position, the underwriters will consider, among other things, the price of shares available for purchase in the open market as compared to the price at which they may purchase additional shares pursuant to the option described above. “Naked” short sales are any short sales that create a short position greater than the amount of additional shares for which the option described above may be exercised. The underwriters must cover any such naked short position by purchasing shares in the open market. A naked short position is more likely to be created if the underwriters are concerned that there may be downward pressure on the price of the common stock in the open market after pricing that could adversely affect investors who purchase in the offering. Stabilizing transactions consist of various bids for or purchases of common stock made by the underwriters in the open market prior to the completion of the offering.

The underwriters may also impose a penalty bid. This occurs when a particular underwriter repays to the underwriters a portion of the underwriting discount received by it because the representatives have repurchased shares sold by or for the account of such underwriter in stabilizing or short covering transactions.

Purchases to cover a short position and stabilizing transactions, as well as other purchases by the underwriters for their own accounts, may have the effect of preventing or retarding a decline in the market price of our stock, and together with the imposition of the penalty bid, may stabilize, maintain or otherwise affect the market price of the common stock. As a result, the price of the common stock may be higher than the price that otherwise might exist in the open market. The underwriters are not required to engage in these activities and may end any of these activities at any time. These transactions may be effected on The Nasdaq Global Market, in the over-the-counter market or otherwise.

We estimate that our share of the total expenses of the offering, excluding underwriting discounts and commissions, will be approximately $600,000. We have agreed to reimburse the underwriters for certain of their expenses in an amount up to $20,000.

We have agreed to indemnify the several underwriters against certain liabilities, including liabilities under the Securities Act of 1933.

The underwriters and their respective affiliates are full service financial institutions engaged in various activities, which may include sales and trading, commercial and investment banking, advisory, investment management, investment research, principal investment, hedging, market making, brokerage and other financial and non-financial activities and services. Certain of the underwriters and their respective affiliates have provided, and may in the future provide, a variety of these services to

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the issuer and to persons and entities with relationships with the issuer, for which they received or will receive customary fees and expenses

In the ordinary course of their various business activities, the underwriters and their respective affiliates, officers, directors and employees may purchase, sell or hold a broad array of investments and actively traded securities, derivatives, loans, commodities, currencies, credit default swaps and other financial instruments for their own account and for the accounts of their customers, and such investment and trading activities may involve or relate to assets, securities or instruments of the issuer (directly, as collateral securing other obligations or otherwise) or persons and entities with relationships with the issuer. The underwriters and their respective affiliates may also communicate independent investment recommendations, market color or trading ideas or publish or express independent research views in respect of such assets, securities or instruments and may at any time hold, or recommend to clients that they should acquire, long and/or short positions in such assets, securities and instruments.

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.

European Economic Area

In relation to each Member State of the European Economic Area which has implemented the Prospectus Directive (each, a "Relevant Member State") an offer to the public of our common stock may not be made in that Relevant Member State, except that an offer to the public in that Relevant Member State of our common stock may be made at any time under the following exemptions under the Prospectus Directive:

1. To any legal entity which is a qualified investor as defined in the Prospectus Directive;
2. To fewer than 150 natural or legal persons (other than qualified investors as defined in the Prospectus Directive), subject to obtaining the prior consent of the Representatives for any such offer; or
3. In any other circumstances falling within Article 3(2) of the Prospectus Directive;

provided that no such offer or shares of our common stock shall require us or any underwriter to publish a prospectus pursuant to Article 3 of the Prospectus Directive.

For the purposes of this provision, the expression an "offer to public" in relation to our common stock in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and our common stock to be offered so as to enable an investor to decide to purchase our common stock, as the same may be varied in that Member State by any measure implementing the Prospectus Directive in that Member State, and the expression "Prospectus Directive" means Directive 2003/71/EC (as amended), including by Directive 2010/73/EU and includes any relevant implementing measure in the Relevant Member State.

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This European Economic Area selling restriction is in addition to any other selling restrictions set out below.

United Kingdom

In the United Kingdom, this prospectus is only addressed to and directed at qualified investors who are (i) investment professionals falling within Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (the Order); or (ii) high net worth entities and other persons to whom it may lawfully be communicated, falling within Article 49(2)(a) to (d) of the Order (all such persons together being referred to as "relevant persons"). Any investment or investment activity to which this prospectus relates is available only to relevant persons and will only be engaged in with relevant persons. Any person who is not a relevant person should not act or rely on this prospectus or any of its contents.

Canada

The securities may be sold in Canada 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 securities must be made in accordance with an exemption form, 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.

Hong Kong

The securities may not be offered or sold in Hong Kong by means of any document other than (i) in circumstances which do not constitute an offer to the public within the meaning of the Companies (Winding Up and Miscellaneous Provisions) Ordinance (Cap. 32 of the Laws of Hong Kong) ("Companies (Winding Up and Miscellaneous Provisions) Ordinance") or which do not constitute an invitation to the public within the meaning of the Securities and Futures Ordinance (Cap. 571 of the Laws of Hong Kong) ("Securities and Futures Ordinance"), or (ii) to "professional investors" as defined in the Securities and Futures Ordinance and any rules made thereunder, or (iii) in other circumstances which do not result in the document being a "prospectus" as defined in the Companies (Winding Up and Miscellaneous Provisions) Ordinance, and no advertisement, invitation or document relating to the securities may be issued or may be in the possession of any person for the purpose of issue (in each case 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 in 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" in Hong Kong as defined in the Securities and Futures Ordinance and any rules made thereunder.

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Singapore

This prospectus has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, this prospectus and any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of the shares may not be circulated or distributed, nor may the shares be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor (as defined under Section 4A of the Securities and Futures Act, Chapter 289 of Singapore (the "SFA")) under Section 274 of the SFA, (ii) 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 (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA, in each case subject to conditions set forth in the SFA.

Where the shares are subscribed or purchased under Section 275 of the SFA by a relevant person which is 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, the securities (as defined in Section 239(1) of the SFA) of that corporation shall not be transferable for 6 months after that corporation has acquired the shares under Section 275 of the SFA except: (1) to an institutional investor under Section 274 of the SFA or to a relevant person (as defined in Section 275(2) of the SFA), (2) where such transfer arises from an offer in that corporation's securities pursuant to Section 275(1A) of the SFA, (3) where no consideration is or will be given for the transfer, (4) where the transfer is by operation of law, (5) as specified in Section 276(7) of the SFA, or (6) as specified in Regulation 32 of the Securities and Futures (Offers of Investments) (Shares and Debentures) Regulations 2005 of Singapore ("Regulation 32").

Where the shares are subscribed or purchased under Section 275 of the SFA by a relevant person which is a trust (where the trustee is not an accredited investor (as defined in Section 4A of the SFA)) whose sole purpose is to hold investments and each beneficiary of the trust is an accredited investor, the beneficiaries' rights and interest (howsoever described) in that trust shall not be transferable for 6 months after that trust has acquired the shares under Section 275 of the SFA except: (1) to an institutional investor under Section 274 of the SFA or to a relevant person (as defined in Section 275(2) of the SFA), (2) where such transfer arises from an offer that is made on terms that such rights or interest are acquired at a consideration of not less than S$200,000 (or its equivalent in a foreign currency) for each transaction (whether such amount is to be paid for in cash or by exchange of securities or other assets), (3) where no consideration is or will be given for the transfer, (4) where the transfer is by operation of law, (5) as specified in Section 276(7) of the SFA, or (6) as specified in Regulation 32.

Japan

The securities have not been and will not be registered under the Financial Instruments and Exchange Act of Japan (Act No. 25 of 1948, as amended), or the FIEA. The securities may not be offered or sold, directly or indirectly, in Japan or to or for the benefit of any resident of Japan (including any person resident in Japan or any corporation or other entity organized under the laws of Japan) or to others for reoffering or resale, directly or indirectly, in Japan or to or for the benefit of any resident of Japan, except pursuant to an exemption from the registration requirements of the FIEA and otherwise in compliance with any relevant laws and regulations of Japan.

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Australia

No placement document, prospectus, product disclosure statement or other disclosure document has been lodged with the Australian Securities and Investments Commission ("ASIC"), in relation to the offering. This offering document does not constitute a prospectus, product disclosure statement or other disclosure document under the Corporations Act 2001 (the "Corporations Act"), and does not purport to include the information required for a prospectus, product disclosure statement or other disclosure document under the Corporations Act.

Any offer in Australia of the shares may only be made to persons (the "Exempt Investors") who are "sophisticated investors" (within the meaning of section 708(8) of the Corporations Act), "professional investors" (within the meaning of section 708(11) of the Corporations Act) or otherwise pursuant to one or more exemptions contained in section 708 of the Corporations Act so that it is lawful to offer the shares without disclosure to investors under Chapter 6D of the Corporations Act.

The shares applied for by Exempt Investors in Australia must not be offered for sale in Australia in the period of 12 months after the date of allotment under the offering, except in circumstances where disclosure to investors under Chapter 6D of the Corporations Act would not be required pursuant to an exemption under section 708 of the Corporations Act or otherwise or where the offer is pursuant to a disclosure document which complies with Chapter 6D of the Corporations Act. Any person acquiring shares must observe such Australian on-sale restrictions.

This offering document contains general information only and does not take account of the investment objectives, financial situation or particular needs of any particular person. It does not contain any securities recommendations or financial product advice. Before making an investment decision, investors need to consider whether the information in this offering document is appropriate to their needs, objectives and circumstances, and, if necessary, seek expert advice on those matters.

Dubai International Financial Centre

This offering document relates to an Exempt Offer in accordance with the Offered Securities Rules of the Dubai Financial Services Authority ("DFSA"). This offering document is intended for distribution only to persons of a type specified in the Offered Securities Rules 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 nor taken steps to verify the information set forth in this prospectus and has no responsibility for the offering document. The securities to which this offering 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 offering document you should consult an authorized financial advisor.

Switzerland

We have not and will not register with the Swiss Financial Market Supervisory Authority ("FINMA") as a foreign collective investment scheme pursuant to Article 119 of the Federal Act on Collective Investment Scheme of 23 June 2006, as amended ("CISA"), and accordingly the securities being offered pursuant to this prospectus have not and will not be approved, and may not be licensable, with FINMA. Therefore, the securities have not been authorized for distribution by FINMA as a foreign collective investment scheme pursuant to Article 119 CISA and the securities offered hereby may not be offered to the public (as this term is defined in Article 3 CISA) in or from Switzerland. The securities may solely be offered to "qualified investors," as this term is defined in

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Article 10 CISA, and in the circumstances set out in Article 3 of the Ordinance on Collective Investment Scheme of 22 November 2006, as amended ("CISO"), such that there is no public offer. Investors, however, do not benefit from protection under CISA or CISO or supervision by FINMA. This prospectus and any other materials relating to the securities are strictly personal and confidential to each offeree and do not constitute an offer to any other person. This prospectus may only be used by those qualified investors to whom it has been handed out in connection with the offer described in this prospectus and may neither directly or indirectly be distributed or made available to any person or entity other than its recipients. It may not be used in connection with any other offer and shall in particular not be copied and/or distributed to the public in Switzerland or from Switzerland. This prospectus does not constitute an issue prospectus as that term is understood pursuant to Article 652a and/or 1156 of the Swiss Federal Code of Obligations. We have not applied for a listing of the securities on the SIX Swiss Exchange or any other regulated securities market in Switzerland, and consequently, the information presented in this prospectus does not necessarily comply with the information standards set out in the listing rules of the SIX Swiss Exchange and corresponding prospectus schemes annexed to the listing rules of the SIX Swiss Exchange.

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LEGAL MATTERS

The validity of the shares of our common stock offered hereby is being passed upon for us by Goodwin Procter LLP, Boston, Massachusetts. Certain legal matters relating to this offering will be passed upon for the underwriters by Cooley LLP, Boston, Massachusetts.

EXPERTS

The financial statements of Karuna Therapeutics, Inc. as of December 31, 2017 and 2018 and for each of the years then ended, have been included herein and in the registration statement in reliance on the report of KPMG LLP, independent registered public accounting firm, appearing elsewhere herein, and upon the authority of said 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 common stock we are offering by this prospectus. This prospectus does not contain all of the information included in the registration statement. For further information pertaining to us and our common stock, you should refer to the registration statement and to its exhibits. Whenever we make reference in this prospectus to any of our contracts, agreements or other documents, the references are not necessarily complete, and you should refer to the exhibits attached to the registration statement for copies of the actual contract, agreement or other document.

We are subject to the informational requirements of the Exchange Act and file annual, quarterly and current reports, proxy statements and other information with the SEC. You can read our SEC filings, including the registration statement, at the SEC's website at www.sec.gov. We also maintain a website at www.karunatx.com. You may access, free of charge, our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendment to those reported filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after such material is electronically filed with, or furnished to, the SEC.

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and Board of Directors
Karuna Therapeutics, Inc.:

Opinion on the Financial Statements

We have audited the accompanying balance sheets of Karuna Therapeutics, Inc. (the Company) as of December 31, 2017 and 2018, the related statements of operations, redeemable convertible preferred stock and stockholders' equity (deficit), and cash flows for each of the years then ended, and the related notes (collectively, the financial statements). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2017 and 2018, and the results of its operations and its cash flows for each of 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 these 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. 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/ KPMG LLP

We have served as the Company's auditor since 2018.

Cambridge, Massachusetts
March 29, 2019, except as to note 15, which date is June 14, 2019

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KARUNA THERAPEUTICS, INC.
BALANCE SHEETS
(In thousands, except share and per share data)

	December 31, 2017	December 31, 2018
Assets		
Current assets:		
Cash and cash equivalents	$ 1,942	$ 8,904
Short-term investments	-	4,983
Prepaid expenses and other current assets	175	1,709
Total current assets	2,117	15,596
Restricted cash	-	123
Property and equipment, net	12	138
Total assets	$ 2,129	$ 15,857
Liabilities, Redeemable Convertible Preferred Stock and Stockholders' Equity (Deficit)		
Current liabilities:		
Accounts payable (includes $716 and $112 at December 31, 2017 and 2018, respectively, due to related parties)	$ 798	$ 269
Accrued expenses	433	538
Derivative liability	2,606	389
Current convertible notes, net of discount	7,674	-
Total current liabilities	11,511	1,196
Non-current convertible notes, net of discount	3,985	2,516
Deferred lease obligation	-	102
Total liabilities	15,496	3,814
Commitments and Contingencies (Note 11)		
Redeemable convertible preferred stock:		
Redeemable convertible preferred stock, Series Seed, $0.0001 par value; 4,412,500 shares authorized and outstanding at December 31, 2017 and 2018; liquidation preference of $4,412 as of December 31, 2017 and 2018	1	1
Redeemable convertible preferred stock, Series A, $0.0001 par value; no and 3,126,700 shares authorized and outstanding at December 31, 2017 and 2018, respectively; liquidation preference of $42,085 as of December 31, 2018	-	41,964
Stockholders' equity (deficit):		
Common stock, $0.0001 par value; 7,142,850 and 12,337,650 shares authorized at December 31, 2017 and 2018, respectively; zero and 12 shares issued and outstanding at December 31, 2017 and 2018, respectively	-	-
Additional paid-in capital	675	1,633
Accumulated deficit	(14,043)	(31,555)
Total stockholders' equity (deficit)	(13,368)	(29,922)
Total liabilities, redeemable convertible preferred stock and stockholders' equity (deficit)	$ 2,129	$ 15,857

The accompanying notes are an integral part of these financial statements

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KARUNA THERAPEUTICS, INC.
STATEMENTS OF OPERATIONS
(In thousands, except share and per share data)

	Year Ended December 31,	
	2017	2018
Revenue	$ -	$ -
Operating expenses:		
Research and development	3,616	11,536
General and administrative	1,190	2,974
Total operating expenses	4,806	14,510
Loss from operations	(4,806)	(14,510)
Other income (expense):		
Interest expense	(555)	(407)
Interest income	-	25
Accretion of debt discount	(616)	(2,176)
Change in fair value of derivative	(55)	(444)
Total other income (expense), net	(1,226)	(3,002)
Net loss before income taxes	(6,032)	(17,512)
Income tax provision	-	-
Net loss attributable to common stockholders	$ (6,032)	$ (17,512)
Net loss per share, basic and diluted (Note 8)		$ (4,378,000)
Weighted average common shares outstanding used in computing net loss per share, basic and diluted		4

The accompanying notes are an integral part of these financial statements

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KARUNA THERAPEUTICS, INC.
STATEMENT OF REDEEMABLE CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' EQUITY (DEFICIT)
(In thousands, except share data)

	Series Seed Redeemable Convertible Preferred Stock		Series A Redeemable Convertible Preferred Stock		Series B Redeemable Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Total Stockholders' (Deficit) Equity
	Shares	Value	Shares	Value	Shares	Value	Shares	Value			
Balance, December 31, 2016	4,412,500	$ 1	-	$ -	-	$ -	-	$ -	$ 461	$ (8,012)	$ (7,551)
Cumulative effect adjustment of the adoption of Accounting Standards Update 2018-07 (Note 2)	-	-	-	-	-	-	-	-	(1)	1	-
Shared-based compensation expense	-	-	-	-	-	-	-	-	215	-	215
Net loss	-	-	-	-	-	-	-	-	-	(6,032)	(6,032)
Balance, December 31, 2017	4,412,500	1	-	-	-	-	-	-	675	(14,043)	(13,368)
Issuance of Series A redeemable convertible preferred stock, net of issuance costs of $120	-	-	3,126,700	41,964	-	-	-	-	-	-	-
Exercise of common warrants	-	-	-	-	-	-	12	-	-	-	-
Shared-based compensation expense	-	-	-	-	-	-	-	-	958	-	958
Net loss	-	-	-	-	-	-	-	-	-	(17,512)	(17,512)
Balance, December 31, 2018	4,412,500	1	3,126,700	41,964	-	-	12	-	1,633	(31,555)	(29,922)

The accompanying notes are an integral part of these financial statements

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KARUNA THERAPEUTICS, INC.
STATEMENTS OF CASH FLOWS
(In thousands)

	Year Ended December 31,	
	2017	2018
Cash flows from operating activities		
Net loss	$(6,032)	$(17,512)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization expense	1	6
Stock-based compensation expense	215	958
Non-cash interest expense	555	407
Accretion of debt discount	616	2,176
Change in fair value of derivative liability	55	444
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	(166)	(1,534)
Accounts payable	537	(529)
Accrued expenses	192	105
Deferred lease obligation	-	102
Net cash used in operating activities	(4,027)	(15,377)
Cash flows from investing activities		
Acquisition of property and equipment	(13)	(132)
Purchase of short-term investments	-	(4,983)
Net cash used in investing activities	(13)	(5,115)
Cash flows from financing activities		
Proceeds from issuance of Series A redeemable convertible preferred stock, net of issuance cost	-	15,877
Proceeds from issuance of convertible notes	4,250	11,700
Net cash provided by financing activities	4,250	27,577
Net increase in cash, cash equivalents and restricted cash	210	7,085
Cash, cash equivalents and restricted cash at beginning of period	1,732	1,942
Cash, cash equivalents and restricted cash at end of period	$ 1,942	$ 9,027
Supplemental disclosures of cash flows information		
Conversion of convertible notes, accrued interest and discount upon conversion to preferred stock	$ -	$ 26,087

The accompanying notes are an integral part of these financial statements

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NOTES TO FINANCIAL STATEMENTS

Note 1. Nature of the Business

Karuna Therapeutics, Inc. (the "Company,") was incorporated under the laws of the State of Delaware in July 2009 as Karuna Pharmaceuticals, Inc. and is headquartered in Boston, Massachusetts. In March 2019, the Company changed its name to Karuna Therapeutics, Inc. The Company is focused on the development of novel therapies to address disabling neuropsychiatric conditions characterized by significant unmet medical need.

Since the Company's inception, it has focused substantially all of its efforts and financial resources on organizing and staffing the company, acquiring and developing its technology, raising capital, building its intellectual property portfolio, undertaking preclinical studies and clinical trials and providing general and administrative support for these activities. The Company has not generated any product revenue related to its primary business purpose to date and is subject to a number of risks similar to those of other early stage companies, including dependence on key individuals, regulatory approval of products, uncertainty of market acceptance of products, competition from substitute products and larger companies, compliance with government regulations, protection of proprietary technology, dependence on third parties, product liability and the need to obtain adequate additional financing to fund the development of its product candidates.

Liquidity

The Company's financial statements have been prepared on the basis of continuity of operations, realization of assets and the satisfaction of liabilities in the ordinary course of business. The Company experienced negative operating cash flows of $15.4 million for the year ended December 31, 2018 and had an accumulated deficit of $31.6 million as of December 31, 2018. The Company expects to continue to generate operating losses for the foreseeable future.

In March 2019, the Company issued 5,285,102 shares of Series B redeemable convertible preferred stock (the "Series B Preferred Stock") (see Note 16). This included $75.0 million in gross proceeds (4,953,758 shares) and $5.0 million (331,344 shares) from the conversion of the debt outstanding at the time of the closing which had a principal value of $4.3 million. As of June 14, 2019, the issuance date of the financial statements for the year ended December 31, 2018, the Company expects that the proceeds from the sale of Series B Preferred Stock in March 2019, together with its cash, cash equivalents and short-term investments of $13.9 million as of December 31, 2018, will be sufficient to fund its operating expenses and capital expenditure requirements through at least 12 months from the date of issuance of these financial statements. The future viability of the Company beyond that point is dependent on its ability to raise additional capital to fund its operations.

The Company is seeking to complete an initial public offering ("IPO") of its common stock. Upon the closing of a qualified IPO (as defined in the Company's Certificate of Incorporation, as amended and restated) on specified terms, all of the Company's outstanding redeemable convertible preferred stock will automatically convert into shares of common stock (see Note 6). In the event the Company does not complete an IPO, the Company expects to seek additional funding through private equity financings, debt financings, or other capital sources, including collaborations with other companies, or other strategic transactions. The Company may not be able to obtain funding on acceptable terms, or at all. The terms of any financing may adversely affect the holdings or the rights of the Company's stockholders.

If the Company is unable to obtain funding, the Company could be forced to delay, reduce or eliminate some or all of its research and development programs, product portfolio expansion or

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commercialization efforts, which could adversely affect its business prospects, or the Company may be unable to continue operations. Although management continues to pursue these plans, there is no assurance that the Company will be successful in obtaining sufficient funding on terms acceptable to the Company to fund continuing operations, if at all.

Note 2. Summary of Significant Accounting Policies

Basis of Presentation and Use of Estimates

The accompanying financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America ("GAAP"). Any reference in these notes to applicable guidance is meant to refer to the authoritative United States generally accepted accounting principles as found in the Accounting Standards Codification ("ASC") and Accounting Standards Updates ("ASUs") of the Financial Accounting Standards Board ("FASB").

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of expenses during the reporting periods. Significant estimates and assumptions reflected in these financial statements include, but are not limited to, the accrual of research and development expenses, and the valuation of common stock, stock-based awards and liabilities associated with financial instruments and derivatives. Estimates are periodically reviewed in light of changes in circumstances, facts and experience. Actual results could differ from the Company's estimates.

Segments

The Company operates and manages its business as one reportable and operating segment, which is the business of research and development of therapies utilizing muscarinic cholinergic receptors to treat psychosis and cognitive impairment in numerous central nervous system disorders. The Company's chief executive officer, who is the chief operating decision maker, reviews financial information on an aggregate basis for purposes of allocating resources and evaluating financial performance. All of the Company's tangible assets are held in the United States.

Cash and Cash Equivalents

The Company considers all short-term, highly liquid investments with original maturities of 90 days or less at acquisition date to be cash equivalents.

Short-term Investments

The Company's short-term investments are classified as available-for-sale and are carried at fair value with the unrealized gains and losses reported as a component of accumulated other comprehensive income (loss) in stockholders' equity. There were no meaningful unrealized gains or losses recognized in 2018 on the short-term investments. Realized gains and losses and declines in value judged to be other than temporary are included as a component of other income (expense), net based on the specific identification method.

Concentration of Credit Risk

Cash, cash equivalents and short-term investments are the primary source of potential exposure for the Company to concentrations of credit risk. Periodically, the Company maintains deposits in

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financial institutions in excess of government insured limits. The Company deposits its cash in financial institutions that it believes have high quality and has not experienced any losses on such accounts and does not believe it is exposed to any significant credit risk on cash. The Company does not believe that it is subject to unusual credit risk beyond the normal credit risk associated with commercial banking relationships.

Concentration of Manufacturing Risk

The Company is dependent on third-party manufacturers to supply products for research and development activities in its programs. In particular, the Company relies and expects to continue to rely on a small number of manufacturers to supply it with its requirements for the active pharmaceutical ingredients and formulated drugs related to these programs. These programs could be adversely affected by a significant interruption in the supply of active pharmaceutical ingredients and formulated drugs.

Deferred Offering Costs

The Company capitalizes certain legal, professional accounting and other third-party fees that are directly associated with in-process equity financings as deferred offering costs until such financings are consummated. After consummation of the equity financing, these costs are recorded in stockholders' equity (deficit) as a reduction of additional paid-in capital generated as a result of the offering. Should the in-process equity financing be abandoned, the deferred offering costs will be expensed immediately as a charge to operating expenses in the statements of operations. As of December 31, 2017 and 2018, the Company had not recorded any deferred offering costs.

Fair Value of Financial Instruments

The Company's financial instruments consist of cash equivalents, short-term investments, accounts payable, accrued expenses, convertible notes and derivatives embedded within the convertible notes. The carrying amount of accounts payable and accrued expenses are considered a reasonable estimate of their fair value, due to the short-term maturity of these instruments. The Company's cash equivalents, short-term investments and derivative liabilities are carried at fair value, determined according to the fair value hierarchy described below (see Note 10).

The Company follows the guidance in FASB ASC 820, *Fair Value Measurements and Disclosures*, which defines fair value and establishes a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1 measurements) and the lowest priority to unobservable inputs (Level 3 measurements). The three levels of the fair value hierarchy are described below:

Level 1: Quoted prices (unadjusted) in active markets for identical assets or liabilities that the reporting entity has the ability to access at the measurement date.

Level 2: Valuations based on quoted prices in markets that are not active or for which all significant inputs are observable, either directly or indirectly.

Level 3: Prices or valuations that require inputs that are both significant to the fair value measurement and unobservable.

To the extent that valuation is based on models or inputs that are less observable or unobservable in the market, the determination of fair value requires more judgment. Accordingly, the degree of judgment exercised by the Company in determining fair value is greatest for instruments categorized in Level 3. A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement.

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Fair value is a market-based measure considered from the perspective of a market participant rather than an entity-specific measure. Therefore, even when market assumptions are not readily available, the Company's own assumptions reflect those that market participants would use in pricing the asset or liability at the measurement date. The Company uses prices and inputs that are current as of the measurement date, including during periods of market dislocation. In periods of market dislocation, the observability of prices and inputs may be reduced for many instruments. This condition could cause an instrument to be reclassified from Level 1 to Level 2 or Level 2 to Level 3.

Convertible Notes and Derivative Liabilities

In connection with the issuance of the Wellcome Trust Convertible Notes and the Convertible Notes (see Note 5), the Company has identified embedded derivatives, which are recorded as liabilities on the Company's balance sheets and are remeasured to fair value at each reporting date until the derivative is settled. Changes in the fair value of the derivative liabilities are recognized as change in fair value of derivative in the statements of operations. The fair value of the derivative liabilities are determined at each period end using a with and without method, which assesses the likelihood and timing of events that would result in either a conversion or change-of-control feature being triggered, as well as changes in the market conditions.

Upon issuance of the notes, each note was recorded at cost, net of the derivative liability. The discount on each note is amortized as interest expense to the date such note is expected to convert using the effective interest rate method and is reflected in the statements of operations as accretion of debt discount.

The Company classifies its derivative liabilities in the balance sheet as current or non-current based on its expectation of when the derivative will be settled, consistent with the assumptions used when determining the fair value of the derivative liabilities.

Redeemable Convertible Preferred Stock

The Company records all shares of redeemable convertible preferred stock at their respective fair values on the dates of issuance, net of issuance costs. The redeemable convertible preferred stock is recorded outside of permanent equity because upon the occurrence of certain deemed liquidation events, the majority of the holders can opt to redeem the shares at the liquidation preference and these events, including a merger, acquisition or sale of substantially all of the assets, are considered not solely within the Company's control. The Company has not adjusted the carrying values of the redeemable convertible preferred stock to its redemption value because it is uncertain whether or when a deemed liquidation event would occur. If a deemed liquidation event becomes probable, the carrying value will be adjusted to the redemption value at that time.

Property and Equipment

Property and equipment are stated at cost less accumulated depreciation and any accumulated impairment losses. Cost includes expenditure that is directly attributable to the acquisition of the asset. Depreciation is calculated using the straight-line method over the estimated useful lives of the related assets:

	Estimated Useful Life
Laboratory equipment	5 years
Computer equipment	3-5 years
Leasehold improvements	Shorter of life of lease or estimated useful life

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Depreciation methods, useful lives and residual values are reviewed at least annually and adjusted, if appropriate.

Impairment of Long-lived Assets

Long-lived assets consist of property and equipment. Long-lived assets to be held and used are tested for recoverability whenever events or changes in business circumstances indicate that the carrying amount of the assets may not be fully recoverable. Factors that the Company considers in deciding when to perform an impairment review include significant underperformance of the business in relation to expectations, significant negative industry or economic trends and significant changes or planned changes in the use of the assets. If an impairment review is performed to evaluate a long-lived asset for recoverability, the Company compares forecasts of undiscounted cash flows expected to result from the use and eventual disposition of the long-lived asset to its carrying value. An impairment loss would be recognized when estimated undiscounted future cash flows expected to result from the use of an asset are less than its carrying amount. The impairment loss would be based on the excess of the carrying value of the impaired asset over its fair value, determined based on discounted cash flows. To date, the Company has not recorded any impairment losses on long-lived assets.

Leases

Leases are classified at their inception as either operating or capital leases based on the economic substance of the agreement. The Company recognizes rent expense for its operating leases, inclusive of rent escalation provisions and rent holidays, on a straight-line basis over the respective lease term. Additionally, the Company recognizes tenant improvement allowances under the operating leases as a deferred lease obligation and amortizes the tenant improvement allowances as a reduction to rent expense on a straight-line basis over the respective lease term. At December 31, 2017 and 2018, no capital leases were recorded in the balance sheets.

Research and Development Costs

Research and development costs are expensed as incurred. Research and development costs include salaries and bonuses, stock compensation, employee benefits, consulting costs and external contract research and development and manufacturing expenses.

Upfront payments and milestone payments made for the licensing of technology are expensed as research and development in the period in which they are incurred. Advance payments for goods or services to be received in the future for use in research and development activities are recorded as prepaid expenses. The prepaid amounts are expensed as the related goods are delivered or the services are performed.

Research Contract Costs and Accruals

The Company accrues for estimated costs of research and development activities conducted by third-party service providers, which include the conduct of preclinical studies and clinical trials, and contract manufacturing activities. The Company records the estimated costs of research and development activities based upon the estimated amount of services provided and includes these costs in accrued liabilities in the balance sheets and within research and development expense in the statements of operations. When evaluating the adequacy of the accrued liabilities, the Company analyzes progress of the research studies or clinical trials and manufacturing activities, including the phase or completion of events, invoices received and contracted costs. Significant judgments and estimates may be made in determining the accrued balances at the end of any reporting period. Actual results could differ from the Company's estimates. The Company's historical accrual estimates have not been materially different from the actual costs.

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Patent Costs

All patent-related costs incurred in connection with filing and prosecuting patent applications are expensed as incurred due to the uncertainty about the recovery of the expenditure. Amounts incurred are classified as general and administrative expenses.

Stock-Based Compensation

The Company measures all stock options and other stock-based awards based on the fair value on the date of the grant using the Black-Scholes option-pricing model and recognizes compensation expense of those awards over the requisite service period, which is generally the vesting period of the respective award. The Company has mainly issued stock options with service-based vesting conditions and records the expense for these awards using the straight-line method. The Company has also issued stock options with performance-based vesting conditions and records the expense for these awards at the time that the achievement of the performance becomes highly probable or complete.

The Company classifies stock-based compensation expense in its statements of operations in the same manner in which the award recipient's payroll costs are classified or in which the award recipients' service payments are classified.

The Company recognizes adjustments to stock-based compensation expense for forfeitures as they occur. The fair value of each stock option grant is estimated on the date of grant using the Black-Scholes option-pricing model. The Company historically has been a private company and lacks company-specific historical and implied volatility information. Therefore, it estimates its expected stock volatility based on the historical volatility of a publicly traded set of peer companies and expects to do so until such time as it has adequate historical data regarding the volatility of its own traded stock price.

The expected term of the Company's stock options has been determined utilizing the "simplified" method for awards that qualify as "plain-vanilla" options. The risk-free interest rate is determined by reference to the U.S. Treasury yield curve in effect at the time of grant of the award for time periods approximately equal to the expected term of the award. Expected dividend yield is based on the fact that the Company has never paid cash dividends and does not expect to pay any cash dividends in the foreseeable future.

Determination of Fair Value of Common Stock on Grant Dates

As there has been no public market for the Company's equity instruments to date, the estimated fair value of the Company's common stock has been determined by the board of directors as of the grant date, with input from management, considering the Company's most recently available third-party valuations of common stock and the board of directors' assessment of additional objective and subjective factors that it believed were relevant and which may have changed from the date of the most recent valuation through the date of the grant. These third-party valuations were performed in accordance with the guidance outlined in the American Institute of Certified Public Accountants' Accounting and Valuation Guide, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation*. The Company's common stock valuations were prepared using either a Discounted Cash Flow Analysis ("DCF"), an option-pricing method ("OPM"), or a probability-weighted expected return method ("PWERM"), which use a combination of market approaches and an income approach to estimate the Company's enterprise value. The DCF is based on management's projection of future revenues and costs. The future cash flows are adjusted for the cost of capital and clinical risk of the program to arrive at a risk-adjusted present-day value of the future cash flows and fair value of equity. The OPM treats common securities and preferred securities as call options on the total equity value of the Company, with exercise prices based on the value thresholds at which the allocation among the

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various holders of a company's securities changes. Under this method, the common and preferred stock have value only if the funds available for distribution to members are expected to exceed the value of the preferred security liquidation preference at the time of the liquidity event, such as a strategic sale or a merger. The PWERM is a scenario-based methodology that estimates the fair value of common and preferred stock based upon an analysis of future values for the company, assuming various outcomes. The common and preferred stock values are based on the probability-weighted present value of expected future investment returns considering each of the possible outcomes available as well as the rights of each class of common and preferred securities.

Income Taxes

The Company accounts for income taxes under the asset and liability method. Under this method, deferred tax assets and liabilities are determined based on the difference between the financial statement and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to affect taxable income. The effect of a change in tax rates on deferred tax assets and liabilities is recognized in income in the period that includes the enactment date. Valuation allowances are established when necessary to reduce deferred tax assets to the amounts expected to be realized.

The Company assesses all material positions taken in any income tax return, including all significant uncertain positions, in all tax years that are still subject to assessment or challenge by the relevant taxing authorities. Assessing an uncertain tax position begins with the initial determination of the positions sustainability and is measured at the largest amount of benefit that is greater than fifty percent likely of being realized upon ultimate settlement. At each balance sheet date, unresolved uncertain tax positions must be reassessed, and the Company will determine whether (i) the factors underlying the sustainability assertion have changed and (ii) the amount of the recognized benefit is still appropriate. The recognition and measurement of tax benefits requires significant judgment. Judgments concerning the recognition and measurement of a tax benefit might change as new information becomes available.

Net Loss Per Share

The Company follows the two-class method when computing net income (loss) per share, as the Company has issued shares that meet the definition of participating securities. The two-class method determines net income (loss) per share for each class of common and participating securities according to dividends declared or accumulated and participation rights in undistributed earnings. The two-class method requires income available to common stockholders for the period to be allocated between common and participating securities based upon their respective rights to receive dividends as if all income for the period had been distributed.

Basic net income (loss) per share attributable to common stockholders is computed by dividing the net income (loss) attributable to common stockholders by the weighted average number of shares of common stock outstanding for the period. Diluted net income (loss) attributable to common stockholders is computed by adjusting income (loss) attributable to common stockholders to reallocate undistributed earnings based on the potential impact of dilutive securities, including outstanding stock options. Diluted net income (loss) per share attributable to common stockholders is computed by dividing the diluted net income (loss) attributable to common stockholders by the weighted average number of common shares outstanding for the period, including potential dilutive common shares assuming the dilutive effect of outstanding stock options.

The Company's outstanding redeemable convertible preferred stock contractually entitle the holders of such shares to participate in distributions but contractually does not require the holders of

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such shares to participate in losses of the Company. Accordingly, in periods in which the Company reports a net loss attributable to common stockholders, diluted net loss per share attributable to common stockholders is the same as basic net loss per share attributable to common stockholders, since dilutive common shares are not assumed to have been issued if their effect is anti-dilutive.

The Company reported a net loss attributable to common stockholders for the years ended December 31, 2017 and 2018.

Comprehensive Loss

Comprehensive loss includes net loss as well as other changes in stockholders' equity (deficit) that result from transactions and economic events other than those with stockholders. There was no difference between net loss and comprehensive loss for the years ended December 31, 2017 and 2018.

Recently Adopted Accounting Pronouncements

In August 2014, the FASB issued ASU 2014-15, *Disclosure of Uncertainties about an Entity's Ability to Continue as a Going Concern* ("ASU 2014-15"). ASU 2014-15 requires management to evaluate relevant conditions, events, and certain management plans that are known or reasonably knowable that, when considered in the aggregate, raise substantial doubt about the entity's ability to continue as a going concern within one year after the date that the financial statements are issued, for both annual and interim periods. ASU 2014-15 also requires certain disclosures around management's plans and evaluation, as well as the plans, if any, that are intended to mitigate those conditions or events that will alleviate the substantial doubt. ASU 2014-15 was effective for fiscal years ending after December 15, 2016. The Company adopted this guidance for the fiscal year ending December 31, 2017.

In May 2014, the Financial Accounting Standards Board issued Accounting Standards Update No. 2014-09, *Revenue from Contracts with Customers* (Topic 606) ("ASC 606"), and further updated through ASU 2016-12, which amends the existing accounting standards for revenue recognition. For public business entities, this standard is effective for annual reporting periods beginning after December 15, 2017, including interim periods within that reporting period. For all other entities, this standard is effective for annual reporting periods beginning after December 15, 2018, and interim periods within annual periods beginning after December 15, 2019. Early adoption is permitted. Effective January 1, 2017, the Company adopted ASC 606, using the full retrospective method. The adoption did not have an impact on the Company's financial statements as the Company has historically not had contracts with customers or recorded revenue to date.

In June 2018, the FASB issued Accounting Standards Update 2018-07, *Compensation—Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting* ("ASU 2018-07"), which expands the scope of Topic 718 to include all share-based payment transactions for acquiring goods and services from nonemployees. ASU 2018-07 specifies that Topic 718 applies to all share-based payment transactions in which the grantor acquires goods and services to be used or consumed in its own operations by issuing share-based payment awards. ASU 2018-07 also clarifies that Topic 718 does not apply to share-based payments used to effectively provide (1) financing to the issuer or (2) awards granted in conjunction with selling goods or services to customers as part of a contract accounted for under ASC 606. The transition method provided by ASU 2018-07 is a modified retrospective basis which recognizes a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption. Effective January 1, 2017, the Company adopted ASU 2018-07, using the modified retrospective method. Management deems that non-employees who provide services to the Company have similar traits as employees with regard to their continued involvement in

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the Company, and therefore concluded that the adoption of ASU 2018-07 more fairly represented the results of the Company's operations. The cumulative effect of the change on retained earnings for awards granted to non-employees as of January 1, 2017 was less than $0.1 million.

In March 2016, FASB issued ASU 2016-09, *Stock Compensation—Improvements to Employee Share-Based Payment Accounting* ("ASU 2016-09"). On January 1, 2017, the Company adopted the amendments to ASC 718, which simplify accounting for share-based payment transactions. Prior to this amendment, excess tax benefits resulting from the difference between the deduction for tax purposes and the compensation costs recognized for financial reporting were not recognized until the deduction reduced taxes payable. Under the new method, the Company recognizes excess tax benefits in the current accounting period. In addition, prior to January 1, 2017, the employee share-based compensation expense was recorded net of estimated forfeiture rates and subsequently adjusted at the vesting date, as appropriate. As part of the amendment, the Company has stopped estimating forfeitures and elected to recognize the actual forfeitures by reducing the employee share-based compensation expense in the same period as the forfeitures occur. The Company has adopted these changes in accounting method using the modified retrospective method under which the Company should recognize the cumulative effect adjustment to the opening accumulated deficit as of January 1, 2017. The cumulative effect of the changes as of January 1, 2017 for the adoption of ASU 2016-09 was immaterial. Hence, the Company did not recognize the cumulative effect adjustment in its financial statements.

In August 2016, the FASB issued ASU No. 2016-15, *Statement of Cash Flows* (Topic 230)*: Classification of Certain Cash Receipts and Cash Payments*. This guidance addresses specific cash flow issues with the objective of reducing the diversity in practice for the treatment of these issues. The areas identified include: debt prepayment or debt extinguishment costs; settlement of zero-coupon debt instruments; contingent consideration payments made after a business combination; proceeds from the settlement of insurance claims; proceeds from the settlement of corporate-owned life insurance policies; distributions received from equity method investees; beneficial interests in securitization transactions; and application of the predominance principle with respect to separately identifiable cash flows. The Company adopted this new guidance beginning January 1, 2017, on a retrospective basis, which did not result in a material impact on its financial statements and related disclosures.

In November 2016, the FASB issued ASU 2016-18, *Restricted Cash*. The new standard requires restricted cash and restricted cash equivalents be included with cash and cash equivalents when reconciling the total beginning and ending amounts for the periods shown on the statement of cash flows. The Company has early adopted this new standard effective on January 1, 2018. The impact of the adoption was to reduce operating activities by the movement in restricted cash for each annual period presented, and to include cash, cash equivalents and restricted cash in a newly titled "Cash, cash equivalents, and restricted cash at beginning of year" and "Cash, cash equivalents, and restricted cash at the end of year" in the statements of cash flows.

In May 2017, the FASB issued ASU No. 2017-09, *Compensation—Stock Compensation* (Topic 718): *Scope of Modification Accounting* ("ASU 2017-09"). This new guidance amends the scope of modification accounting for share-based payment awards. ASU 2017-09 provides guidance on the types of changes to the terms or conditions of share-based payment awards to which an entity would be required to apply modification accounting under ASC 718. Effective January 1, 2017, the Company adopted ASU No. 2017-09, using the full retrospective method and will be applied prospectively to an award modified on or after the adoption date. The cumulative effect of the changes as of January 1, 2017 for the adoption of ASU 2017-09 was immaterial. Hence, the Company did not recognize the cumulative effect adjustment in its financial statements.

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Recently Issued Accounting Pronouncements

In February 2016, the FASB issued ASU No. 2016-02, Leases ("ASU 2016-02"). ASU 2016-02 will require lessees to recognize most leases on their balance sheet as a right-of-use asset and a lease liability. Leases will be classified as either operating or finance, and classification will be based on criteria similar to current lease accounting, but without explicit bright lines. For public entities, the guidance is effective for annual reporting periods beginning after December 15, 2018 and for interim periods within those fiscal years. For non-public entities, the guidance is effective for annual reporting periods beginning after December 15, 2019. Early adoption is permitted for all entities. The Company is currently evaluating the impact that the adoption of ASU 2016-02 will have on its financial statements.

Note 3. Property and Equipment, Net

Property and equipment, net, consisted of the following (in thousands):

	December 31,	
	2017	2018
Laboratory equipment	$ 5	$ 31
Computer equipment	8	8
Leasehold improvements	-	106
Total property and equipment	13	145
Less: accumulated depreciation	(1)	(7)
Property and equipment, net	$ 12	$ 138

Depreciation expense was less than $0.1 million for the years ended December 31, 2017 and 2018.

Note 4. Prepaid Expenses and Other Current Assets and Accrued Expenses

Prepaid expenses and other current assets consisted of the following (in thousands):

	December 31,	
	2017	2018
Prepaid research and development expenses	$ 167	$ 1,686
Other	8	23
Total prepaid expenses and other current assets	$ 175	$ 1,709

Accrued expenses consisted of the following (in thousands):

	December 31,	
	2017	2018
Accrued payroll and related expenses	$ 143	$ 311
Accrued research and development expenses	119	100
Professional fees	133	75
Other	38	52
Total accrued expenses	$ 433	$ 538

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Note 5. Convertible Notes Payable

Wellcome Trust Convertible Notes

On July 31, 2015, the Company entered into a Company Funding Agreement (the "Funding Agreement") with The Wellcome Trust Limited ("Wellcome Trust"), a related party, under which the Company was eligible to receive up to $3.8 million in gross proceeds from the issuance of a convertible note (the "2015 Convertible Note"). As of December 31, 2017, the Company had received the full $3.8 million under the Funding Agreement. In June 2018, the Company entered into a second Company Funding Agreement with Wellcome Trust to receive up to $8.0 million in gross proceeds from the issuance of a convertible note (the "2018 Convertible Note"). The Company received $2.0 million of proceeds in July 2018 and another $2.7 million in November 2018. The 2015 Convertible Note and 2018 Convertible Note are together referred to as the Wellcome Trust Notes.

The Wellcome Trust Notes have a stated interest rate of 2% per annum above the three-month Dollar LIBOR rate, which is not payable until settlement of the principal. The notes are subject to redemption upon written demand by Wellcome Trust any time after the fifth anniversary of the effective date, resulting in their classification as long-term liabilities as of December 31, 2017 and 2018. The principal due under the Wellcome Trust Notes converts into the class of the Company's stock issued in the Company's next qualified financing or upon event of default at a discounted conversion price between 0% and 25% of the purchase price per share of such securities issued. The accrued interest in such a circumstance would be forgiven.

At inception, the Company concluded that the Wellcome Trust Notes contain a conversion option at a significant discount that was deemed to be an embedded derivative, which is required to be bifurcated and accounted for separately from the debt host. Upon issuance of the 2015 Convertible Note, the Company allocated a total of $0.5 million to the derivative as a debt discount, which was accreted through the conversion date of the note. The derivative associated with the issuance of the 2018 Convertible Note in July 2018 was assigned no value, as there was no discount recognized on conversion in connection with the closing of the Series A Preferred Stock financing.

In August 2018, all outstanding principal under the Wellcome Trust Notes was converted into Series A Preferred Stock.

In November 2018, the Company received an additional $2.7 million under the 2018 Convertible Note, $0.4 million of which was allocated to the derivative as a debt discount, which is being accreted to the expected conversion date of the note. There were no debt issuance costs associated with the Wellcome Trust Notes.

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The Company recognized the following changes in the debt related to the Wellcome Trust Notes during the years ended December 31, 2017 and 2018 (in thousands):

		Financial statement impacted
Balance, December 31, 2016	$ 3,331	
Issuance of 2015 Convertible Note	404	Balance sheets
Allocation of proceeds to derivative liability	(71)	Balance sheets
Accretion to settlement value	197	Statements of operations
Accrued interest	124	Statements of operations
Balance, December 31, 2017	3,985	
Issuance of 2018 Convertible Note	2,000	Balance sheets
Accretion to settlement value	51	Statements of operations
Accrued interest	102	Statements of operations
Interest forgiven upon conversion	(289)	Statements of operations
Conversion of Wellcome Trust notes to Series A redeemable convertible preferred stock	(5,849)	Balance sheets
Balance, August 1, 2018 (date of conversion)	-	
Issuance of 2018 Convertible Note	2,700	Balance sheets
Allocation of proceeds to derivative liability	(375)	Balance sheets
Accretion to settlement value	180	Statements of operations
Accrued interest	11	Statements of operations
Balance, December 31, 2018	$ 2,516	

Convertible Notes

From 2011 through 2016, the Company issued convertible notes with principal totaling $3.1 million (the “Convertible Notes”). Of this aggregate principal amount, $2.6 million of the Convertible Notes were issued to PureTech Health LLC (“PureTech Health”), a related party (see Note 13). During the years ended December 31, 2017 and 2018, the Company issued Convertible Notes to PureTech Health with principal totaling $3.8 million and $7.0 million, respectively. There were no debt issuance costs associated with the Convertible Notes.

The Convertible Notes have a stated interest rate of 10% per annum which is not payable until the settlement of the principal. The notes mature upon written demand by the majority note holders. In the event of a default, the interest rate is 15% per annum. Principal and unpaid interest due under the notes convert on demand of a majority of note holders into the class of the Company’s stock issued in the Company’s next qualified financing at a conversion price between 0% to 25% discount off of the purchase price per share of such securities issued. Given that the convertible notes mature upon written demand by the majority note holders, they are classified as current liabilities in the balance sheet as of December 31, 2017.

The Company concluded that the Convertible Notes contained a conversion option at a significant premium that was deemed to be an embedded derivative, which is required to be bifurcated and accounted for separately from the debt host.

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In August 2018, the outstanding Convertible Notes were converted to Series A Preferred Stock. The Company recognized the following changes in the debt related to the Convertible Notes during the years ended December 31, 2017 and 2018 (in thousands):

		Financial statement impacted
Balance, December 31, 2016	$ 3,903	
Issuance of new notes	3,846	Balance sheets
Allocation of proceeds to derivative liability	(925)	Balance sheets
Accretion to settlement value	419	Statements of operations
Accrued interest	431	Statements of operations
Balance, December 31, 2017	7,674	
Issuance of new notes	7,000	Balance sheets
Allocation of proceeds to derivative liability	(1,418)	Balance sheets
Accretion to settlement value	1,945	Statements of operations
Accrued interest	630	Statements of operations
Interest forgiven upon conversion	(47)	Statements of operations
Conversion of Convertible Notes to Series A redeemable convertible preferred stock	(15,784)	Balance sheets
Balance, December 31, 2018	$ -	

Note 6. Redeemable Convertible Preferred Stock

Series Seed Redeemable Convertible Preferred Stock

Between 2009 and 2011, the Company authorized and issued 4,412,500 shares of Series Seed Preferred Stock at an issuance price of $0.0001 per share, for total proceeds of less than $0.1 million.

There were no issuance costs in connection with the Series Seed Preferred Stock issuance.

Series A Redeemable Convertible Preferred Stock

In August 2018, the Company authorized 3,126,700 shares of Series A Preferred Stock. The Company then issued 1,188,707 shares of Series A Preferred Stock at an issuance price of $13.46 per share resulting in gross proceeds of approximately $16.0 million. There were $0.1 million of issuance costs associated with the Series A Preferred Stock.

In conjunction with the August 2018 issuance of Series A Preferred Stock, all outstanding principal and accrued interest under the Wellcome Trust Notes and Convertible Notes converted to 1,937,993 shares of Series A Preferred Stock.

The Series Seed and Series A redeemable convertible preferred stock (together as “Preferred Stock”) have the following rights and preferences:

Voting: On any matter presented to the stockholders of the Company for their action or consideration at any meeting of stockholders of the Company, 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.

Dividends: Prior to and in preference of any dividends declared for common stock of the Company, the Board of Directors may elect to declare dividends on each share of Preferred Stock.

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Liquidation preference: In the event of any liquidation, dissolution or winding-up of the Company, the Preferred Stock shall be entitled to receive an amount per share equal to the greater of (i) the original issue price, plus any dividends declared but unpaid thereon, or (ii) such amount per share as would have been payable had all shares of such class or series of Preferred Stock been converted into common stock, prior to any distributions being made to common stock. If upon liquidation, dissolution or winding up of the Company, the assets available for distribution are insufficient to pay the holders of Preferred Stock the full amount to which they are entitled, the Preferred Stock holders share ratably in any distribution of the assets.

Conversion: Each share of Preferred Stock is convertible at the option of the holder at any time after issuance into the number of fully paid and non-assessable shares of common stock as determined by dividing the original issue price of each series of Preferred Stock by the conversion price of each series in effect at time of the conversion. The initial conversion price is the respective original issue price, subject to adjustment in accordance with the anti-dilution provisions of the stock. Each share of Preferred Stock will automatically be converted into one share of common stock at the then effective conversion rate in the event of either (i) a qualified initial public offering that results in minimum gross proceeds to the Company of $50.0 million or (ii) the election of the holders of the then outstanding Preferred Stock. As of December 31, 2018, none of the outstanding shares of Preferred Stock had been converted into common stock.

Redemption: The Preferred Stock may be redeemed upon a Deemed Liquidation Event as defined in the Company's Certificate of Incorporation. The Preferred Stock may be redeemed at the greater of (i) the original issue price per share, plus any dividends declared but unpaid thereon, or (ii) such amount per share as would have been payable had all shares of such class or series of Preferred Stock been converted into common stock prior to the Deemed Liquidation Event. At December 31, 2018, the shares of Preferred Stock were not redeemable and the likelihood of an occurrence of a Deemed Liquidation Event was not deemed to be probable.

Reissuance: Shares of any Preferred Stock that are redeemed or converted will be retired or canceled and may not be reissued by the Company.

The original issuance price of the Preferred Stock was $1.00 per share and $13.46 per share for the Series Seed Preferred Stock and Series A Preferred Stock, respectively.

Note 7. Common Stock

As of December 31, 2018, the Company's Certificate of Incorporation authorized the Company to issue 12,337,650 shares of common stock, $0.0001 par value per share.

The voting, dividend and liquidation rights of the holders of common stock are subject to and qualified by the rights, powers, and preferences of the holders of the shares of Preferred Stock. 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 the Company's 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 of one or more other such series, to vote thereon pursuant to the Company's Certificate of Incorporation or pursuant to Delaware General Corporation Law.

Subject to the payment in full of all preferential dividends to which the holders of the Preferred Stock are entitled, the holders of common stock shall be entitled to receive dividends out of funds legally available. In the event of any voluntary or involuntary liquidation, dissolution or winding up of the

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Company, after the payment or provision for payment of all debts and liabilities of the Company and all preferential amounts to which the holders of Preferred Stock are entitled with respect to the distribution of assets in liquidation, the holders of common stock shall be entitled to share ratably in the remaining assets of the Company available for distribution.

As of December 31, 2018, there were twelve shares of common stock outstanding.

Note 8. Net Loss per Share

Net Loss per Share

To date, the Company has been funded solely through the issuance of convertible notes and Preferred Stock. As of December 31, 2017, the Company had no shares of common stock outstanding. On August 21, 2018, PureTech Health, a related party (see Note 9), exercised a warrant to purchase twelve shares of common stock, resulting in a weighted-average number of common shares outstanding during the year ended December 31, 2018 of four shares and a net loss per share for this same period of $4.4 million.

The Company's outstanding Preferred Stock contractually entitle the holders of such shares to participate in distributions but contractually does not require the holders of such shares to participate in losses of the Company. Accordingly, these shares have not been included in the denominator used to calculate net loss per share.

Common Stock Equivalents

The following common stock equivalents presented based on amounts outstanding at each period end, have been excluded from the calculation of diluted net loss per share because including them would have had an anti-dilutive impact:

	December 31,	
	2017	2018
Redeemable convertible preferred stock (as converted to common stock)	5,730,513	9,791,151
Stock options to purchase common stock	1,100,224	2,310,369
Warrants to purchase common stock	19,998	19,986
	6,850,735	12,121,506

Note 9. Stock-based Compensation

2009 Stock Incentive Plan

In September 2009, the Company's board of directors approved the 2009 Stock Incentive Plan (the "2009 Plan") which provides for the grant of incentive stock options to employees and nonstatutory stock options to directors, consultants, and non-employees of the Company up to an aggregate of 1,298,700 shares of the Company's common stock. The board of directors approved increasing the aggregate shares to 1,412,336 on April 30, 2011. In August 2018, in conjunction with the issuance of Series A Preferred Stock, the Company approved an increase in the aggregate common shares issuable to 2,453,074. A total of 142,705 shares remained available for issuance under the 2009 Plan as of December 31, 2018. In March 2019, in conjunction with the issuance of Series B Preferred Stock, the Company approved to increase the aggregate common shares issuable to 3,911,138.

Options generally vest based on the grantee's continued service with the Company during a specified period following a grant as determined by the board of directors and expire ten years from the grant date. In general, awards typically vest in four years, but vesting conditions can vary based on the discretion of the Company's board of directors.

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A summary of the Company's stock option activity and related information is as follows:

	Number of Shares	Weighted-Average Exercise Price Per Share	Weighted-Average Remaining Contractual Term (Years)	Aggregate Intrinsic Value (in thousands)
Outstanding as of December 31, 2016	953,797	$ 0.81	5.6	$ 4,425
Granted	146,427	5.45		
Exercised	-	-		
Forfeited	-	-		
Outstanding as of December 31, 2017	1,100,224	1.43	5.2	6,170
Granted	1,231,573	7.24		
Exercised	-	-		
Forfeited	(21,428)	5.45		
Outstanding as of December 31, 2018	2,310,369	4.49	7.1	6,420
Options vested and expected to vest as of December 31, 2018	2,310,369	$ 4.49	7.1	$ 6,420
Options exercisable as of December 31, 2018	1,109,247	1.93	4.5	5,921

The aggregate intrinsic values of options outstanding, exercisable, vested and expected to vest were calculated as the difference between the exercise price of the options and the estimated fair value of the Company's common stock, as determined by the Board of Directors, as of December 31, 2018.

As of December 31, 2018, there was $3.8 million of unrecognized compensation cost, which is expected to be recognized over a weighted-average period of 2.1 years.

The fair value of all option activity was estimated at the date of grant using the Black-Scholes model with the following assumptions:

	Year Ended December 31,	
	2017	2018
Fair value of options	$2.69 - $2.71	$3.46 - $4.23
Fair value of common stock	$5.45	$7.04 - $7.27
Expected term (in years)	6.03 - 6.16	5.65 - 9.34
Expected volatility	49.41% - 50.35%	45.57% - 48.84%
Risk-free interest rate	1.84% - 2.13%	2.69% - 3.04%
Expected dividend yield	0.00%	0.00%

Warrants

In October 2016, PureTech Health, a related party, agreed to provide management services to the Company in exchange for a warrant to purchase up to 19,998 shares of the Company's common stock. The warrant vests monthly as services are performed over a 24-month period and has a purchase price of $2.92 per share. The total expense for the years ended December 31, 2017 and 2018 for the warrant was less than $0.1 million. As of December 31, 2018, there was $0 of unrecognized compensation cost related to the warrants, as the warrant was fully vested.

In August 2018, PureTech Health exercised the warrant to purchase 12 shares resulting in proceeds to the Company of less than $0.1 million.

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Stock-based Compensation Expense

Stock-based compensation expense is classified in the statements of operations for the years ended December 31, 2017 and 2018 as follows (in thousands):

	Year Ended December 31,	
	2017	2018
Research and development	$ 49	$ 107
General and administrative	131	851
Total stock based compensation expense	$ 180	$ 958

Note 10. Fair Value of Financial Assets and Liabilities

The following table presents information about the Company's assets and liabilities as of December 31, 2017 and 2018 that are measured at fair value on a recurring basis and indicates the level of the fair value hierarchy utilized to determine such fair values (in thousands):

	Fair Value Measurement at December 31, 2018 Using			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents (US Treasuries)	$ 5,042	$ -	$ -	$ 5,042
Short-term investments	4,983	-	-	4,983
Total	$10,025	$ -	$ -	$10,025
Liabilities:				
Derivative instrument	$ -	$ -	$ 389	$ 389
Total	$ -	$ -	$ 389	$ 389

	Fair Value Measurement at December 31, 2017 Using			
	Level 1	Level 2	Level 3	Total
Liabilities:				
Derivative instrument	$ -	$ -	$2,606	$ 2,606
Total	$ -	$ -	$2,606	$ 2,606

The estimated fair value and amortized cost of the Company's short-term investments by contractual maturity are summarized as follows (in thousands):

	December 31, 2018			
	Amortized Cost	Unrealized Gains	Unrealized Losses	Fair Value
Due in one year or less	$ 4,984	$ -	$ (1)	$ 4,983
Total	$ 4,984	$ -	$ (1)	$ 4,983

The derivative liability is considered a Level 3 liability because its fair value measurement is based, in part, on significant inputs not observed in the market. The Company determined the fair value of the liability as described in Note 5. Any reasonable changes in the assumptions used in the valuation could materially affect the financial results of the Company. The Company recognized the

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following changes in the fair value of derivative liabilities during the years ended December 31, 2017 and 2018 (in thousands):

Balance, December 31, 2016	$ 1,555
Allocation of note issuance proceeds to derivative	996
Change in fair value of derivative	55
Balance, December 31, 2017	2,606
Allocation of note issuance proceeds to derivative	1,418
Change in fair value of derivative	430
Conversion of convertible debt to Series A preferred stock	(4,454)
Balance, August 1, 2018 (date of conversion)	-
Allocation of note issuance proceeds to derivative	375
Change in fair value of derivative	14
Balance, December 31, 2018	$ 389

Note 11. Commitments and Contingencies

Leases

The Company entered into a 51 month lease for office space in Boston, Massachusetts that began in December 2018 and expires in February 2023. The Company is required to maintain a cash balance of $0.1 million to secure a letter of credit associated with this lease. The amount was classified as restricted cash in the balance sheet at December 31, 2018.

The Company recorded rent expense of less than $0.1 million during the year ended December 31, 2018. Future minimum lease payments under non-cancelable operating lease agreements as of December 31, 2018, are as follows (in thousands):

Year Ending December 31,	Minimum Lease Payments
2019	$ 335
2020	499
2021	506
2022	514
2023	86
Total	$ 1,940

Intellectual Property License with PureTech Health

In March 2011, the Company entered into a royalty-bearing exclusive patent license agreement with PureTech Health, a related party, granting the Company rights to research, develop, make, use, sell, and lease technology covered by two then-pending patent applications (the “Patent License”). The two patents pending related to methods and compositions for treatment of disorders ameliorated by muscarinic receptor activation. The Company paid no initial upfront costs upon signing the agreement. Under the agreement, of products covered by the patents, the Company will owe PureTech Health a low single digit percentage running royalty of annual net sales by the Company. Additionally, upon certain clinical and regulatory approval events, the Company will owe PureTech amounts in the form of milestone payments, totaling $10.0 million.

The Company incurred no expenses related to the Patent License provided by PureTech Health during the years ended December 31, 2017 and 2018. The Company had no outstanding liabilities to PureTech Health related to the Patent License at December 31, 2017 and 2018.

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Intellectual Property License with Eli Lilly and Company

In May 2012, the Company entered into an agreement with Eli Lilly and Company to obtain rights to data, regulatory filings and patents (now expired) related to xanomeline. The Company paid an initial upfront payment of $0.1 million upon signing of the agreement, which was expensed when incurred. Upon certain regulatory approval events and other sales achievements, the Company will owe Eli Lilly and Company additional amounts in the form of milestone payments of up to $70.0 million and tiered royalties ranging from the low to mid single digits on sales. As of December 31, 2018, no milestones have been reached, and accordingly, no milestone payments have been made.

Indemnification

In the normal course of business, the Company enters into contracts and agreements that contain a variety of representations and warranties and provide for general indemnifications. The Company's exposure under these agreements is unknown because it involves claims that may be made against the Company in the future but have not yet been made. To date, the Company has not paid any claims or been required to defend any action related to its indemnification obligations. However, the Company may incur charges in the future as a result of these indemnification obligations.

Contingencies

From time to time, the Company may have certain contingent liabilities that arise in the ordinary course of its business activities. The Company accrues a liability for such matters when it is probable that future expenditures will be made, and such expenditures can be reasonably estimated.

Litigation

The Company is not a party to any litigation and does not have contingency reserves established for any litigation liabilities as of December 31, 2018.

Note 12. Income Taxes

On December 22, 2017, the Tax Cuts and Jobs Act (the "TCJA") was signed into United States law. In December 2017, the SEC staff issued Staff Accounting Bulletin No. 118, *Income Tax Accounting Implications of the Tax Cuts and Jobs Act (SAB 118)*, which allowed the Company to record provisional amounts during a measurement period not to extend beyond one year of the enactment date. The Company's provisional estimate associated with the reduction in the U.S. federal corporate tax rate from 35% to 21% impacted the change in valuation allowance and change in tax rate component of the Company's effective tax rate reconciliation as well as its ending deferred tax assets, and valuation allowance in the 2017 deferred tax footnote disclosure. In the fourth quarter of 2018, the Company completed the analysis to determine the effect of the TCJA and recorded no adjustments.

During the years ended December 31, 2017 and 2018, the Company recorded no income tax benefit for the net operating losses incurred or for the research and development tax credits generated in each year, due to the full valuation allowance maintained against the Company's net deferred tax assets.

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A reconciliation of the differences between the effective tax rates of the Company for the years ended December 31, 2017 and 2018, respectively, and the U.S. federal statutory tax rate are as follows:

	Year Ended December 31,	
	2017	2018
Statutory tax rate	34.0%	21.0%
State taxes, net of federal benefit	4.1	5.0
Share-based compensation	-0.6	-1.0
Change in derivative liability	-0.3	-0.5
Non-deductible interest expense	-6.6	-3.1
Other	0.2	0.0
Tax credits	0.0	3.0
Change in valuation allowance	-10.0	-24.4
Impact of 2018 tax rate changes on temporary differences	-20.8	0.0
Effective income tax rate	0.0%	0.0%

Significant components of the Company's deferred tax assets and liabilities at December 31, 2017 and 2018 are as follows (in thousands):

	December 31,	
	2017	2018
Deferred tax assets:		
Operating tax losses	$ 2,665	$ 6,288
Tax credit carryforwards	-	537
Accrued expenses	66	134
Share-based compensation	131	166
Deferred tax assets	2,862	7,125
Valuation allowance	(2,860)	(7,122)
Deferred tax liabilities:		
Depreciation	(2)	(3)
Deferred tax liabilities	(2)	(3)
	$ -	$ -

Deferred income taxes reflect the net tax effect of temporary differences between the carrying amount of assets and liabilities for financial reporting purposes and the amount used for income tax purposes. The Company applied the separate return method for allocation of current and deferred tax expense.

Until August 1, 2018, the Company filed federal and state taxes as part of a controlled group, PureTech Health, a related party, as it met the requirements to be included in the controlled group filing. The Company has not recorded any deferred tax assets for Research and Development tax credits for the period from inception through August 1, 2018 at which point the Company exited the controlled group. The Company believes that some of its activities do qualify for the credit during that time. Under Section §41 of the Internal Revenue Code of 1986, as amended (the "IRC"), Research and Development tax credits are required to be computed on a controlled group basis and as such, without additional input from companies outside of the Company's control, the Company cannot reasonably estimate its share of the overall credit. As a result, further analysis must be performed to determine the

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amount of the consolidated credit allocable to the Company. The Company has excluded from the deferred tax table above tax credits that were generated in periods prior to August 2018 as PureTech Health has not completed an analysis to determine the portion that would be available to the Company.

The Company is still required to file tax returns on a combined basis with PureTech Health in certain state jurisdictions. At December 31, 2018, the Company had federal net operating loss carryforwards totaling $23.0 million, of which $9.7 million begin to expire in 2029 and $13.3 million can be carried forward indefinitely. At December 31, 2018, the Company had state net operating loss carryforwards totaling $22.9 million which begin to expire in 2029. In addition, the Company has federal research credits of $0.5 million and state research credits of less than $0.1 million which expire in 2038 and 2033, respectively.

Management has evaluated the positive and negative evidence bearing upon the realizability of its deferred tax assets, which are comprised principally of net operating loss carryforwards and tax credit carryforwards. Under the applicable accounting standards, management has considered the Company's history of losses and concluded that it is more likely than not that the Company will not recognize the benefits of deferred tax assets. Accordingly, a full valuation allowance has been established against the net deferred tax assets at December 31, 2018. The valuation allowance increased by $4.3 million during the year ended December 31, 2018 which primarily relates to the current year operating loss and tax credits generated.

Under the provisions of the IRC, the net operating loss and tax credit carryforwards are subject to review and possible adjustment by the Internal Revenue Service and state tax authorities. Net operating loss and tax credit carryforwards may become subject to an annual limitation in the event of certain cumulative changes in the ownership interest of significant shareholders over a three-year period in excess of 50%, as defined under Sections 382 and 383 of the IRC, respectively, as well as similar state provisions. This could limit the amount of tax attributes that can be utilized annually to offset future taxable income or tax liabilities. The amount of the annual limitation is determined based on the value of the Company immediately prior to the ownership change. Subsequent ownership changes may further affect the limitation in future years. The Company has completed financings since its inception which may have resulted in a change in control as defined by Section 382 and 383 of the IRC, and it may complete future financings that could result in a change in control in the future. The Company completed a Section 382 study through December 31, 2018 and concluded that it experienced an ownership change during 2014 but has not experienced any subsequent ownership changes. Based on the results of this analysis, the Company does not expect the future utilization of net operating loss carryforwards to be materially limited.

The Company accounts for uncertain tax positions pursuant to ASC 740 which prescribes a recognition threshold and measurement process for financial statement recognition of uncertain tax positions taken or expected to be taken in a tax return. If the tax position meets this threshold, the benefit to be recognized is measured as the tax benefit having the highest likelihood of being realized upon ultimate settlement with the taxing authority. As of December 31, 2018, the Company has not recorded any unrecognized tax benefits. The Company has not, as yet, conducted a study of research and development tax credit carryforwards. This study may result in an adjustment to the Company's research and development credit carryforwards; however, until a study is completed and any adjustment is known, no amounts are being presented as an uncertain tax position. A full valuation allowance has been provided against the Company's research and development tax credits and, if an adjustment is required, this adjustment would be offset by an adjustment to the valuation allowance. Thus, there would be no impact to the balance sheets or statements of operations if an adjustment was required. The Company does not expect any material change in unrecognized tax benefits within the next twelve months.

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The Company is subject to taxation in the United States federal and certain state jurisdictions. The Company has incurred operating losses since inception, and therefore, the losses in all periods may be adjusted by taxing jurisdictions in future periods in which they are utilized.

Note 13. Related Party Transactions

PureTech Health Management Consulting Services and Overhead Agreement

The Company engages PureTech Health, a related party, to provide, among other things, management expertise, strategic advice, administrative support, computer and telecommunications services and office infrastructure. In exchange for providing such services, the Company pays PureTech Health a monthly fee. In addition, PureTech Health periodically invoices the Company for out-of-pocket expenses reasonably incurred in connection with providing such business services.

The Company incurred general and administrative costs for management services provided by PureTech Health totaling $0.2 million in each of the years ended December 31, 2017 and 2018. The Company had outstanding current liabilities to PureTech Health of $0.7 million and $0.1 million at December 31, 2017 and 2018, respectively, which are recorded as accounts payable in the balance sheet.

Note 14. 401(k) Savings Plan

The Company has a 401(k) retirement plan in which substantially all U.S. employees are eligible to participate. Eligible employees may elect to contribute up to the maximum limits, as set by the Internal Revenue Service, of their eligible compensation. The total contribution matching expense for the Company was less than $0.1 million for each of the years ended December 31, 2017 and 2018.

Note 15. Stock Split

On June 14, 2019, the Company effected a one-for-1.2987 stock split of its issued and outstanding shares of common stock and a proportional adjustment to the existing conversion ratios for each series of the Company's convertible preferred stock. Accordingly, all share and per share amounts for all periods presented in the accompanying financial statements and notes thereto have been adjusted retroactively, where applicable, to reflect this stock split and adjustment of the convertible preferred stock conversion ratios.

Note 16. Subsequent Events

On March 1, 2019, the Company received $1.6 million from the issuance of convertible notes under the 2018 Wellcome Trust Note, which were subsequently converted to Series B preferred stock in conjunction with the Series B stock purchase agreement discussed below.

On March 15, 2019, the Company entered into a Series B stock purchase agreement and issued 4,492,500 shares, or $68.0 million, of Series B Preferred Stock (the "Series B Financing"), of which $63.0 million of cash proceeds was received from new investors. All convertible notes outstanding at the time of the closing, which had original principal values of $4.3 million, were converted into 331,344 shares, or $5.0 million, of Series B Preferred Stock. As of March 15, 2019, the Company's certificate of incorporation, as amended and restated, (the "Certificate of Incorporation"), authorized the Company to issue 12,031,700 shares of Preferred Stock, of which 4,412,500 shares have been designated as Series Seed Preferred Stock, 3,126,700 shares have been designated as Series A Preferred Stock, and 4,492,500 shares have been designated as Series B Preferred Stock. In conjunction with the Series B Financing, the 2009 Stock Incentive Plan was amended to increase the number of shares reserved for issuance by 1,458,064 shares to 3,911,138 shares.

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On March 19, 2019, the Company issued 19,986 shares of common stock to PureTech Health upon exercise of remaining shares under the warrants issued to it, representing all of the outstanding warrants, resulting in proceeds to the Company of $0.1 million.

On March 28, 2019, the Company entered into an Amended and Restated Series B stock purchase agreement, authorizing the Company to issue up to 930,345 additional shares of Series B preferred stock, of which 792,602 shares were issued resulting in gross proceeds of $12.0 million. As of March 28, 2019, the Certificate of Incorporation authorized the Company to issue 12,962,045 shares of Preferred Stock, of which 4,412,500 shares have been designated as Series Seed Preferred Stock, 3,126,700 shares have been designated as Series A Preferred Stock, and 5,422,845 shares have been designated as Series B Preferred Stock. All of the Company's authorized Series Seed Preferred Stock and Series A Preferred Stock, and 5,285,102 shares of Series B Preferred Stock, were outstanding as of March 28, 2019.

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KARUNA THERAPEUTICS, INC.
BALANCE SHEETS
(In thousands, except share and per share data)
(Unaudited)

	September 30, 2019	December 31, 2018
Assets		
Current assets:		
Cash and cash equivalents	$ 54,144	$ 8,904
Short-term investments	107,461	4,983
Prepaid expenses and other current assets	2,323	1,709
Total current assets	163,928	15,596
Restricted cash	123	123
Property and equipment, net	176	138
Total assets	$ 164,227	$ 15,857
Liabilities, Redeemable Convertible Preferred Stock and Stockholders' Equity (Deficit)		
Current liabilities:		
Accounts payable (includes $10 and $112 at September 30, 2019 and December 31, 2018, respectively, due to related parties)	158	$ 269
Accrued expenses	1,319	538
Deferred lease obligation, short term portion	56	-
Derivative liability	-	389
Total current liabilities	1,533	1,196
Non-current convertible notes, net of discount	-	2,516
Deferred lease obligation, long term portion	164	102
Total liabilities	1,697	3,814
Commitments and Contingencies (Note 11)		
Redeemable convertible preferred stock		
Redeemable convertible preferred stock, Series Seed, $0.0001 par value; 0 and 4,412,500 shares authorized and outstanding at September 30, 2019 and December 31, 2018, respectively	-	1
Redeemable convertible preferred stock, Series A, $0.0001 par value; 0 and 3,126,700 shares authorized and outstanding at September 30, 2019 and December 31, 2018, respectively	-	41,964
Redeemable convertible preferred stock, Series B, $0.0001 par value; 0 shares authorized and outstanding at September 30, 2019 and December 31, 2018	-	-
Stockholders' equity (deficit):		
Preferred stock, $0.0001 par value; 10,000,000 and 0 shares authorized as of September 30, 2019 and December 31, 2018, respectively; 0 shares outstanding at September 30, 2019 and December 31, 2018	-	-
Common stock, $0.0001 par value; 150,000,000 and 12,337,650 shares authorized at September 30, 2019 and December 31, 2018, respectively; 23,412,754 and 12 shares issued and outstanding at September 30, 2019 and December 31, 2018, respectively	2	-
Additional paid-in capital	230,216	1,633
Accumulated deficit	(67,738)	(31,555)
Accumulated other comprehensive income	50	-
Total stockholders' equity (deficit)	162,530	(29,922)
Total liabilities, redeemable convertible preferred stock and stockholders' equity (deficit)	$ 164,227	$ 15,857

The accompanying notes are an integral part of these financial statements

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KARUNA THERAPEUTICS, INC.
STATEMENTS OF OPERATIONS
(In thousands, except share and per share data)
(Unaudited)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2019	2018	2019	2018
Revenue	-	-	-	-
Operating expenses:				
Research and development	$ 5,793	$ 1,417	$ 19,544	$ 4,816
General and administrative	4,103	1,056	16,995	1,548
Total operating expenses	9,896	2,473	36,539	6,364
Loss from operations	(9,896)	(2,473)	(36,539)	(6,364)
Other income (expense):				
Interest income (expense) (Note 4)	-	192	11	(396)
Interest income	858	-	1,425	-
Accretion of debt discount	-	(1,324)	(945)	(1,996)
Change in fair value of derivative	-	(2,633)	(135)	(429)
Total other income (expense), net	858	(3,765)	356	(2,821)
Net loss before income taxes	(9,038)	(6,238)	(36,183)	(9,185)
Income tax provision	-	-	-	-
Net loss attributable to common stockholders	$ (9,038)	$ (6,238)	$ (36,183)	$ (9,185)
Net loss per share, basic and diluted (Note 8)	$ (0.39)	$ (1,247,600)	$ (4.67)	$ (4,592,500)
Weighted average common shares outstanding used in computing net loss per share, basic and diluted	22,907,349	5	7,755,137	2

The accompanying notes are an integral part of these financial statements

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KARUNA THERAPEUTICS, INC.
STATEMENTS OF COMPREHENSIVE LOSS
(In thousands)
(Unaudited)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2019	2018	2019	2018
Net loss	$ (9,038)	$ (6,238)	$ (36,183)	$ (9,185)
Other comprehensive income (loss):				
Unrealized (losses) gains on short-term investments	(21)	-	50	-
Comprehensive loss	$ (9,059)	$ (6,238)	$ (36,133)	$ (9,185)

The accompanying notes are an integral part of these financial statements

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KARUNA THERAPEUTICS, INC.
STATEMENTS OF REDEEMABLE CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' EQUITY (DEFICIT)
(In thousands, except share data)
(Unaudited)

	Series Seed Redeemable Convertible Preferred Stock		Series A Redeemable Convertible Preferred Stock		Series B Redeemable Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Income	Total Stockholders' Equity (Deficit)
	Shares	Value	Shares	Value	Shares	Value	Shares	Value				
Balance, December 31, 2018	4,412,500	$ 1	3,126,700	$ 41,964	-	$ -	12	$ -	$ 1,633	$ (31,555)	$ -	$ (29,922)
Issuance of Series B redeemable convertible preferred stock, net of issuance costs of $175	-	-	-	-	5,422,845	81,927	-	-	-	-	-	-
Stock-based compensation expense	-	-	-	-	-	-	-	-	9,945	-	-	9,945
Exercise of common warrants	-	-	-	-	-	-	19,986	-	58	-	-	58
Exercise of common options	-	-	-	-	-	-	38,961	-	4	-	-	4
Vesting of restricted stock units	-	-	-	-	-	-	105,163	-	-	-	-	-
Other comprehensive income	-	-	-	-	-	-	-	-	-	-	71	71
Net loss	-	-	-	-	-	-	-	-	-	(27,145)	-	(27,145)
Balance, June 30, 2019	4,412,500	$ 1	3,126,700	$ 41,964	5,422,845	$ 81,927	164,122	$ -	$ 11,640	$ (58,700)	$ 71	$ (46,989)
Issuance of common stock upon initial public offering, net of $7.2 million in under- writing discounts and commissions and $2.4 million in offering costs	-	-	-	-	-	-	6,414,842	1	93,043	-	-	93,044
Automatic conversion of preferred stock	(4,412,500)	(1)	(3,126,700)	(41,964)	(5,422,845)	(81,927)	16,833,790	1	123,891	-	-	123,892
Stock-based compensation expense	-	-	-	-	-	-	-	-	1,642	-	-	1,642
Other comprehensive loss	-	-	-	-	-	-	-	-	-	-	(21)	(21)
Net loss	-	-	-	-	-	-	-	-	-	(9,038)	-	(9,038)
Balance, September 30, 2019	-	-	-	-	-	-	23,412,754	2	230,216	(67,738)	50	162,530

	Series Seed Redeemable Convertible Preferred Stock		Series A Redeemable Convertible Preferred Stock		Series B Redeemable Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Income	Total Stockholders' Equity (Deficit)
	Shares	Value	Shares	Value	Shares	Value	Shares	Value				

Balance, December 31, 2017	4,412,500	$ 1	-	$ -	-	$ -	-	$ -	$ 675	$ (14,043)	$ -	$ (13,368)
Stock-based compensation expense	-	-	-	-	-	-	-	-	128	-	-	128
Net loss	-	-	-	-	-	-	-	-	-	(2,947)	-	(2,947)
Balance, June 30, 2018	4,412,500	1	-	-	-	-	-	-	803	(16,990)	-	(16,187)
Issuance of Series A redeemable convertible preferred stock, net of issuance costs of $121	-	-	3,126,700	41,964	-	-	-	-	-	-	-	-
Stock-based compensation expense	-	-	-	-	-	-	-	-	415	-	-	415
Exercise of common warrants	-	-	-	-	-	-	12	-	-	-	-	-
Net loss	-	-	-	-	-	-	-	-	-	(6,238)	-	(6,238)
Balance, September 30, 2018	4,412,500	$ 1	3,126,700	$ 41,964	-	$ -	12	$ -	$ 1,218	$ (23,228)	$ -	$ (22,010)

The accompanying notes are an integral part of these financial statements

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KARUNA THERAPEUTICS, INC.
STATEMENTS OF CASH FLOWS
(In thousands)
(Unaudited)

	Nine Months Ended September 30,	
	2019	2018
Cash flows from operating activities		
Net loss	$ (36,183)	$ (9,185)
Adjustments to reconcile net loss to net cash used in operating activities:		
Stock-based compensation expense	11,587	517
Accretion of debt discount	945	1,996
Non-cash interest income	(787)	-
Change in fair value of derivative liability	135	429
Depreciation and amortization expense	37	2
Non-cash interest (income) expense	(11)	396
Warrant expense	-	26
Changes in operating assets and liabilities:		
Accrued expenses	781	(16)
Prepaid expenses and other current assets	(614)	(2,076)
Deferred lease obligation	118	-
Accounts payable	(111)	(602)
Net cash used in operating activities	(24,103)	(8,513)
Cash flows from investing activities		
Purchases of short-term investments	(131,641)	-
Maturities of short-term investments	30,000	-
Acquisition of property and equipment	(75)	-
Net cash used in investing activities	(101,716)	-
Cash flows from financing activities		
Proceeds from initial public offering, net of $7.2 million in underwriting discounts and commissions	95,453	-
Payment of initial public offering costs	(2,409)	-
Proceeds from issuance of Series B redeemable convertible preferred stock, net of issuance costs	74,825	-
Proceeds from issuance of Series A redeemable convertible preferred stock, net of issuance costs	-	15,877
Proceeds from issuance of convertible notes	3,128	9,000
Proceeds from exercise of warrant	58	-
Proceeds from exercise of stock options	4	-
Net cash provided by financing activities	171,059	24,877
Net increase in cash, cash equivalents and restricted cash	45,240	16,364
Cash, cash equivalents and restricted cash at beginning of period	9,027	1,942
Cash, cash equivalents and restricted cash at end of period	$ 54,267	$18,306
Supplemental disclosures of cash flows information		
Conversion of redeemable convertible preferred stock into common stock	$ 123,892	$ -
Conversion of convertible notes, accrued interest and discount upon conversion to preferred stock	$ 7,102	$26,087

The accompanying notes are an integral part of these financial statements

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NOTES TO FINANCIAL STATEMENTS
(Unaudited)

Note 1. Nature of the Business

Karuna Therapeutics, Inc. (the "Company") was incorporated under the laws of the State of Delaware in July 2009 as Karuna Pharmaceuticals, Inc. and is headquartered in Boston, Massachusetts. In March 2019, the Company changed its name to Karuna Therapeutics, Inc. The Company is focused on the development of novel therapies to address disabling neuropsychiatric conditions characterized by significant unmet medical need.

Since the Company's inception, it has focused substantially all of its efforts and financial resources on organizing and staffing the Company, acquiring and developing its technology, raising capital, building its intellectual property portfolio, undertaking preclinical studies and clinical trials and providing general and administrative support for these activities. The Company has not generated any product revenue related to its primary business purpose to date and is subject to a number of risks similar to those of other early stage companies, including dependence on key individuals, regulatory approval of products, uncertainty of market acceptance of products, competition from substitute products and larger companies, compliance with government regulations, protection of proprietary technology, dependence on third parties, product liability and the need to obtain adequate additional financing to fund the development of its product candidates.

Forward Stock Split

On June 14, 2019, the Company effected a one-for-1.2987 stock split of its issued and outstanding shares of common stock and a proportional adjustment to the existing conversion ratios for each series of the Company's redeemable convertible preferred stock (see Note 5). Accordingly, all share and per share amounts for all periods presented in the accompanying financial statements and notes thereto have been adjusted retroactively, where applicable, to reflect this stock split and adjustment of the redeemable convertible preferred stock conversion ratios.

Initial Public Offering

On June 27, 2019, the Company's registration statement on Form S-1 relating to its initial public offering of its common stock ("IPO") was declared effective by the Securities and Exchange Commission ("SEC"). In the IPO, which closed on July 2, 2019, the Company issued and sold 6,414,842 shares of common stock, including full exercise of the underwriters' over-allotment option to purchase an additional 836,718 shares, at a public offering price of $16.00 per share. The aggregate net proceeds to the Company from the IPO, inclusive of proceeds from the over-allotment exercise, were approximately $93.0 million after deducting underwriting discounts and commissions of $7.2 million and offering expenses of $2.4 million. Upon closing of the IPO, all 12,962,045 shares of the Company's redeemable convertible preferred stock then outstanding converted into an aggregate of 16,833,790 shares of common stock.

Liquidity

The Company's financial statements have been prepared on the basis of continuity of operations, realization of assets and the satisfaction of liabilities in the ordinary course of business. The Company experienced negative operating cash flows of $24.1 million for the nine months ended September 30, 2019 and had an accumulated deficit of $67.7 million as of September 30, 2019. The Company expects to continue to generate operating losses for the foreseeable future.

The Company expects that its cash and cash equivalents and short-term investments of $161.6 million as of September 30, 2019 will be sufficient to fund its operating expenses and capital

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expenditure requirements through at least 12 months from the date of issuance of these financial statements. The future viability of the Company beyond that point is dependent on its ability to raise additional capital to fund its operations.

If the Company is unable to obtain funding, the Company could be forced to delay, reduce or eliminate some or all of its research and development programs, product portfolio expansion or commercialization efforts, which could adversely affect its business prospects, or the Company may be unable to continue operations. Although management continues to pursue these plans, there is no assurance that the Company will be successful in obtaining sufficient funding on terms acceptable to the Company to fund continuing operations, if at all.

NOTE 2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation and Use of Estimates

The accompanying financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America ("U.S. GAAP"). Any reference in these notes to applicable guidance is meant to refer to the authoritative United States generally accepted accounting principles as found in the Accounting Standards Codification ("ASC") and Accounting Standards Updates ("ASUs") of the Financial Accounting Standards Board ("FASB").

The preparation of financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting periods. Significant estimates and assumptions reflected in these financial statements include, but are not limited to, the accrual for research and development expenses, the valuation of stock-based awards and prior to the IPO, the valuation of common stock, and derivative liabilities. Estimates are periodically reviewed in light of changes in circumstances, facts and experience. Changes in estimates are recorded in the period in which they become known. Actual results could differ from those estimates.

Unaudited Interim Financial Information

The accompanying balance sheet as of September 30, 2019, the statements of operations, comprehensive loss, and cash flows for the three and nine months ended September 30, 2019 and 2018, and the statements of redeemable convertible preferred stock and stockholders' equity (deficit) for the three and nine months ended September 30, 2019 and 2018 are unaudited. The unaudited interim financial statements have been prepared on the same basis as the audited annual financial statements and, in the opinion of management, reflect all adjustments, which include only normal recurring adjustments, necessary for the fair statement of the Company's financial position as of September 30, 2019 and the results of its operations and its cash flows for the three and nine months ended September 30, 2019 and 2018. Certain information and footnote disclosures typically included in annual financial statements prepared in accordance with U.S. GAAP have been condensed or omitted. Accordingly, these unaudited interim financial statements should be read in conjunction with the Company's financial statements as of and for the year ended December 31, 2018, which are included in the Company's prospectus related to the Company's IPO, filed June 28, 2019 (File No. 333-231863) with the SEC, pursuant to Rule 424(b) under the Securities Act of 1933, as amended. The results for the three and nine months ended September 30, 2019, are not necessarily indicative of results to be expected for the year ending December 31, 2019, any other interim periods, or any future year or period.

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Cash and Cash Equivalents

The Company considers all short-term, highly liquid investments with original maturities of 90 days or less at acquisition date to be cash equivalents.

Short-term Investments

The Company's short-term investments are classified as available-for-sale and are carried at fair value with the unrealized gains and losses reported as a component of accumulated other comprehensive income (loss) in stockholders' equity. Realized gains and losses and declines in value judged to be other than temporary are included as a component of other income (expense), net based on the specific identification method.

Concentration of Manufacturing Risk

The Company is dependent on third-party manufacturers to supply products for research and development activities in its programs. In particular, the Company relies and expects to continue to rely on a small number of manufacturers to supply it with its requirements for the active pharmaceutical ingredients and formulated drugs related to these programs. These programs could be adversely affected by a significant interruption in the supply of active pharmaceutical ingredients and formulated drugs.

Deferred Offering Costs

The Company capitalizes certain legal, professional accounting and other third-party fees that are directly associated with in-process equity financings as deferred offering costs until such financings are consummated. After consummation of the equity financing, these costs are recorded in stockholders' equity (deficit) as a reduction of additional paid-in capital generated as a result of the offering. Should an in-process equity financing be abandoned, the deferred offering costs will be expensed immediately as a charge to operating expenses in the statements of operations. As of September 30, 2019 and December 31, 2018, there were no deferred offering costs outstanding. All deferred offering costs accumulated during 2019 and associated with the Company's IPO were recorded as a reduction of additional paid-in capital upon the close of the Company's IPO on July 2, 2019.

Fair Value of Financial Instruments

The Company's financial instruments consist of cash equivalents, short-term investments, prepaid expenses, interest receivable, accounts payable, accrued expenses, convertible notes and derivatives embedded within the convertible notes. The carrying amount of prepaid expenses, interest receivable, accounts payable and accrued expenses are considered a reasonable estimate of their fair value, due to the short-term maturity of these instruments. The Company's cash equivalents, short-term investments, convertible notes, and derivative liabilities are carried at fair value, determined according to the fair value hierarchy described below (see Note 10).

The Company follows the guidance in FASB ASC 820, *Fair Value Measurements and Disclosures*, which defines fair value and establishes a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1 measurements) and the lowest priority to unobservable inputs (Level 3 measurements). The three levels of the fair value hierarchy are described below:

Level 1: Quoted prices (unadjusted) in active markets for identical assets or liabilities that the reporting entity has the ability to access at the measurement date.

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Level 2: Valuations based on quoted prices in markets that are not active or for which all significant inputs are observable, either directly or indirectly.

Level 3: Prices or valuations that require inputs that are both significant to the fair value measurement and unobservable.

To the extent that valuation is based on models or inputs that are less observable or unobservable in the market, the determination of fair value requires more judgment. Accordingly, the degree of judgment exercised by the Company in determining fair value is greatest for instruments categorized in Level 3. A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement.

Fair value is a market-based measure considered from the perspective of a market participant rather than an entity-specific measure. Therefore, even when market assumptions are not readily available, the Company's own assumptions reflect those that market participants would use in pricing the asset or liability at the measurement date. The Company uses prices and inputs that are current as of the measurement date, including during periods of market dislocation. In periods of market dislocation, the observability of prices and inputs may be reduced for many instruments. This condition could cause an instrument to be reclassified from Level 1 to Level 2 or Level 2 to Level 3.

Convertible Notes and Derivative Liabilities

In connection with the issuance of the Wellcome Trust Convertible Notes and the Convertible Notes (see Note 4), the Company had identified embedded derivatives, which were recorded as liabilities on the Company's balance sheets and were remeasured to fair value at each reporting date until the derivative was settled. Changes in the fair value of the derivative liabilities are recognized as change in fair value of derivative in the statements of operations. The fair value of the derivative liabilities were determined at each period end using a with and without method, which assesses the likelihood and timing of events that would result in either a conversion or change-of-control feature being triggered, as well as changes in the market conditions.

Upon issuance of the notes, each note was recorded at cost, net of the derivative liability. The discount on each note was amortized as interest expense to the date such note was expected to convert using the effective interest rate method and is reflected in the statements of operations as accretion of debt discount.

The Company classified its derivative liabilities in the balance sheet as current or non-current based on its expectation of when the derivative will be settled, consistent with the assumptions used when determining the fair value of the derivative liabilities.

Redeemable Convertible Preferred Stock

Prior to the IPO, the Company recorded all shares of redeemable convertible preferred stock at their respective fair values on the dates of issuance, net of issuance costs. The redeemable convertible preferred stock was recorded outside of permanent equity because upon the occurrence of certain deemed liquidation events, the majority of the holders could opt to redeem the shares at the liquidation preference and these events, including a merger, acquisition or sale of substantially all of the assets, was considered not solely within the Company's control. Prior to the IPO, the Company had not adjusted the carrying values of the redeemable convertible preferred stock to its redemption value because it was uncertain whether or when a deemed liquidation event would occur. Upon closing of the IPO, all 12,962,045 shares of the Company's redeemable convertible preferred stock then outstanding converted into an aggregate of 16,833,790 shares of common stock.

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Leases

Leases are classified at their inception as either operating or capital leases based on the economic substance of the agreement. The Company recognizes rent expense for its operating leases, inclusive of rent escalation provisions and rent holidays, on a straight-line basis over the respective lease term. Additionally, the Company recognizes tenant improvement allowances under the operating leases as a deferred lease obligation and amortizes the tenant improvement allowances as a reduction to rent expense on a straight-line basis over the respective lease term. At September 30, 2019 and December 31, 2018, no capital leases were recorded in the balance sheets.

Research and Development Costs

Research and development costs are expensed as incurred. Research and development costs include salaries and bonuses, stock compensation, employee benefits, consulting costs and external contract research and development and manufacturing expenses.

Upfront payments and milestone payments made for the licensing of technology are expensed as research and development in the period in which they are incurred. Advance payments for goods or services to be received in the future for use in research and development activities are recorded as prepaid expenses. The prepaid amounts are expensed as the related goods are delivered or the services are performed.

Research Contract Costs and Accruals

The Company accrues for estimated costs of research and development activities conducted by third-party service providers, which include the conduct of preclinical studies and clinical trials, and contract manufacturing activities. The Company records the estimated costs of research and development activities based upon the estimated amount of services provided and includes these costs in accrued liabilities in the balance sheets and within research and development expense in the statements of operations. When evaluating the adequacy of the accrued liabilities, the Company analyzes progress of the research studies or clinical trials and manufacturing activities, including the phase or completion of events, invoices received and contracted costs. Significant judgments and estimates may be made in determining the accrued balances at the end of any reporting period. Actual results could differ from the Company's estimates. The Company's historical accrual estimates have not been materially different from the actual costs.

Stock-Based Compensation

The Company measures all stock options and other stock-based awards based on the date of the grant and recognizes compensation expense of those awards over the requisite service period, which is generally the vesting period of the respective award. The Company has mainly issued stock options with service-based vesting conditions and records the expense for these awards using the straight-line method. The Company has also issued stock options with performance-based vesting conditions and records the expense for these awards at the time that the achievement of the performance becomes highly probable or complete. The Company recognizes adjustments to stock-based compensation expense for forfeitures as they occur. The Company classifies stock-based compensation expense in its statements of operations in the same manner in which the award recipient's payroll costs are classified or in which the award recipients' service payments are classified.

The fair value of each stock option grant is estimated on the date of grant using the Black-Scholes option-pricing model. The Company historically has been a private company and lacked company-specific historical and implied volatility information. Therefore, it estimated its expected stock

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volatility based on the historical volatility of a publicly traded set of peer companies and expects to do so until such time as it has adequate historical data regarding the volatility of its own publicly traded stock price.

The expected term of the Company's stock options has been determined utilizing the "simplified" method for awards that qualify as "plain-vanilla" options. The risk-free interest rate is determined by reference to the U.S. Treasury yield curve in effect at the time of grant of the award for time periods approximately equal to the expected term of the award. Expected dividend yield is based on the fact that the Company has never paid cash dividends and does not expect to pay any cash dividends in the foreseeable future.

The fair value for each restricted common stock award is estimated on the date of grant based on the fair value of the Company's common stock on that same date.

Net Loss Per Share

In July 2019, upon closing of the IPO, all outstanding shares of the Company's redeemable convertible preferred stock automatically converted to common stock. Prior to this conversion, the Company followed the two-class method when computing net income (loss) per share, as the Company has issued shares that met the definition of participating securities. The two-class method determines net income (loss) per share for each class of common and participating securities according to dividends declared or accumulated and participation rights in undistributed earnings. The two-class method requires income available to common stockholders for the period to be allocated between common and participating securities based upon their respective rights to receive dividends as if all income for the period had been distributed.

Basic net income (loss) per share attributable to common stockholders is computed by dividing the net income (loss) attributable to common stockholders by the weighted average number of shares of common stock outstanding for the period. Diluted net income (loss) attributable to common stockholders is computed by adjusting income (loss) attributable to common stockholders to reallocate undistributed earnings based on the potential impact of dilutive securities, including outstanding stock options. Diluted net income (loss) per share attributable to common stockholders is computed by dividing the diluted net income (loss) attributable to common stockholders by the weighted average number of common shares outstanding for the period, including potential dilutive common shares assuming the dilutive effect of outstanding stock options.

Prior to the IPO, the Company's outstanding redeemable convertible preferred stock contractually entitled the holders of such shares to participate in distributions but contractually did not require the holders of such shares to participate in losses of the Company. Accordingly, in periods in which the Company reports a net loss attributable to common stockholders, diluted net loss per share attributable to common stockholders is the same as basic net loss per share attributable to common stockholders, since dilutive common shares are not assumed to have been issued if their effect is anti-dilutive.

Comprehensive Income (Loss)

Comprehensive income (loss) includes net loss as well as other changes in stockholders' equity (deficit) that result from transactions and economic events other than those with stockholders. For the three and nine months ended September 30, 2019, the Company's only element of other comprehensive income (loss) was unrealized gains and losses on short-term investments.

Recently Adopted Accounting Pronouncements

In May 2014, the Financial Accounting Standards Board issued Accounting Standards Update No. 2014-09, *Revenue from Contracts with Customers* (Topic 606) ("ASC 606"), and further

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updated through ASU 2016-12, which amends the existing accounting standards for revenue recognition. For public business entities, this standard is effective for annual reporting periods beginning after December 15, 2017, including interim periods within that reporting period. For all other entities, this standard is effective for annual reporting periods beginning after December 15, 2018, and interim periods within annual periods beginning after December 15, 2019. Early adoption is permitted. Effective January 1, 2017, the Company adopted ASC 606, using the full retrospective method. The adoption did not have an impact on the Company's financial statements as the Company has historically not had contracts with customers or recorded revenue to date.

In June 2018, the FASB issued Accounting Standards Update 2018-07, *Compensation—Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting* ("ASU 2018-07"), which expands the scope of Topic 718 to include all share-based payment transactions for acquiring goods and services from nonemployees. ASU 2018-07 specifies that Topic 718 applies to all share-based payment transactions in which the grantor acquires goods and services to be used or consumed in its own operations by issuing share-based payment awards. ASU 2018-07 also clarifies that Topic 718 does not apply to share-based payments used to effectively provide (1) financing to the issuer or (2) awards granted in conjunction with selling goods or services to customers as part of a contract accounted for under ASC 606. The transition method provided by ASU 2018-07 is a modified retrospective basis which recognizes a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption. Effective January 1, 2017, the Company adopted ASU 2018-07, using the modified retrospective method. Management deems that non-employees who provide services to the Company have similar traits as employees with regard to their continued involvement in the Company, and therefore concluded that the adoption of ASU 2018-07 more fairly represented the results of the Company's operations. The cumulative effect of the change on the accumulated deficit for awards granted to non-employees as of January 1, 2017 was less than $0.1 million.

In August 2016, the FASB issued ASU No. 2016-15, Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments. This guidance addresses specific cash flow issues with the objective of reducing the diversity in practice for the treatment of these issues. The areas identified include: debt prepayment or debt extinguishment costs; settlement of zero-coupon debt instruments; contingent consideration payments made after a business combination; proceeds from the settlement of insurance claims; proceeds from the settlement of corporate-owned life insurance policies; distributions received from equity method investees; beneficial interests in securitization transactions; and application of the predominance principle with respect to separately identifiable cash flows. The Company adopted this new guidance beginning January 1, 2017, on a retrospective basis, which did not result in a material impact on its financial statements and related disclosures.

In November 2016, the FASB issued ASU 2016-18, *Restricted Cash*. The new standard requires restricted cash and restricted cash equivalents be included with cash and cash equivalents when reconciling the total beginning and ending amounts for the periods shown on the statement of cash flows. The Company has early adopted this new standard effective on January 1, 2018. The impact of the adoption was to reduce operating activities by the movement in restricted cash for each annual period presented, and to include cash, cash equivalents and restricted cash in a newly titled "Cash, cash equivalents, and restricted cash at beginning of year" and "Cash, cash equivalents, and restricted cash at the end of year" in the statements of cash flows.

In May 2017, the FASB issued ASU No. 2017-09, *Compensation—Stock Compensation* (Topic 718): *Scope of Modification Accounting* ("ASU 2017-09"). This new guidance amends the scope of modification accounting for share-based payment awards. ASU 2017-09 provides guidance on the types of changes to the terms or conditions of share-based payment awards to which an entity would

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be required to apply modification accounting under ASC 718. Effective January 1, 2017, the Company adopted ASU No. 2017-09, using the full retrospective method and will be applied prospectively to an award modified on or after the adoption date. The cumulative effect of the changes as of January 1, 2017 for the adoption of ASU 2017-09 was immaterial. Hence, the Company did not recognize the cumulative effect adjustment in its financial statements.

Recently Issued Accounting Pronouncements

In February 2016, the FASB issued ASU No. 2016-02, Leases ("ASU 2016-02"). ASU 2016-02 will require lessees to recognize most leases on their balance sheet as a right-of-use asset and a lease liability. Leases will be classified as either operating or finance, and classification will be based on criteria similar to current lease accounting, but without explicit bright lines. For public entities, the guidance is effective for annual reporting periods beginning after December 15, 2018 and for interim periods within those fiscal years. For non-public entities, the guidance is effective for annual reporting periods beginning after December 15, 2019. Early adoption is permitted for all entities. The Company is currently evaluating the impact that the adoption of ASU 2016-02 will have on its financial statements.

In August 2018, the FASB issued ASU No. 2018-13, Fair Value Measurement (Topic 820) ("ASU 2018-13"). ASU 2018-13 modifies fair value disclosure requirements, specifically around level transfers and valuation of Level 3 assets and liabilities. ASU 2018-13 is effective for financial statements issued for annual and interim periods beginning after December 15, 2019 for all entities. Early adoption of all or part of ASU No. 2018-13 is permitted. The Company does not expect that the adoption of this new standard will have a material impact on its disclosures.

Note 3. Prepaid Expenses and Other Current Assets and Accrued Expenses

Prepaid expenses and other current assets consisted of the following (in thousands):

	September 30, 2019	December 31, 2018
Prepaid insurance	$ 1,741	$ 23
Prepaid research and development expenses	359	1,686
Other	223	-
Total prepaid expenses and other current assets	$ 2,323	$ 1,709

Accrued expenses consisted of the following (in thousands):

	September 30, 2019	December 31, 2018
Accrued payroll and related expenses	$ 839	$ 311
Accrued research and development expenses	198	100
Professional fees	229	75
Other	53	52
Total accrued expenses	$ 1,319	$ 538

Note 4. Convertible Notes Payable

Wellcome Trust Convertible Notes

In June 2018, the Company entered into a second Company Funding Agreement with The Wellcome Trust, LLC ("Wellcome Trust") to receive up to $8.0 million in gross proceeds from the

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issuance of a convertible note (the “2018 Convertible Note”). The Company received $2.0 million of proceeds in July 2018, $2.7 million in November 2018, $1.6 million in March 2019, and $1.6 million in April 2019. The Company is eligible to receive up to an aggregate of approximately $0.1 million in future funding under the terms of the 2018 Wellcome Funding Agreement, which would be payable by Wellcome Trust at the Company’s option upon the achievement of a specified clinical milestone.

The 2018 Convertible Note has a stated interest rate of 2% per annum above the three-month Dollar LIBOR rate, which is not payable until settlement of the principal. The note is subject to redemption upon written demand by Wellcome Trust any time after the fifth anniversary of the effective date, resulting in their classification as long-term liabilities as of December 31, 2018. The principal due under the 2018 Convertible Note converts into the class of the Company’s stock issued in the Company’s next qualified financing or upon event of default at a discounted conversion price between 0% and 25% of the purchase price per share of such securities issued. The accrued interest in such a circumstance would be forgiven.

At inception, the Company concluded that the 2018 Convertible Note contained a conversion option at a significant discount that was deemed to be an embedded derivative, which is required to be bifurcated and accounted for separately from the debt host. There were no debt issuance costs associated with the 2018 Convertible Note.

The Company recognized the following changes in the debt related to the 2018 Convertible Note during the year ended December 31, 2018 as well as the three and nine months ended September 30, 2019 and 2018 (in thousands):

		Financial statement impacted
Balance, December 31, 2017	$ 3,985	
Accretion to settlement value	28	Statement of operations
Accrued interest	83	Statement of operations
Balance, June 30, 2018	4,096	
Issuance of 2018 Convertible Note	2,000	Balance sheet
Accretion to settlement value	23	Statement of operations
Accrued interest	19	Statement of operations
Interest forgiven upon conversion	(289)	Statement of operations
Conversion of Wellcome Trust Convertible Notes to redeemable convertible preferred stock	(5,849)	Balance sheet
Balance, September 30, 2018	-	
Issuance of 2018 Convertible Note	2,700	Balance sheet
Allocation of proceeds to derivative liability	(375)	Balance sheet
Accretion to settlement value	180	Statement of operations
Accrued interest	11	Statement of operations
Balance, December 31, 2018	2,516	
Issuance of 2018 Convertible Note	3,128	Balance sheet
Allocation of proceeds to derivative liability	(750)	Balance sheet
Accretion to settlement value	945	Statement of operations
Accrued interest	29	Statement of operations
Interest forgiven upon conversion	(40)	Statement of operations
Conversion of Wellcome Trust Convertible Notes to redeemable convertible preferred stock	(5,828)	Balance sheet
Balance, June 30, 2019	$ -	

There was no balance outstanding related to the 2018 Convertible Note as of September 30, 2019.

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Convertible Notes

Since inception, the Company has issued $14.0 million of convertible notes (the "Convertible Notes"), of which $13.5 million was issued to PureTech Health LLC ("PureTech Health"), a related party (see Note 12). There were no debt issuance costs associated with the Convertible Notes.

The Company concluded that the Convertible Notes contained a conversion option at a significant premium that was deemed to be an embedded derivative, which is required to be bifurcated and accounted for separately from the debt host.

In August 2018, the then outstanding Convertible Notes were converted to Series A Preferred Stock.

The Company recognized the following changes in the debt related to the Convertible Notes during the three and nine months ended September 30, 2018 (in thousands):

		Financial statement impacted
Balance, December 31, 2017	$ 7,674	
Issuance of new notes	7,000	Balance sheet
Allocation of proceeds to derivative liability	(1,418)	Balance sheet
Accretion to settlement value	644	Statement of operations
Accrued interest	505	Statement of operations
Balance, June 30, 2018	14,405	
Accretion to settlement value	1,301	Statement of operations
Accrued interest	125	Statement of operations
Interest forgiven upon conversion	(47)	Statement of operations
Conversion of Convertible Notes to redeemable convertible preferred stock	(15,784)	Balance sheet
Balance, September 30, 2018	-	

There were no Convertible Notes outstanding as of December 31, 2018 or issued during the nine months ended September 30, 2019.

Note 5. Redeemable Convertible Preferred Stock

Series Seed Redeemable Convertible Preferred Stock

Between 2009 and 2011, the Company authorized and issued 4,412,500 shares of Series Seed Preferred Stock at an issuance price of $0.0001 per share, for total proceeds of less than $0.1 million.

There were no issuance costs in connection with the Series Seed Preferred Stock issuance.

Series A Redeemable Convertible Preferred Stock

In August 2018, the Company authorized 3,126,700 shares of Series A Preferred Stock. The Company then issued 1,188,707 shares of Series A Preferred Stock at an issuance price of $13.46 per share resulting in gross proceeds of approximately $16.0 million. There were $0.1 million of issuance costs associated with the Series A Preferred Stock.

In conjunction with the August 2018 issuance of Series A Preferred Stock, all outstanding principal and accrued interest under the Wellcome Trust Notes and Convertible Notes converted to 1,937,993 shares of Series A Preferred Stock.

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Series B Redeemable Convertible Preferred Stock

In March 2019, the Company authorized 5,422,845 shares of Series B Preferred Stock. The Company then issued 4,953,758 shares of Series B Preferred Stock at an issuance price of $15.14 per share resulting in gross proceeds of approximately $75.0 million. There were $0.2 million of issuance costs associated with the Series B Preferred Stock.

In conjunction with the March 2019 issuance of Series B Preferred Stock, all outstanding principal and accrued interest under the Wellcome Trust Notes converted to 331,344 shares of Series B Preferred Stock. In April 2019, the Company received $1.6 million from the issuance of the Wellcome Trust Notes, which were subsequently converted into 137,743 shares of Series B redeemable convertible preferred stock.

Upon closing of the Company's IPO, the then-outstanding shares of the Series Seed, Series A and Series B redeemable convertible preferred stock (together as "Preferred Stock") converted into common stock. As of September 30, 2019, there were no shares of redeemable convertible preferred stock authorized, issued or outstanding.

Note 6. Preferred Stock

On July 2, 2019, in connection with the closing of the Company's IPO, the Company filed its restated Certificate of Incorporation, which authorizes the Company to issue up to 10,000,000 shares of preferred stock, $0.0001 par value per share. There are no shares of preferred stock outstanding as of September 30, 2019.

Note 7. Common Stock

As of September 30, 2019, the Company's Certificate of Incorporation authorized the Company to issue 150,000,000 shares of common stock, $0.0001 par value per share.

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. The holders of common stock shall be entitled to receive dividends out of funds legally available, as declared by the board of directors. These dividends are subject to the preferential dividend rights of the holders of the Company's preferred stock. Through September 30, 2019 and December 31, 2018, no cash dividends have been declared or paid.

Upon completion of the Company's IPO on July 2, 2019, all outstanding shares of Series Seed, Series A, and Series B Redeemable Convertible Preferred Stock converted to common stock. As of September 30, 2019, there were 23,412,754 shares of common stock outstanding.

Note 8. Net Loss per Share

The following table sets forth the computation of basic and diluted net loss per share of common stock for the three and nine months ended September 30, 2019 (in thousands, except share and per share data):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2019	2018	2019	2018
Net Loss	$ (9,038)	$ (6,238)	$ (36,183)	$ (9,185)
Weighted-average shares used in computing net loss per share	22,907,349	5	7,755,137	2
Net loss per share, basic and diluted	$ (0.39)	$ (1,247,600)	$ (4.67)	$ (4,592,500)

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The Company's potentially dilutive securities, which include stock options and convertible preferred stock, have been excluded from the computation of diluted net loss per share as the effect would be to reduce the net loss per share. Therefore, the weighted average number of common shares outstanding used to calculate both basic and diluted net loss per share attributable to common stockholders is the same.

Prior to the IPO, the Company's outstanding shares of Preferred Stock contractually entitled the holders of such shares to participate in distributions but contractually did not require the holders of such shares to participate in losses of the Company. Accordingly, these shares have not been included in the denominator used to calculate net loss per share.

Common Stock Equivalents

The following common stock equivalents presented based on amounts outstanding at each period end, have been excluded from the calculation of diluted net loss per share because including them would have had an anti-dilutive impact:

	September 30,	
	2019	2018
Redeemable convertible preferred stock (as converted to common stock)	-	9,791,151
Stock options to purchase common stock	4,671,906	2,245,981
Warrants to purchase common stock	-	19,986
	4,671,906	12,057,118

Note 9. Stock-based Compensation

Stock Options

In September 2009, the Company's board of directors approved the 2009 Stock Incentive Plan (the "2009 Plan") which provided for the grant of incentive stock options to employees and non-statutory stock options to directors, consultants, and non-employees of the Company. The aggregate common shares issuable were 3,911,138 under the 2009 Plan, as amended. The 2009 Plan terminated in July 2019 effective upon the completion of the Company's IPO. No additional options will be granted under the 2009 Plan. At September 30, 2019, there were 3,839,545 options and restricted stock units ("RSUs") outstanding under the 2009 Plan.

In May 2019, the board of directors approved the 2019 Stock Option and Incentive Plan (the "2019 Plan") which became effective on June 26, 2019, the date immediately prior to the date on which the registration statement related to the IPO was declared effective by the SEC. The 2019 Plan will expire in May 2029. Under the 2019 Plan, the Company may grant incentive stock options, non-statutory stock options, restricted stock awards, RSUs and other stock-based awards. There were 1,709,832 shares of the Company's common stock initially reserved for issuance under the 2019 Plan. In addition, the number of shares of common stock that may be issued under the 2019 Plan will automatically increase on January 1, 2020 and each January 1 thereafter by 4% of the number of shares of common stock outstanding on the immediately preceding December 31, subject to limitation. As of September 30, 2019, there were 772,308 common shares available for issuance and 937,524 options outstanding under the 2019 Plan.

Options under the 2019 Plan generally vest based on the grantee's continued service with the Company during a specified period following a grant as determined by the board of directors and expire ten years from the grant date. In general, awards typically vest in four years, but vesting conditions can vary based on the discretion of the Company's board of directors.

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A summary of the Company's stock option activity and related information is as follows:

	Number of Shares	Weighted-Average Exercise Price Per Share	Weighted-Average Remaining Contractual Term (Years)	Aggregate Intrinsic Value (in thousands)
Outstanding as of December 31, 2018	2,310,369	$ 4.49	7.1	$ 6,420
Granted	2,554,146	11.93		
Exercised	(38,961)	0.11		
Forfeited	(153,648)	5.00		
Outstanding as of September 30, 2019	4,671,906	8.58	8.2	36,423
Options vested and expected to vest as of September 30, 2019	4,671,906	$ 8.58	8.2	$ 36,423
Options exercisable as of September 30, 2019	3,111,295	$ 8.00	7.7	$ 26,147

The aggregate intrinsic values of options outstanding, exercisable, vested and expected to vest were calculated as the difference between the exercise price of the options and the fair value of the Company's common stock as of September 30, 2019.

As of September 30, 2019, there was $6.1 million of unrecognized compensation cost, which is expected to be recognized over a weighted-average period of 2.6 years.

The fair value of all option activity was estimated at the date of grant using the Black-Scholes model with the following assumptions:

	Nine Months Ended September 30, 2019
Fair value of options	$ 3.83 - 8.05
Fair value of common stock	$ 9.20 - 20.02
Expected term (in years)	5.02 - 6.16
Expected volatility	43.57% - 44.41%
Risk-free interest rate	1.76% - 2.44%
Expected dividend yield	0.00%

On May 16, 2019, the Company issued 105,163 fully vested restricted common stock units. The average grant date fair value was $10.97 per share. As of September 30, 2019, there was no unrecognized compensation expense related to unvested RSUs.

Warrants

In October 2016, PureTech Health, a related party, agreed to provide management services to the Company in exchange for a warrant to purchase up to 19,998 shares of the Company's common stock. The warrants vested monthly as services were performed over a 24-month period and had a purchase price of $2.92 per share. The total expense for the three and nine months ended September 30, 2018 for the warrant was less than $0.1 million. The warrant was fully vested as of October 2018.

In August 2018, PureTech Health exercised the warrant to purchase 12 shares resulting in proceeds to the Company of less than $0.1 million. In March 2019, PureTech Health exercised the warrant to purchase the remaining 19,986 shares resulting in proceeds to the Company of $0.1 million. There are no outstanding warrants as of September 30, 2019.

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Stock-based Compensation Expense

Stock-based compensation expense is classified in the statements of operations for the three and nine months ended September 30, 2019 and 2018 as follows (in thousands):

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2019	2018	2019	2018
Research and development	$ 147	$ 28	$ 371	$ 71
General and administrative	1,496	378	$11,217	446
Total stock based compensation expense	$ 1,642	$ 406	$11,587	$ 517

Note 10. Fair Value of Financial Assets and Liabilities

The following tables present information about the Company's assets and liabilities as of September 30, 2019 and December 31, 2018 that are measured at fair value on a recurring basis and indicates the level of the fair value hierarchy utilized to determine such fair values (in thousands):

	Fair Value Measurement at September 30, 2019 Using			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents (Money Market Fund)	$ 22,406	$ -	$ -	$ 22,406
Cash equivalents (US Treasuries)	22,519			22,519
Short-term investments (US Treasuries)	107,461	-	-	107,461
Total	$152,386	$ -	$ -	$152,386

	Fair Value Measurement at December 31, 2018 Using			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents (US Treasuries)	$ 5,042	$ -	$ -	$ 5,042
Short-term investments (US Treasuries)	4,983	-	-	4,983
Total	$ 10,025	$ -	$ -	$ 10,025
Liabilities:				
Derivative instrument	$ -	$ -	$ 389	$ 389
Total	$ -	$ -	$ 389	$ 389

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The estimated fair value and amortized cost of the Company's short-term investments by contractual maturity are summarized as follows (in thousands):

	September 30, 2019			
	Amortized Cost	Unrealized Gains	Unrealized Losses	Fair Value
Due in one year or less	$107,411	$ 50	$ -	$107,461
Total	$107,411	$ 50	$ -	$107,461

	December 31, 2018			
	Amortized Cost	Unrealized Gains	Unrealized Losses	Fair Value
Due in one year or less	$ 4,984	$ -	$ (1)	$ 4,983
Total	$ 4,984	$ -	$ (1)	$ 4,983

The derivative liability is considered a Level 3 liability because its fair value measurement is based, in part, on significant inputs not observed in the market. Any reasonable changes in the assumptions used in the valuation could materially affect the financial results of the Company. The Company recognized the following changes in the fair value of derivative liabilities during the year ended December 31, 2018 and the three and nine months ended September 30, 2019 (in thousands):

Balance, December 31, 2017	$ 2,606
Allocation of note issuance proceeds to derivative	1,418
Change in fair value of derivative	(2,203)
Balance, June 30, 2018	1,821
Change in fair value of derivative	2,633
Conversion of convertible debt to Series A preferred stock	(4,454)
Balance, September 30, 2018	-
Allocation of note issuance proceeds to derivative	375
Change in fair value of derivative	14
Balance, December 31, 2018	389
Allocation of note issuance proceeds to derivative	750
Change in fair value of derivative	135
Conversion of convertible debt to Series B preferred stock	(1,274)
Balance, June 30, 2019	$ -

There was no derivative liability recorded as of September 30, 2019.

Note 11. Commitments and Contingencies

Leases

The Company entered into a 51-month lease for office space in Boston, Massachusetts that began in December 2018 and expires in February 2023. The Company is required to maintain a cash balance of $0.1 million to secure a letter of credit associated with this lease. The amount was classified as restricted cash in the balance sheet at December 31, 2018 and September 30, 2019.

The Company recorded rent expense of $0.3 million during the nine months ended September 30, 2019.

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Future minimum lease payments under non-cancelable operating lease agreements as of September 30, 2019, are as follows (in thousands):

As of September 30,	Minimum Lease Payments
Less than 1 year	$ 498
1 to 2 years	504
2 to 3 years	512
3 to 4 years	214
4 to 5 years	-
Total	$ 1,728

Intellectual Property License with Eli Lilly and Company

In May 2012, the Company entered into an exclusive license agreement, or the Lilly License Agreement, with Eli Lilly, pursuant to which Eli Lilly assigned to us all of its rights to certain patents (now expired), regulatory documentation, data records and materials related to xanomeline. The Company is also entitled to sublicense or otherwise transfer the rights granted in connection with the Lilly License Agreement.

Under the Lilly License Agreement, the Company is obligated to use commercially reasonable efforts to develop, manufacture, commercialize and seek and maintain regulatory approval for xanomeline, in any formulation, for use in humans.

The Company paid Eli Lilly an upfront payment of $0.1 million and has agreed to make milestone payments to Eli Lilly of up to an aggregate of $16 million upon the achievement of specified regulatory milestones and up to an aggregate of $54 million in commercial milestones. In addition, the Company is obligated to pay Eli Lilly tiered royalties, at rates in the low to mid single-digit percentages, on the worldwide net sales of any commercialized product on a country-by-country basis until the expiration of the applicable royalty term, which is the longer of six years from the date of first commercial sale of each licensed product within a country or data exclusivity in such country. During the royalty term, Eli Lilly is prohibited from granting any third party rights to the patents, regulatory documentation, data records and materials that have been licensed to us under the Lilly License Agreement.

The Lilly License Agreement will expire on the later of (i) the expiration of the last-to-expire royalty term on a licensed product-by-licensed product basis or (ii) the date on which the Company has made all milestone payments pursuant to the terms of the Lilly License Agreement, unless terminated earlier by the parties. In no event will the term of the Lilly License Agreement exceed 15 years past the anniversary of the first commercial sale of a xanomeline product. The Company may terminate the Lilly License Agreement for any reason with proper prior notice to Eli Lilly. Either party may terminate the Lilly License Agreement upon an uncured material breach by the other party.

The initial upfront payment of $0.1 million was expensed when incurred in May 2012. As of September 30, 2019, no milestones have been reached, and accordingly, no milestone payments have been made.

Intellectual Property License with PureTech Health

In March 2011, the Company entered into an exclusive license agreement, or the Patent License Agreement, with PureTech Health, pursuant to which PureTech Health granted us an exclusive license to patent rights relating to combinations of a muscarinic activator with a muscarinic inhibitor for the treatment of central nervous system disorders.

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In connection with the Patent License Agreement, the Company has agreed to make milestone payments to PureTech Health of up to an aggregate of $10 million upon the achievement of specified development and regulatory milestones. In addition, the Company is obligated to pay PureTech Health low single-digit royalties on the worldwide net sales of any commercialized product covered by the licenses granted under the Patent License Agreement. In the event that the Company sublicenses any of the patent rights granted under the Patent License Agreement, the Company will be obligated to pay PureTech Health royalties within the range of 15% to 25% on any income we receive from the sublicensee, excluding royalties.

The Company may terminate the Patent License Agreement for any reason with proper prior notice to PureTech Health. Either party may terminate the Patent License Agreement upon an uncured material breach by the other party.

The Company incurred no expenses related to the Patent License provided by PureTech Health during the nine months ended September 30, 2019 and 2018. The Company had no outstanding liabilities to PureTech Health related to the Patent License at December 31, 2018 and September 30, 2019.

Indemnification

In the normal course of business, the Company enters into contracts and agreements that contain a variety of representations and warranties and provide for general indemnifications. The Company's exposure under these agreements is unknown because it involves claims that may be made against the Company in the future but have not yet been made. To date, the Company has not paid any claims or been required to defend any action related to its indemnification obligations. However, the Company may incur charges in the future as a result of these indemnification obligations.

Contingencies

From time to time, the Company may have certain contingent liabilities that arise in the ordinary course of its business activities. The Company accrues a liability for such matters when it is probable that future expenditures will be made, and such expenditures can be reasonably estimated.

Litigation

The Company is not a party to any litigation and does not have contingency reserves established for any litigation liabilities as of September 30, 2019.

Note 12. Related Party Transactions

PureTech Health Management Consulting Services and Overhead Agreement

The Company engages PureTech Health, a related party, to provide, among other things, management expertise, strategic advice, administrative support, computer and telecommunications services and office infrastructure. In exchange for providing such services, the Company pays PureTech Health a monthly fee. In addition, PureTech Health periodically invoices the Company for out-of-pocket expenses reasonably incurred in connection with providing such business services.

The Company incurred general and administrative costs for management services provided by PureTech Health totaling less than $0.1 million in the nine months ended September 30, 2019, and totaling $0.2 million in the nine months ended September 30, 2018. The Company had outstanding current liabilities to PureTech Health of less than $0.1 million and $0.1 million at September 30, 2019 and December 31, 2018, respectively, which are recorded as accounts payable in the balance sheet.

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Note 13. 401(k) Savings Plan

The Company has a 401(k) retirement plan in which substantially all U.S. employees are eligible to participate. Eligible employees may elect to contribute up to the maximum limits, as set by the Internal Revenue Service, of their eligible compensation. The total contribution matching expense for the Company was less than $0.1 million for each of the nine months ended September 30, 2019 and 2018.

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2,600,000 Shares

Common Stock

Goldman Sachs & Co. LLC **Citigroup** **Stifel**

JMP Securities