# UNITED STATES
# SECURITIES AND EXCHANGE COMMISSION

**Washington, D.C. 20549**

# Form 10-K

☒ **Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934**

For the fiscal year ended: March 31, 2019

or

☐ **Transition Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934**

Commission file number: 001-37761

# VistaGen Therapeutics, Inc.

(Exact name of registrant as specified in its charter)

| **Nevada** | **20-5093315** |
|---|---|
| (State or other jurisdiction of incorporation or organization) | (I.R.S. Employer Identification No.) |

**343 Allerton Avenue**
**South San Francisco, California 94080**
**(650) 577-3600**
(Address, including zip code, and telephone number, including area code, of registrant's principal executive office)

**Securities registered pursuant to Section 12(b) of the Act**

| **Title of each class** | **Name of each exchange on which registered** |
|---|---|
| Common Stock, par value $0.001 per share | The Nasdaq Capital Market |

**Securities registered pursuant to Section 12(g) of the Act**

**None**

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐ No ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☒

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

Large accelerated filer ☐ Accelerated filer ☐ Non-accelerated filer ☐ Smaller reporting company ☒ Emerging Growth Company ☐

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

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☒

The aggregate market value of the common stock of the registrant held by non-affiliates of the registrant on September 30, 2018, the last business day of the registrant’s second fiscal quarter, was: $41,111,438.

As of June 24, 2019, there were 42,622,965 shares of the registrant’s common stock, $0.001 par value per share, outstanding.

**DOCUMENTS INCORPORATED BY REFERENCE**

Items 10, 11, 12, 13 and 14 of Part III incorporate by reference certain information from VistaGen Therapeutics, Inc.’s definitive proxy statement, to be filed with the Securities and Exchange Commission on or before July 29, 2019.

**TABLE OF CONTENTS**

## Forward-Looking Statements

This Annual Report on Form 10-K (*Annual Report*) contains forward-looking statements that involve substantial risks and uncertainties. All statements contained in this Annual Report other than statements of historical facts, including statements regarding our strategy, future operations, future financial position, future revenue, projected costs, prospects, plans, objectives of management and expected market growth, are forward-looking statements. These statements involve known and unknown risks, uncertainties and other important factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements.

The words "anticipate," "believe," "estimate," "expect," "intend," "may," "plan," "predict," "project," "target," "potential," "will," "would," "could," "should," "continue," 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 availability of capital to satisfy our working capital requirements and clinical and non-clinical development objectives;
- the accuracy of our estimates regarding expenses, future revenues and capital requirements;
- our plans to develop and commercialize our product candidates, including, among other things, AV-101, initially as an add-on treatment for Major Depressive Disorder (*MDD*), and subsequently as a treatment for additional diseases and disorders involving the Central Nervous System (*CNS*), PH94B as a treatment for Social Anxiety Disorder (*SAD*) and PH10 as a treatment for MDD;
- our ability to initiate and complete necessary preclinical and clinical trials, to advance our product candidates into additional preclinical and clinical trials, including pivotal clinical trials, to successfully complete any such preclinical and clinical trials, and for those trials to generate positive results;
- economic, regulatory and political developments in the U.S. and foreign countries;
- the performance of the Department of Veterans Affairs (*VA*), Baylor University, our third-party contract manufacturer(s) (*CMOs*), contract research organizations (*CROs*) and other third-party preclinical and clinical drug development collaborators and regulatory service providers;
- our ability to obtain and maintain intellectual property (*IP*) protection for our core assets, including our product candidates;
- the size of the potential markets for our product candidates and our ability to enter and serve those markets;
- the rate and degree of market acceptance of our product candidates for any indication once approved;
- the success of competing products and product candidates in development by others that are or become available for the indications that we are pursuing in the markets we seek to enter on our own or with collaborators;
- the loss of key scientific, clinical or nonclinical development, regulatory, and/or management personnel, internally or from one or more of our third-party collaborators; and
- other risks and uncertainties, including those listed under Part I, Item 1A of this Annual Report titled "*Risk Factors*."

These forward-looking statements are only predictions and we may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements, so 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 based these forward-looking statements largely on our current expectations and projections about future events and trends that we believe may affect our business, financial condition and operating results. We have included important factors in the cautionary statements included in this Annual Report, particularly in Part I, Item 1A, titled "*Risk Factors*," that could cause actual future 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, joint ventures or investments we may make.

You should read this Annual Report and the documents that we have filed as exhibits to the Annual Report 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 applicable law.

## PART I

*All brand names or trademarks appearing in this Annual Report are the property of their respective holders. Unless the context requires otherwise, references in this report to "VistaGen," the "Company," "we," "us," and "our" refer to VistaGen Therapeutics, Inc., a Nevada corporation. All references to future quarters and years in this Annual Report refer to calendar quarters and calendar years, unless reference is made otherwise.*

### Item 1. Business

#### Overview

We are a clinical-stage biopharmaceutical company committed to developing and commercializing new generation medicines to treat diseases and disorders of the central nervous system (*CNS*) with high unmet need. Our portfolio of three clinical-stage product candidates is currently focused on major depressive disorder (*MDD*), neuropathic pain (*NP*), levodopa-induced dyskinesia (*LID*), social anxiety disorder (*SAD*) and suicidal ideation (*SI*).

Our most advanced product candidate, PH94B neuroactive nasal spray, is fundamentally different from all current treatments for SAD. Developed from proprietary compounds called pherines and administered as a nasal spray, PH94B activates nasal chemosensory receptors that trigger neural circuits in the brain that suppress fear and anxiety. In a published, peer-reviewed, double-blind, placebo-controlled Phase 2 clinical trial undertaken in a laboratory setting mimicking public speaking and social interaction challenges, PH94B neuroactive nasal spray was significantly more effective than placebo in reducing behavior related to social anxiety in individuals with SAD. Its novel mechanism of pharmacological action, rapid-onset of therapeutic effects and exceptional safety and tolerability profile in clinical trials to date make PH94B neuroactive nasal spray an excellent product candidate with potential to become the first FDA-approved on-demand treatment for SAD. Additional potential indications for PH94B include post-traumatic stress disorder (*PTSD*) and general anxiety disorder (*GAD*), as well as other neuropsychiatric indications.

AV-101 (4-Cl-KYN), one of our two product candidates initially focused on MDD, belongs to a new generation of investigational medicines in neuropsychiatry and neurology known as NMDA (N-methyl-D-aspartate) glutamate receptor modulators. The NMDA receptor is a pivotal receptor in the brain and abnormal NMDA function is associated with multiple CNS diseases and disorders, including MDD, epilepsy, LID, NP and many others. AV-101 is an oral prodrug of 7-chlorokynurenic acid (7-Cl-KYNA), which binds uniquely at the glycine site of the NMDA receptor and has potential to be a new at-home treatment for MDD and other CNS indications with high unmet need. AV-101 is currently in Phase 2 development in the U.S. for MDD. ELEVATE is our Phase 2 multicenter, double blind, placebo-controlled clinical study to evaluate the efficacy and safety of AV-101 as an add-on treatment for MDD in adult patients with an inadequate therapeutic response to current FDA-approved oral antidepressants (*ADs*) (the *ELEVATE Study*). Dr. Maurizio Fava, Professor of Psychiatry at Harvard Medical School and Director, Division of Clinical Research, Massachusetts General Hospital (*MGH*) Research Institute, is the Principal Investigator of the ELEVATE Study, assisting our internal team, which is led by Mark Smith, MD, PhD, our Chief Medical Officer. Dr. Fava was the co-Principal Investigator with Dr. A. John Rush of the STAR*D study, the largest clinical trial conducted in depression to date, whose findings were published in journals such as the *New England Journal of Medicine* (*NEJM*) and the *Journal of the American Medical Association* (*JAMA*). We currently anticipate top line results from the ELEVATE Study in the second half of 2019. In addition to MDD, we believe preclinical data and positive safety data in all clinical studies to date support AV-101's potential to treat LID, NP and SI, The FDA has granted Fast Track designation for development of AV-101 both as a potential add-on treatment of MDD and as a non-opioid treatment for NP.

Our other product candidate in Phase 2 development and initially focused on MDD is PH10 neuroactive nasal spray. PH10 is a potential first-in-class, CNS neurosteroid nasal spray administered in microgram doses for front-line treatment of MDD. PH10 nasal spray activates nasal chemosensory receptors that, in turn, engage GABA (gamma-aminobutyric acid) and CRH (corticotropin-releasing hormone) neurons in the limbic amygdala system. The activation of these neural circuits is believed to have the potential to lead to rapid antidepressant effects without psychological side effects, systemic exposure or safety concerns often associated with current antidepressants. Based on positive results from a small exploratory Phase 2a study in MDD in which rapid-onset antidepressant effects were observed without psychological side effects or systemic exposure, we are planning for Phase 2b clinical development of PH10 as a first-line treatment for MDD in the second half of 2020.

In addition to our CNS business, we have two pipeline-enabling programs through our wholly-owned subsidiary, VistaStem Therapeutics (*VistaStem*). VistaStem is focused on applying pluripotent stem cell (*hPSC*) technology to discover, rescue, develop and commercialize proprietary new chemical entities (*NCEs*) for CNS and other diseases and regenerative medicine (*RM*) involving hPSC-derived blood, cartilage, heart and liver cells. Our internal drug rescue programs are designed to utilize *CardioSafe 3D*, our customized stem cell technology-based cardiac bioassay system, to discover and develop small molecule NCEs for our CNS pipeline or for out-licensing. To advance potential RM applications of our cardiac stem cell technology, we have sublicensed to BlueRock Therapeutics LP, a next generation cell therapy and RM company established by Bayer AG and Versant Ventures (*BlueRock Therapeutics*), rights to certain proprietary technologies relating to the production of cardiac stem cells for the treatment of heart disease (the *BlueRock Agreement*). In a manner similar to the BlueRock Agreement, we may pursue additional collaborations or licensing transactions involving blood, cartilage, and/or liver cells derived from hPSCs for cell-based therapy, cell repair therapy, RM and/or tissue engineering.

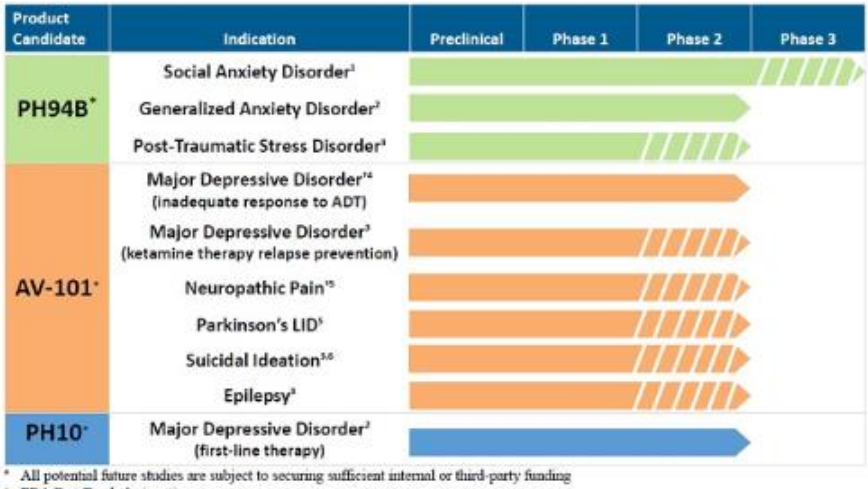
## Our Strategy

Our goal is to be a leading biopharmaceutical company committed to development and commercialization of novel proprietary therapies for the treatment of CNS diseases and disorders with high unmet need. Our current focus is on building our opportunities in neuropsychiatry, with emphasis on MDD, SAD and SI, and in neurology, with emphasis on LID and NP. Key elements of our strategy are to:

- Advance and complete Phase 3 clinical development of PH94B for on-demand treatment of SAD;
- File for and obtain regulatory approval of PH94B for treatment of SAD in the U.S., if our Phase 3 development efforts are successful;
- Commercialize PH94B in the U.S. on our own, if and when approved for treatment of SAD;
- Advance AV-101 and PH10 through completion of Phase 2 clinical development for treatment of MDD on our own, and, if our Phase 2 development efforts are successful, through completion of Phase 3 clinical development for treatment of MDD, either on our own or with a collaborator;
- File for and obtain regulatory approval of AV-101 and PH10 for treatment of MDD in the U.S., if they are advanced into and successfully complete Phase 3 development;
- Commercialize AV-101 and PH10 in the U.S. on our own or with a collaborator, if and when approved;
- Explore potential of our product candidates, in preclinical studies and in early-stage clinical clinical studies, in additional CNS indications, including evaluation of PH94B, AV-101 and PH10 in additional neuropsychiatry disorders such as PTSD, GAD, and SI, as well as AV-101's potential as a treatment for LID and NP;
- Evaluate the market potential and regulatory pathways for our product candidates in China, the European Union (the *EU*), Japan, Hong Kong, South Korea and other countries outside the U.S., and move forward where and when it may make business and strategic sense for us to proceed;
- Explore potential for development and commercialization collaborations to advance clinical development, file for and obtain regulatory approval of, and commercialize our product candidates in China, the EU, Japan, Hong Kong, South Korea, and other global markets outside the U.S.;
- Continue our research and development efforts to evaluate the potential for our existing product candidates in the treatment of additional CNS indications, and the identification of new drug candidates and new areas of interest;
- Enhance the probability of our success by developing and commercializing unique assets with differentiated features, and focus our development activities on CNS indications where we can make well-informed go/no-go decisions;
- Utilize the strengths of our proprietary hPSC-based cardiotoxicity assay system, *CardioSafe* 3D, and our scientific know-how to both expand our CNS product candidate portfolio through our internal drug rescue programs and lessen our long-term reliance on the success of any one particular program to facilitate our long-term growth; and
- Leverage the strengths of our hPSC-based intellectual property portfolio to explore potential for one or more additional strategic out-licensing transactions in the RM and cell therapy (*RM/CT*) fields focused on applications of blood, cartilage and/or liver cells, with each such transaction similar in scope and structure to the BlueRock Agreement.

## Our Product Pipeline

The following table summarizes the status of our development programs as of the filing date of this Annual Report.




* All potential future studies are subject to securing sufficient internal or third-party funding
† FDA Fast Track designation

1. Preparing for initial pivotal Phase 3 Study in 2020
2. Assessing/preparing for Phase 2b Study in 2020/2021
3. Assessing for potential Phase 2a Study in 2020/2021
4. Phase 2 Study ongoing – the ELEVATE Study
5. Planning for potential Phase 2a Study in 2020
6. Baylor/VA 1st-step Phase 1b Study ongoing

## Our Programs

### PH94B Neuroactive Nasal Spray for SAD

SAD, a social phobia that affects as many as 15 million Americans according to the Anxiety and Depression Association of America (ADAA), is characterized by an intense and persistent fear of embarrassment, evaluation, humiliation, judgment, and rejection in everyday social or performance situations, leading the individual to avoid anxiety and fear-producing social situations when possible, even if such avoidance is detrimental to the individual's employment, social activities and overall quality of life. SAD is commonly treated chronically with ADs, which have slow onset of effect (several weeks or months) and known side effects that may make them unattractive to individuals intermittently or episodically affected by SAD. Benzodiazepines, also known as benzos, and beta blockers, which are prescribed off-label to treat SAD, have been found in third party literature to have addictive or sedative properties, and have other adverse effects when used to treat SAD.

PH94B neuroactive nasal spray is a synthetic investigational neurosteroid with a novel, rapid-onset mechanism of action that is fundamentally different from all current treatments for SAD. Developed from proprietary compounds called pherines and administered at microgram doses as an odorless nasal spray, PH94B activates nasal chemosensory receptors that trigger neural circuits in the brain that suppress fear and anxiety. Specifically, PH94B engages nasal chemosensory receptors that trigger a subset of neurons in the main olfactory bulbs (*OB*). OB neurons then stimulate inhibitory GABAergic neurons in the limbic amygdala, releasing anxiolytic neuropeptide S, decreasing release of norepinephrine, and facilitating fear extinction activity of the limbic-hypothalamic parasympathetic system.

In a 91-patient published, peer-reviewed, randomized, double-blind, placebo-controlled Phase 2 clinical trial, which included both laboratory-based public speaking and social situation challenges, PH94B, administered as a nasal spray at a microgram dose, significantly improved the primary efficacy endpoint, as assessed using subjective anxiety ratings on the Subjective Units of Distress Scale (*SUDS*), within 10 to 15 minutes of self-administration, without systemic exposure. It was not observed to be addictive, sedative or have other adverse events. In a 22-patient, four-week, randomized, double blind, placebo-controlled pilot Phase 3 crossover study, subjects receiving PH94B had a significantly greater decrease in average peak SUDS scores compared to placebo within one week of treatment. There was also a significantly greater decrease in Liebowitz Social Anxiety Scale (*LSAS*) avoidance scores for subjects who received PH94B first, before crossing over to placebo. These data were presented in a poster session at ADAA's 2019 Annual Conference. PH94B's safety profile was excellent in all clinical studies to date, without systemic exposure and with no serious adverse events.

We acquired PH94B in September 2018 on a non-cash basis through the issuance of unregistered shares of our common stock under a license from Pherin Pharmaceuticals, Inc. (*Pherin*) giving us the exclusive worldwide rights to develop and commercialize PH94B. With its novel mechanism of pharmacological action, rapid-onset of therapeutic effects and exceptional safety and tolerability profile shown in clinical trials to date, we believe PH94B neuroactive nasal spray is an excellent product candidate with potential to become the first FDA-approved, on-demand, as-needed treatment for SAD. We are currently preparing for the initial pivotal Phase 3 study of PH94B as a first-line on-demand treatment for SAD. Subject to securing sufficient financing, we currently plan to begin this initial pivotal Phase 3 study in the first half of 2020.

### AV-101 for MDD

According to the World Health Organization (*WHO*), depression is the leading cause of disability worldwide, affecting over 300 million people, or approximately 4.4% of the global population. Statistics from the U.S. National Institute of Mental Health (*NIMH*) indicate that an estimated 17.3 million adults in the U.S., or approximately 7.1% of all adults in the U.S., had at least one major depressive episode in 2017. While most people will experience depressed mood at some point during their lifetime, MDD is different. In typical depressive episodes, the person experiences depressed mood, loss of interest and enjoyment, and reduced energy leading to diminished activity and impaired daily functioning for at least two weeks and often much longer. Symptoms of MDD also may include diminished pleasure in activities, changes in appetite that result in weight changes, insomnia or oversleeping, psychomotor agitation, loss of energy or increased fatigue, feelings of worthlessness or inappropriate guilt, difficulty thinking, concentrating or making decisions, and thoughts of death or suicide and attempts at suicide. MDD is the psychiatric diagnosis most commonly associated with suicide.

For many people, depression cannot be controlled for any length of time without treatment. Current oral ADs available in the multi-billion-dollar global depression market, including commonly-prescribed oral SSRIs and SNRIs, have modest efficacy, substantial lag of onset of action, and considerable side effects. Approximately two out of every three depression sufferers do not receive adequate therapeutic benefits from their initial treatment with a standard AD, and the likelihood of achieving remission of depressive symptoms declines with each successive AD treatment attempt. Even after multiple treatment attempts, approximately one-third of depression sufferers still fail to find an adequately effective AD. In addition, this trial and error process and the systemic effects of the various ADs involved may increase the risk of patient tolerability issues and serious side effects, including suicidal thoughts and behaviors in certain groups. New generation ADs with different mechanisms of action, faster onset activity and fewer side effects are needed.

Convincing clinical data involving the NMDAR antagonist, ketamine, and its isomer, esketamine, support that the NMDAR complex is involved in improving depressive symptoms faster than current ADs. Ketamine-based therapies block the ion channel of the NMDAR, and this blockade is associated with significant psychological side effects and safety concerns.

AV-101 (4-Cl-KYN) is an orally-available investigational prodrug of 7-chlorokynurenic acid (7-Cl-KYNA), a potent and selective full antagonist of the glycine site of the NMDAR. AV-101's mechanism of action is fundamentally different from all current oral ADs. In preclinical models, after oral administration, AV-101 is actively transported across the blood-brain barrier and converted into 7-Cl-KYNA in the brain, primarily in astrocytes and predominantly by kynurenine aminotransferase II, the major enzyme responsible for the levels of kynurenic acid that can be rapidly mobilized in the brain. Although 7-Cl-KYNA is a full antagonist at the glycine site of the NMDAR, it does not block the ion channel of the NMDAR. Instead, 7-Cl-KYNA is an allosteric antagonist and down-regulates the NMDAR, which, in part, accounts for AV-101's exceptional safety profile and lack of psychological side effects and safety concerns.

In clinical and nonclinical testing, AV-101 has good oral bioavailability, an excellent pharmacokinetic (*PK*) profile, and is not an inhibitor or inducer of the human cytochrome P450 (*CYP*) isoforms. No binding of AV-101 or 7-Cl-KYNA to off-site targets was identified by an extensive receptor screening. Moreover, in all clinical trials to date, AV-101 has been safe and very well-tolerated with no psychological side effects or safety concerns, and no treatment-related serious adverse events that are often observed with classic channel-blocking NMDAR antagonists such as ketamine and amantadine. We are conducting our ELEVATE Study to evaluate the safety and efficacy of AV-101 as an add-on treatment of MDD in adult patients with an inadequate response to standard, FDA-approved oral ADs s. We currently anticipate that we will be able to report top line results of the ELEVATE Study during the second half of 2019. The Principal Investigator of the ELEVATE Study is Dr. Maurizio Fava of Harvard Medical School. Dr. Fava was the co-Principal Investigator with Dr. A. John Rush of the largest clinical trial ever conducted in depression, STAR*D, whose findings were published in journals such the *New England Journal of Medicine* and the *Journal of the American Medical Association*. In published preclinical studies, AV-101 has been shown to have rapid, persistent, AMPA-dependent antidepressive effects similar to ketamine controls. Recent nonclinical results also indicate that chronic administration of 4-Cl-KYN induces hippocampal neurogenesis, a hallmark of drugs that have antidepressive effects, and increases endogenous levels of KYNA, which also is a functional NMDAR glycine site antagonist.

The FDA has granted Fast Track designation for development of AV-101 as an add-on treatment for MDD in adult patients with an inadequate response to standard, FDA-approved ADs.

We believe the potential for widespread and long-term use of ketamine-based therapies for MDD may be limited by the potential for abuse, dissociative and other psychological side effects and by the inconvenience and practical challenges associated with required administration in a clinical setting. In the event that the cost, side effects, safety concerns, required in-clinic administration or other factors limit the use of ketamine-based therapies and result in relapse of MDD and/or suicidal ideation, we believe AV-101 has potential to prevent relapse of MDD and/or suicidal ideation without ketamine-like side effects and safety concerns, when administered orally to ketamine therapy responders, on an at-home basis, following cessation of ketamine-based therapy. In May 2019, we announced top line results from the NIMH's small, exploratory Phase 2 clinical study of AV-101 as a monotherapy (given alone) in patients with treatment-resistant depression (*TRD*), a disease characterized by serious, long-lasting episodes of depression. The average length of the current depressive episode of the 19 TRD patients that completed the NIMH study was 8.6 years. Prior to participating in the NIMH study, patients had undergone an average of 7.8 attempts to treat their TRD over their lifetime, using multiple different antidepressant drugs. In this severe treatment resistant population, AV-101 given alone, as a monotherapy, did not demonstrate significant separation from placebo on the primary outcome measure, the change from baseline in the Hamilton Depression Rating Scale (*HDRS*) total score compared to placebo. A key objective of the NIMH study was to evaluate safety and tolerability of AV-101 in TRD patients, and, consistent with our Phase 1 studies, AV-101 was very well-tolerated with no ketamine-like psychological side effects or safety concerns and no treatment-related serious adverse events. In sharp contrast to the NIMH monotherapy study in severe TRD patients, our ELEVATE Study is intended to evaluate AV-101 as an adjunctive therapy (as add-on treatment given with a current oral AD) in patients experiencing less severe depression. We plan to leverage our ELEVATE Study Investigational New Drug application (*IND*) to conduct an exploratory Phase 2 study to assess the efficacy and safety of AV-101 as an add-on treatment with standard ADs to prevent relapse of MDD following successful ketamine-based therapy.

**PH10 Neuroactive Nasal Spray for MDD**

PH10 neuroactive nasal spray is a synthetic investigational neurosteroid with a novel, rapid-onset mechanism of action that is fundamentally different from all current treatments for MDD. Developed from proprietary compounds called pherines and administered at microgram doses as an odorless nasal spray, PH10 activates nasal chemosensory receptors that trigger neural circuits in the brain that produce antidepressant effects. Specifically, PH94B engages nasal chemosensory receptors that trigger a subset of neurons in the main OB. OB neurons then stimulate neurons in the limbic amygdala that release norepinephrine and increase activity of the limbic-hypothalamic sympathetic nervous system.

In an exploratory 30-patient Phase 2a clinical trial, PH10 was well-tolerated and, at microgram doses, demonstrated rapid-onset antidepressant effects, as measured by the Hamilton Depression Rating Scale (*HAM-D*), without systemic psychological side effects or safety concerns. PH10 is a new generation antidepressant with a mechanism of action that is fundamentally different from AV-101 and all current ADs. As with AV-101, we believe PH10 has potential for multiple applications in global depression markets, initially as a stand-alone front line therapy for MDD, and as both an add-on therapy to augment current FDA-approved ADs for patients with MDD who have an inadequate response to standard ADs, and to prevent relapse following successful treatment with ketamine-based therapy.

We acquired PH10 from Pherin in October 2018, on a non-cash basis through the issuance of unregistered shares of our common stock. Under our license, we have exclusive worldwide rights to develop and commercialize PH10. We are currently planning for Phase 2b development of PH10 as a first-line treatment for MDD. Subject to securing sufficient financing, we plan to submit our IND for a Phase 2b study of PH10 in MDD in the second half of 2020, and, if authorized by the FDA, begin the study in the second half of 2020.

**Additional Potential Clinical Development Programs**

*Suicidal Ideation*

According to the WHO, every year approximately 800,000 people worldwide take their own life and many more attempt suicide. The U.S. Centers for Disease Control (*CDC*) views suicide as a major public health concern in the U.S. as rates of suicide have been increasing for both men and women and across all age groups. Suicide is the 10th leading cause of death in the U.S. and is one of just three leading causes that are on the rise. According to experts in the field of suicidal ideation (*SI*), characterized as suicidal thoughts and behavior, the number of Americans who die by suicide is, since 2010, higher than those who die in motor vehicle accidents. People of all genders, ages, and ethnicities can be at risk for suicide. Suicidal ideation is complex and there is no single cause. The NIMH attributes many different factors to someone making a suicide attempt, including, but not limited to, depression, other mental health disorders or substance abuse. Additionally, according to reports released by the U.S. Department of Veterans Affairs (*VA*), the U.S. Military Veteran population is at significantly higher risk for suicide than the general population.

We are collaborating with Baylor College of Medicine (*Baylor*) and the VA on a small Phase 1b clinical trial of AV-101 in healthy volunteer U.S. Military Veterans from Operation Enduring Freedom, Operation Iraqi Freedom or Operation New Dawn (the *Baylor Study*). The Baylor Study is a randomized, double-blind, placebo-controlled cross-over study designed as a target engagement study as the first-step in our plans to test potential anti-suicidal effects of AV-101 in U.S. Military Veterans who respond to ketamine-based therapy. Dr. Marijn Lijffijt of Baylor is the Principal Investigator of the Baylor Study. In June 2018, we entered into a Material Transfer Cooperative Research and Development Agreement (*MT CRADA*) with the VA regarding clinical trial material for the Baylor Study. Government funding from the VA is being provided for substantially all other study costs.

*Neuropathic Pain*

NP affects approximately 33 million people in the United States (excluding patients with back pain) according to an article published in the Journal of Pain Research in 2017. NP is a complex, chronic pain state characterized by a steady burning "pins and needles" or "electric shock" sensation that results in abnormal neuronal function after nerve damage. The American Chronic Pain Association has identified various causes of NP, including tissue injury, nerve damage or disease, diabetes, infection, toxins, certain types of drugs, such as antivirals and chemotherapeutic agents, certain cancers, and even chronic alcohol intake. Current treatments for NP include antidepressants, anticonvulsants (such as gabapentin and pregabalin), and opioids, among others. However, current medications may offer inadequate efficacy, have limiting side effects, and be associated with abuse.

The effects of AV-101 as a potential new treatment for NP were assessed in published peer-reviewed preclinical studies involving four well-established models of pain. In these studies, AV-101 was observed to have robust, dose-dependent anti-nociceptive effects, as measured by dose-dependent reversal of NP in the Chung (nerve ligation), formalin and carrageenan thermal models in rats, and was well-tolerated. The publication, titled: "*Characterization of the effects of L-4-chlorokynurenine on nociception in rodents*," by lead author, Tony L. Yaksh, Ph.D., Professor in Anesthesiology at the University of California, San Diego, was published in *The Journal of Pain* in April 2017 (J Pain. 18:1184-1196, 2017)). In recent studies in this preclinical model, AV-101 also had positive results using pregabalin (Lyrica®2) as an active control. AV-101 demonstrated robust analgesic effects, similar to Lyrica, but fewer side effects as measured in the rotarod assay. Neurontin and Lyrica have been associated with sedation and mild cognitive impairment in third party literature and are often prescribed for treatment of NP. Other commonly prescribed medications for NP include drugs targeting opioid receptors in the brain. Unfortunately, misuse of such drugs can lead to a significantly increased risk of addiction, and, we believe, their therapeutic utility for neuropathic pain is unclear.

Based on successful preclinical studies involving AV-101, gabapentin and pregabalin, as well as AV-101's exceptional safety profile in all preclinical and clinical studies to date, we are exploring the optimal development path forward, subject to securing sufficient capital, for Phase 2a clinical development of AV-101 as a new generation, non-opioid treatment to reduce debilitating NP, as well as its potential to avoid sedative side effects and cognitive impairment that have been observed in third party literature to be associated with other NP treatments, and to reduce the risk of addiction associated with pain medications targeting opioid receptors.

The FDA has granted Fast Track designation for development of AV-101 as a potential new, non-opioid treatment of NP.

*Levodopa-Induced Dyskinesia*

Parkinson's disease (*PD*) is the second most common neurodegenerative disease worldwide, affecting approximately one million people in the U.S., according to the Parkinson's Foundation. Although there is no "one-size-fits-all" description of PD, PD is a complex neurodegenerative disorder that occurs when brain cells responsible for making dopamine, a chemical that coordinates movement, stop working or die. This results in progressive deterioration of voluntary motor control. Loss of dopamine neurons is thought to be due to neurotoxicity associated with misfolding of proteins and is associated with increased signaling of glutamate, the most abundant excitatory neurotransmitter in the brain. Increased glutamate activity is involved with aberrant neuronal signaling and excitotoxic death of neurons. Classic PD motor symptoms include muscular rigidity, resting tremor, and postural and gait impairment. Typically, PD patients present with a combination of motor and non-motor symptoms. Non-motor symptoms may include cognitive impairment, sleep disorders pain and fatigue. There is currently no medication to slow, delay, stop or cure PD, and currently available treatments are symptomatic. Treatment of motor symptoms with oral levodopa, introduced about 50 years ago, remains the gold standard treatment.

Levodopa-induced dyskinesia **(***LID*) is a disorder that affects people with PD who are treated with levodopa, for an extended period of time. Oral levodopa remains the most effective therapy for motor symptoms of PD. However, after continuous long-term use (longer than five years), many PD patients experience LID. Although clinical manifestations of LID are heterogenous, LID is commonly associated with abnormal involuntary movements, including chorea and dystonia. These motor complications tend to become more severe as PD progresses and as the duration of levodopa treatment is extended, until the impact of LID may compromise the advantage of treatment with levodopa. PD treatment with levodopa is routinely delayed due to concerns over LID. Once LID develops, levodopa-treated PD patients may be faced with a choice between immobility due to untreated and uncontrolled PD, or mobility with the associated LID. Studies published in the *New England Journal of Medicine* and *Movement Disorders* have shown LID develops in approximately 45% of levodopa-treated Parkinson's disease patients after five years and 80% after 10 years of levodopa treatment. In the U.S., there are an estimated 150,000 to 200,000 people with PD who are impacted by LID.

AV-101 is not a dopamine-based drug candidate. Rather, as a member of a new generation of investigational medicines in neuropsychiatry and neurology known as NMDA glutamate receptor modulators, AV-101's active metabolite, 7-Cl-KYNA, is a potent and selective NMDA receptor glycine site antagonist with neuroprotective properties, which receptor plays a major role in glutamatergic signaling and has been shown to be a therapeutic target for LID.

In a recently reported preclinical study in the "gold standard" MPTP monkey model of PD and LID, AV-101's efficacy against LID was measured through behavioral scores on a dyskinesia scale, and a Parkinsonian disability scale was used to measure levodopa anti-parkinsonian efficacy. This study demonstrated that AV-101 significantly ($p = 0.01$) reduced LID. Importantly, AV-101 did not reduce the timing, extent, or duration of the therapeutic effects of levodopa, indicating that AV-101 did not impact the anti-parkinsonian efficacy of levodopa. Moreover, AV-101 did not cause adverse events often associated with amantadine therapy for LID, such as hallucinations, dizziness, and falls. These recent preclinical results confirm our prior antidyskinesia study in this MPTP monkey model. We believe these preclinical data and AV-101's positive safety profile in all clinical studies to date support AV-101's potential to treat LID, while both maintaining the antiparkinsonian benefits of levodopa and without causing hallucinations or other serious side effects that may be associated with amantadine therapy for LID. As a result, we are exploring the optimal development path forward, subject to securing sufficient capital, for Phase 2a clinical development of AV-101 as a new generation treatment for LID.

*General Anxiety Disorder*

Generalized Anxiety Disorder (*GAD*) is a common chronic neuropsychiatric disorder characterized by persistent, debilitating and excessive concern and worry about family, friends, health, money, work, or other everyday issues and situations. Individuals with GAD find it difficult to control their worry and may worry more about actual circumstances than seems appropriate. They may also expect the worst even when there is no apparent reason to do so. GAD is diagnosed when an individual is unable or finds it difficult to control worry on more days than not for at least six months and has three or more of the many symptoms of GAD, such as excessive and ongoing worrying and tension, an unrealistic view of problems, restlessness, irritability, difficulty concentrating, or being easily startled. This differentiates GAD from worry that may be specific to a set stressor or for a more limited period of time. According to the Anxiety and Depression Association, GAD affects approximately 6.8 million adults in the U.S. in any given year. GAD comes on gradually and can begin across the life cycle, though the risk is highest between childhood and middle age.

People with GAD do not know how to stop the worry cycle and feel it is beyond their control, even though they usually realize that their anxiety is more intense than the situation warrants. Many individuals with GAD may avoid situations because they have the disorder or they may not take advantage of important professional or social opportunities in their lives due to their anxiety and worry. When their anxiety is severe, it is difficult for individuals with GAD to carry out even the simplest of daily activities. Currently, the standard of care for GAD includes psychotherapy and certain medications with limited therapeutic benefits and various side effects and safety concerns, including antidepressants (SSRIs and SNRIs) and benzodiazepines.

PH94B demonstrated efficacy in a small placebo-controlled study in patients with GAD. Twenty one patients were randomized to receive 200 pg PH94B or placebo in a one second aerosol pulse to the chemosensory epithelium of the anterior nasal septum. Thirty minutes after treatment there was mean reduction of 32.0% for the PH94B group and 19.6% for the placebo group in the total HAM-A score. Electrophysiological changes (respiratory, cardiac, and electrodermal frequency), concordant with the reduction in anxiety, were significantly greater for the PH94B group. We believe these transient anti-anxiety effects of PH94B may warrant further investigation in a Phase 2b GAD trial.

*Post-Traumatic Stress Disorder*

Post-traumatic stress disorder (*PTSD*) is a clinically diagnosed psychiatric disorder that develops in some people who have experienced or witnessed a shocking, scary, dangerous or life-threatening event, such as military combat, natural disasters, terrorist incidents, serious accidents, or physical or sexual assault in adulthood or childhood. Symptoms of PTSD include flashbacks, nightmares, severe anxiety, uncontrollable intrusive thoughts, and emotional numbing after the event. More than 8 million people in the U.S. suffer from PTSD. Anyone can develop PTSD at any age. According to the National Center for PTSD, about 7 or 8 out of every 100 people will experience PTSD at some point in their lives. PTSD is often accompanied by depression, substance abuse or one or more of the other anxiety disorders.

It is natural to feel afraid during and after a traumatic situation. Fear triggers many split-second changes in the body to help defend against danger or to avoid it. This “fight-or-flight” response is a typical reaction meant to protect a person from harm. Because PTSD is associated with a heightened “fight or flight” response mediated by increased sympathetic nervous response to conditioned stimuli, an agent which decreases sympathetic tone may be able to treat some symptoms of PTSD. Our PH94B neuroactive nasal spray is a neurosteroid that binds to chemosensory cells in the olfactory bulb and indirectly decreases amygdala function, reduces stress-induced blood pressure, heart rate and sweating mediated by the sympathetic nervous system. In Phase 2 studies, at microgram doses, PH94B has been shown to have anti-anxiety effects in patients with both generalized anxiety disorder and social anxiety disorder. PH94B may therefore have utility either as monotherapy or as add-on therapy in PTSD. Available therapeutic options for PTSD are limited, including only two FDA-approved SSRI antidepressants, which have limited efficacy, undesirable side effects, and target only the symptoms of PTSD, not the underlying disorder itself. We are currently assessing PH94B’s potential for Phase 2a clinical development as a new generation, rapid-acting, anxiolytic for treatment of PTSD.

*Epilepsy*

Epilepsy is one of the most prevalent neurological disorders, affecting almost 1% of the worldwide population. According to the Epilepsy Foundation, as many as three million Americans have epilepsy, and one-third of those suffering from epilepsy are not effectively treated with currently available medications. In addition, standard anticonvulsants can cause significant side effects, which frequently interfere with compliance.

Glutamate is a neurotransmitter that is also critically involved in the pathophysiology of epilepsy. Through its stimulation of the NMDAR subtype, glutamate has been implicated in the neuropathology and clinical symptoms of the disease. In support of this, NMDAR antagonists are potent anticonvulsants. However, as noted, classic ion channel-blocking NMDAR antagonists are limited by adverse effects, such as neurotoxicity, declining mental status, and the onset of psychotic symptoms following administration of the drug. The endogenous amino acid glycine modulates glutamatergic neurotransmission by stimulating the glycine coagonist site of the NMDAR. Glycine site antagonists such as AV-101’s active metabolite, 7-Cl-KYNA, inhibit NMDAR function and are therefore anticonvulsant and neuroprotective. Importantly, glycine site antagonists have fewer and less severe side effects than classic ion channel-blocking NMDAR antagonists and other antiepileptic agents, making them a safer potential alternative to, and one expected to be associated with greater patient compliance than, currently available anticonvulsant medications.

In addition, another active metabolite of AV-101, 4-Cl-3-hydroxyanthranilic acid, inhibits the synthesis of quinolinic acid (*QUIN*), which is an endogenous NMDAR agonist that causes convulsions and excitotoxic neuronal damage.

AV-101 has been shown to protect against seizures and neuronal damage in preclinical animal models of epilepsy. We believe AV-101’s dual action as a NMDAR GlyB antagonist and QUIN synthesis inhibitor, and exploratory preclinical data, together with human safety data in all clinical studies to date, may provide support for AV-101’s potential as a Phase 2a clinical development candidate for treatment of epilepsy. As a result, subject to securing sufficient capital, we anticipate conducting additional preclinical studies in 2020 to assess AV-101’s optimal development path forward and potential for future Phase 2a clinical development as a new generation treatment for epilepsy.

**VistaStem Therapeutics - Stem Cell Technology-Based Programs**

Stem cells are the building blocks of all cells of the human body. They have the potential to develop into many different mature cell types. Stem cells are defined by a minimum of two key characteristics: (i) their capacity to self-renew, or divide in a way that results in more stem cells; and (ii) their capacity to differentiate, or turn into mature, specialized cells that make up tissues and organs. There are many different types of stem cells that come from different places in the body or are formed at different times throughout our lives, including pluripotent stem cells and adult or tissue-specific stem cells, which are limited to differentiating into the specific cell types of the tissues in which they reside. We focus exclusively on hPSCs, which can be differentiated into all of the more than 200 types of cells

in the human body, can be expanded readily, and have diverse medical research, drug discovery, drug rescue (*DR*), drug development and therapeutic applications. We believe hPSCs can be used to develop numerous cell types, tissues and customized assays that can mimic complex human biology, including heart biology for DR applications.

VistaStem Therapeutics (*VistaStem*) is our wholly owned subsidiary focused on applying our hPSC technology to discover, rescue, develop and commercialize proprietary new chemical entities (*NCEs*) for our CNS pipeline and cellular therapies and RM involving hPSC-derived blood, cartilage, heart and liver cells. We used our hPSC-derived human heart cells to develop *CardioSafe* 3D™, our customized *in vitro* bioassay system for predicting heart toxicity of potential DR NCEs. We believe *CardioSafe* 3D is more comprehensive and clinically predictive than the hERG assay and provides us with new generation human cell-based technology to identify and evaluate DR candidates and develop DR NCEs for our CNS pipeline and/or out-licensing.

*Drug Rescue*

Our DR activities are focused on producing, for our internal CNS pipeline or out-licensing, novel, proprietary and safer variants of still-promising NCEs previously discovered, optimized and tested for efficacy by pharmaceutical companies and others but terminated before FDA approval due to unexpected heart toxicity. Our DR strategy involves using *CardioSafe* 3D to assess the cardiac toxicity that caused certain NCEs available in the public domain to be terminated, and then produce and develop new, potentially safer, and proprietary NCEs. We believe the pre-existing public domain knowledge base supporting the therapeutic and commercial potential of NCEs that we target for our DR programs will provide us with a valuable head start as we launch each of our potential DR programs. The essential components of our DR strategy are to (i) leverage the substantial prior investments by global pharmaceutical companies and others in discovery, optimization and efficacy validation of the NCEs we identify in the public domain and (ii) use *CardioSafe* 3D to enhance our understanding of the cardiac liability profile of such NCEs, insight not previously available when the NCEs were originally discovered, optimized for efficacy and developed by others, and (iii) demonstrate preclinical proof-of-concept (*POC*) as to the efficacy and safety of new, safer DR NCEs in standard *in vitro* and *in vivo* models earlier in development and with substantially less investment in discovery and preclinical development than was required of others prior to their decision to terminate the original NCE. In this context, POC means that the lead DR NCE, as compared to the original previously-terminated original NCE, demonstrates both (i) equal or superior efficacy in the same, or a similar, *in vitro* and *in vivo* preclinical efficacy models used by the initial developer of the previously-terminated NCE before it was terminated for cardiac safety reasons, and (ii) significant reduction of concentration dependent cardiotoxicity in *CardioSafe* 3D.

*Regenerative Medicine*

Stem cell technology-based cell therapy (*CT*) and RM have the potential to transform healthcare by providing new approaches for treating the fundamental mechanisms of disease. We currently intend to establish strategic CT- and/or RM-focused collaborations to leverage our hPSC technology platform, our expertise in human biology, differentiation of hPSCs to develop functional adult human cells and tissues involved in human disease, including blood, bone, cartilage, heart and liver cells for CT and RM purposes. We have exclusively sublicensed to BlueRock Therapeutics, a next generation RM company established by Bayer AG and Versant Ventures, rights to certain proprietary technologies relating to the production of cardiac stem cells for the treatment of heart disease. In a manner similar to our agreement with BlueRock Therapeutics, we may pursue additional CT and RM collaborations or licensing transactions involving blood, cartilage, and/or liver cells derived from hPSCs for CT and RM applications.

## Intellectual Property

We strive to protect the proprietary know-how and technology that we believe is important to our business, including seeking and maintaining patents intended to cover our product candidates and related pharmaceutical compositions, their methods of use, including therapeutic and prognostic methods, as well as processes for their manufacture, and any other aspects of our discoveries and inventions that are commercially important to the development of our business.

We may also rely on trade secrets to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection. We also rely on know-how, continuing technological innovation and in-licensing opportunities to develop and maintain our proprietary position. We seek to obtain domestic and international patent protection, and endeavor to promptly file patent applications for new commercially valuable inventions.

To protect our rights to our proprietary technology, we require all employees, as well as our external collaborators, consultants and CROs when feasible, to enter into agreements that require disclosure and assignment to us of ideas, developments, discoveries and inventions made by these employees, consultants, and CROs in the course of their service to us.

We plan to continue to expand our intellectual property estate by filing patent applications directed to compositions, methods of use, including treatment and patient selection, formulations and manufacturing processes created or identified from our ongoing development of our product candidates.

### Patents

We own and have licensed granted patents and pending patent applications in the U.S. and in certain foreign countries. These patent properties include, but are not limited to:

***AV-101***

- Two granted U.S. patents related to the treatment of depression with AV-101 and to certain unit dose formulations of AV-101 effective to treat depression;
- Pending U.S. patent applications and foreign granted patents and pending foreign patent applications related to treatment of various disorders, including depression, LID, NP, tinnitus and obsessive-compulsive disorder; and
- Pending U.S. patent application related to the prognostic identification of high and low responders to treatment of various CNS disorders with AV-101.

The U.S. and foreign patents related to AV-101 nominally expire between 2034 and 2040, depending on the particular subject matter, subject to extensions that may be available on a country-by-country basis.

***PH94B (licensed by us from Pherin)***

- Two granted U.S. patents and other foreign patents related to the reduction of anticipatory anxiety or social phobic response.

The U.S. patents related to PH94B nominally expire either in 2025 or 2028, respectively, and foreign patents nominally expire in 2026, subject to extensions that may be available on a country-by-country basis.

***PH10 (licensed by us from Pherin)***

- One allowed U.S. patent application related to treatment of depressive disorders; and
- Granted foreign patents and pending foreign patent applications related to treatment of depressive disorders.

The U.S. and foreign patents related to PH10 nominally expire in 2033, subject to extensions that may be available on a country-by-country basis.

***Stem Cell Technology (owned by us and/or licensed by us from the University Health Network (Toronto) or Icahn School of Medicine at Mount Sinai)***

***Cardiac Cells***

- U.S. and foreign patents and patent applications relating to methods for enriching pluripotent stem cell-derived cardiomyocyte cells, methods for generating epicardium cells, methods for making and using sino-atrial node-like pacemaker and ventricular-like cardiomyocytes and methods for generation of atrial and ventricular cardiomyocyte lineages.

The U.S. and foreign patents and patent applications related to cardiac stem cells nominally expire between 2031 and 2037, subject to extensions that may be available on a country-by-country basis. Additionally, therapeutic and certain other fields of use have been licensed by us to BlueRock Therapeutics under the BlueRock Agreement.

***Blood Cells***

- U.S. and foreign patents and patent applications relating mesoderm and definitive endoderm cell populations, and to populations of hematopoietic progenitors.

The U.S. and foreign patents and patent applications related to blood stem cells nominally expire between 2023 and 2032, subject to extensions that may be available on a country-by-country basis.

***Cartilage and Chondrocyte Cells***

- U.S. and foreign patents and patent applications relating to methods and compositions for generating chondrocyte lineage cells and cartilage like tissue.

The U.S. and foreign patents and patent applications related to blood stem cells nominally expire in 2034, subject to extensions that may be available on a country-by-country basis.

***Liver and Biliary Cells***

- U.S. and foreign patents and patent applications relating to methods for generating hepatocytes and cholangiocytes from pluripotent stem cells and to toxicity typing using liver stem cells.

The U.S. and foreign patents and patent applications related to blood stem cells nominally expire between 2021 and 2034.

**Patent Term**

The base term of a U.S. patent is 20 years from the filing date of the earliest-filed non-provisional patent application from which the patent claims priority. The term of a U.S. patent can be lengthened by patent term adjustment, which compensates the owner of the patent for administrative delays at the USPTO. In some cases, the term of a U.S. patent is shortened by a terminal disclaimer that reduces its term to that of an earlier-expiring and related patent.

Depending upon the timing, duration and specifics of the FDA approval of our drug candidates, if any, some of our U.S. patents may be eligible for limited patent term extension under the Drug Price Competition and Patent Term Restoration Act of 1984, commonly referred to as the Hatch-Waxman Amendments. The Hatch-Waxman Amendments permit a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. However, patent term restoration cannot extend the remaining term of a patent beyond a total of 14 years from the product's approval date. The patent term restoration period is generally one-half the time between the effective date of an IND and the submission date of an NDA (*testing phase*), plus the time between the submission date of an NDA and the approval of that application (*approval phase*). This patent term restoration period may be reduced by the FDA if it finds that applicant did not act with due diligence during the testing phase or the approval phase. Only one patent applicable to an approved drug is eligible for the extension and the application for the extension must be submitted prior to the expiration of the patent. The U.S. PTO, in consultation with the FDA, reviews and approves the application for any patent term extension or restoration. In the future, if circumstances permit, we intend to apply for restoration of patent term for one of our then owned or licensed patents, if any, to add patent life beyond its current expiration date, depending on the expected length of the clinical trials and other factors involved in the filing of the relevant NDA.

Some of our products may also be entitled to certain non-patent-related data exclusivity under the FDCA. The FDCA provides a five-year period of non-patent data exclusivity within the United States to the first applicant to obtain approval of an NDA for a new chemical entity. A drug is a new chemical entity if the FDA has not previously approved any other new drug containing the same active moiety, which is the molecule or ion responsible for the action of the drug substance. During the exclusivity period, an abbreviated new drug application (*ANDA*), or a 505(b)(2) NDA may not be submitted by another company for another drug containing the same active moiety, regardless of whether the drug is intended for the same indication as the original innovator drug or for another indication, where the applicant does not own or have a legal right of reference to all the data required for approval. However, an application may be submitted after four years if it contains a certification of patent invalidity or non-infringement to one of the patents listed with the FDA Orange Book by the innovator NDA holder. The FDCA also provides three years of marketing exclusivity for a full NDA, or supplement to an existing NDA if new clinical investigations, other than bioavailability studies, that were conducted or sponsored by the applicant are deemed by the FDA to be essential to the approval of the application, for example, for new indications, dosages or strengths of an existing drug. Three-year exclusivity prevents the FDA from approving ANDAs and 505(b)(2) applications that rely on the information that served as the basis of granting three-year exclusivity. This three-year exclusivity covers only the modification for which the drug received approval on the basis of the new clinical investigations, and does not prohibit the FDA from approving ANDAs for drugs containing the active agent for the original indication or condition of use. Five-year and three-year exclusivity will not delay the submission or approval of a full NDA. However, an applicant submitting a full NDA would be required to conduct or obtain a right of reference to all of the nonclinical studies and adequate and well-controlled clinical trials necessary to demonstrate safety and efficacy.

Some foreign jurisdictions, including Europe and Japan, also have patent term extension provisions, which allow for extension of the term of a patent that covers a drug approved by the applicable foreign regulatory agency. In the future, if and when our pharmaceutical products receive FDA approval, we expect to apply for patent term extension on patents covering those products, their methods of use, and/or methods of manufacture.

**Trade Secrets**

In addition to patents, we may rely on trade secrets and know-how to develop and maintain our competitive position. We protect trade secrets, if any, and know-how by establishing confidentiality agreements and invention assignment agreements with our employees, consultants, scientific advisors, contractors and partners. These agreements provide that all confidential information developed or made known during the course of an individual or entity's relationship with us must be kept confidential during and after the relationship. These agreements also generally provide that all relevant inventions resulting from work performed for us or relating to our business and conceived or completed during the period of employment or assignment, as applicable, shall be our exclusive property. In addition, we take other appropriate precautions, such as physical and technological security measures, to guard against misappropriation of our proprietary information by third parties.

**Trademarks**

The Company also owns a registered trademark in the U.S. for "VISTAGEN," which was renewed in 2014. In addition, we use trademarks in our business for *CardioSafe* 3D and *LiverSafe* 3D.

## Strategic Transactions and Relationships

Strategic collaborations are an important cornerstone of our corporate development strategy. We believe that our highly selective outsourcing of certain research, development, manufacturing and regulatory activities gives us flexible access to a broad range of capabilities and expertise at a lower overall cost than developing and maintaining such capabilities and expertise internally on a full-time basis. In particular, we contract with third parties for certain manufacturing, nonclinical development, clinical development and regulatory affairs support. We may seek multiple additional strategic collaborations and relationships focused on development and commercialization of our product candidates in regions outside the U.S.

## Manufacturing and Supply

We neither own nor operate, and currently have no plans to own or operate, any manufacturing facilities. We currently source all of our clinical and nonclinical material supply through third party contract development and manufacturing organizations (*CDMOs*). If our product candidates are approved, we intend to contract with CDMOs to produce all of our future commercial supplies on our behalf.

We have established relationships with CMOs under which the CMOs manufacture clinical and nonclinical supplies of the active pharmaceutical ingredient (*API*), as well as drug product, for AV-101, PH94B and PH10 on a purchase order basis. When produced, all clinical supplies are certified by our CDMOs to have been manufactured under current Good Manufacturing Practices (*cGMP*). Starting materials and key intermediates to support the production of these candidates are either manufactured by other qualified suppliers or purchased from chemical suppliers. We do not currently have arrangements in place for either long-term supply or redundant supply of bulk drug substance or drug product for AV-101, PH94B and PH10. Our CMOs manufacture such product candidates on a purchase order basis under master service and quality agreements. We intend to put a long-term commercial supply agreement in place at the appropriate time for drug substance and drug product for each product candidate, if development continues. We plan to mitigate potential commercial supply risks for any products that are approved in the future through inventory management and through exploring additional back-up manufacturers to provide API and/or drug product.

We continue to refine and scale up the manufacturing process for PH94B to supply our Phase 3 clinical trials, and for AV-101 and PH10 to supply future clinical and nonclinical studies. We believe we currently have sufficient AV-101 drug substance on hand for our ongoing ELEVATE Study and the ongoing Baylor/VA Study.

AV-101, PH94B and PH10 are small molecule drugs. The current syntheses of AV-101, PH94B and PH10 are reliable and reproducible from readily available starting materials. On-going development work is in progress to ensure that these synthetic routes are cost-effective , robust and amenable to large-scale manufacturing. We expect to continue to identify and develop drug candidates that are amenable to cost-effective manufacturing at contract manufacturing facilities.

## Sales and Marketing

We believe that we can successfully launch and commercialize PH94B on our own in the U.S., if approved by the FDA, through the hiring of a targeted sales and marketing force. If an NDA for PH94B in the treatment of SAD is approved by the FDA following our Phase 3 clinical development program, we anticipate hiring and deploying a field sales force of key account managers calling on hospitals and specialty representatives calling on healthcare professionals who treat SAD. We expect to focus our future sales and marketing efforts, if PH94B is approved for SAD, on psychiatrists and select primary care physicians and potentially on pediatricians who are likely to see adolescents, as well as nurse practitioners and psychologists who, in some states, are permitted to prescribe medications.

Should we advance AV-101 and PH10 through successful completion of Phase 2 and Phase 3 clinical development for treatment of MDD and/or other CNS indications, we plan to file for and obtain regulatory approval of AV-101 and PH10 in the U.S. and then commercialize them in the U.S., either on our own or with a collaborator.

To develop and commercialize one or more our product candidates in pharmaceutical markets outside the U.S., if approved in such markets, we may decide to establish agreements or alliances with one or more pharmaceutical company collaborators and/or distributors. Currently, in China, the EU, Japan, Hong Kong, and South Korea, we plan to develop and commercialize our product candidates with third-party collaborators with successful operations involving development and/or commercialization of CNS products, especially neuropsychiatry products. We anticipate that such collaborations would involve local clinical development, regulatory submissions comparable to those required by the FDA in the U.S. and commercial activities necessary to monetize our product candidates. We may also consider other partnering opportunities if we believe the partnering opportunity will add significant value to our efforts, including through local capabilities and infrastructure, as well as speed to market and financial contributions, in each case depending on, among other things, the applicable indications, the expected development pathway and related costs, deal terms, our available resources, and whether the transaction makes strategic sense.

## Competition

The biopharmaceutical industry is highly competitive and subject to rapid and significant technological change. The large and growing markets for SAD, MDD, NP, LID, and other CNS diseases and disorders make them attractive therapeutic areas for biopharmaceutical businesses. We face potential competition from many different sources, including major pharmaceutical, specialty pharmaceutical, and biotechnology companies, academic institutions, governmental agencies, and public and private research institutions. Any product candidates that we successfully develop and commercialize will compete with existing therapies and new therapies that may become available in the future. Many of our competitors may have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical studies, obtaining regulatory approvals, and marketing approved products than we do. Several of these entities have commercial products, robust drug pipelines, readily available capital, and established research and development organizations. Mergers and acquisitions in the pharmaceutical, biotechnology, and diagnostic industries may result in even more resources being concentrated among a smaller number of our competitors. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical study sites and patient registration for clinical studies, as well as in acquiring technologies complementary to, or necessary for, our programs. Small or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. It is probable that the number of companies seeking to develop products and therapies similar to our products will increase. The key competitive factors affecting the success of all of our product candidates, if approved, are likely to be their efficacy, safety, convenience, price, the level of branded and generic competition, and the availability of reimbursement from government and other third-party payors.

Although currently there are no FDA-approved therapies for SAD with the mechanism of action of PH94B, we are aware of two companies with development programs potentially focused on SAD. However, neither of those companies is developing a potential treatment for SAD that is either a nasal spray or involves the same mechanism of pharmacological action as PH94B.

Although currently there are no FDA-approved oral therapies for MDD with the mechanism of pharmacological action of either AV-101 or PH10, we are aware of numerous pharmaceutical and biotechnology companies that are developing therapies targeting the MDD market, including with drug candidates focused on the NMDAR. Certain of the potential MDD therapies being developed are broad NMDAR antagonists and tend to have multiple target actions. We believe AV-101 is an NMDAR glycine site antagonist and is modulatory, without negative off-target activity in preclinical screening. We are aware of the numerous companies developing or commercializing therapies for MDD or NMDAR-targeted therapies for other CNS disorders. Such companies include but are not limited to, Acadia, Adamas, Alkermes, Allergan, Aptynix, Avanir, Axsome, Biohaven, BlackThorn, Cadent, Cerecor, Eli Lilly, , Janssen, Lundbeck, Minerva, Navitor, NeuroRx, Otsuka, Novartis, Perceptive Neuroscience, Relmada, Sage, Seelos, Shionogi, Taisho and Takeda. Additionally, we expect that AV-101 and PH10 will have to compete with a variety of therapeutic procedures for treatment of MDD, such as psychotherapy and electroconvulsive therapy.

While we believe that our employees and consultants, scientific knowledge, technology, and development experience provide us with competitive advantages, many of our potential competitors, alone or with their strategic partners, have substantially greater financial, technical and human resources than we do and significantly greater experience in the discovery and development of product candidates, obtaining FDA and other regulatory approvals of treatments and the commercialization of those treatments.

We believe that VistaStem's hPSC technology platform, the hPSC-derived human cells we produce, and the customized human cell-based assay systems we have formulated and developed are capable of being competitive in the diverse and growing global stem cell, CT and RM markets, including potential markets involving the sale of hPSC-derived cells to third-parties for their *in vitro* drug discovery and safety testing, contract predictive toxicology drug screening services for third parties, internal drug discovery, drug development and DR of new NCEs, and RM, including *in vivo* CT research and development. A representative list of such biopharmaceutical companies pursuing one or more of these potential applications of adult and/or hPSC technology includes, but is not limited to, the following: Acea, Astellas, Athersys, BioCardia, BioTime, Caladrius, Cellectis, Cellerant, Cytori, Fujifilm, HemoGenix, International Stem Cell, Neuralstem, Organovo, PluriStem, and Stemina BioMarker Discovery. Pharmaceutical companies and other established corporations such as Bristol-Myers Squibb, Charles River, GE Healthcare, GlaxoSmithKline, Novartis, Pfizer, Roche Holdings, Thermo Fisher and others have been and are expected to continue pursuing internally various stem cell-related research and development programs. Many of the foregoing companies have greater resources and capital availability and as a result, may be more successful in their research and development programs than us. We anticipate that acceptance and use of hPSC technology for drug development, CT and RM will continue to occur and increase at pharmaceutical and biotechnology companies in the future.

## Government Regulation

Government authorities in the U.S. at the federal, state and local level and in other countries extensively regulate, among other things, the research, development, testing, manufacture, quality control, approval, labeling, packaging, storage, record-keeping, promotion, advertising, distribution, post-approval monitoring/pharmacovigilance, safety and periodic reporting, marketing and export and import of drug products. Generally, before a new drug can be marketed in a given jurisdiction, considerable data demonstrating its quality, safety and efficacy must be obtained and/or generated, organized into a format specific to each regulatory authority, submitted for review and the drug must be approved by the relevant regulatory authority or authorities.

### U.S. Drug Development

In the U.S., the FDA regulates drugs under the Federal Food, Drug, and Cosmetic Act (*FDCA*), and its implementing regulations. Drugs are also subject to other federal, state and local statutes and regulations. The process of obtaining regulatory approvals and the subsequent compliance with appropriate federal, state, and local statutes and regulations require the expenditure of substantial time and financial resources. Failure to comply with the applicable U.S. requirements at any time during the product development process, approval process or after approval, may subject a company to administrative or judicial sanctions. These sanctions could include, among other actions, the FDA's refusal to approve pending applications, withdrawal of an approval, a clinical hold on a clinical investigation, warning or untitled letters, product recalls or withdrawals from the market, product seizures, total or partial suspension of production or distribution, injunctions, fines, refusals of government contracts, restitution, disgorgement, or civil penalties or criminal prosecution. Any agency or judicial enforcement action could have a material adverse effect on us.

Each of our product candidates must be approved by the FDA through the NDA process before they may be legally marketed in the U.S. The process required by the FDA before a drug may be marketed in the U.S. requires substantial time, effort and financial resources and generally involves the following:

- Completion of extensive non-clinical studies and testing, sometimes referred to as non-clinical laboratory tests, non-clinical animal studies and formulation studies, in accordance with applicable regulations, including the FDA's current Good Laboratory Practice (*cGLP*) regulations;
- Submission to the FDA of an IND application, which must become effective before human clinical trials may begin;
- Approval by an independent institutional review board (*IRB*) or ethics committee representing each clinical trial site before each trial may be initiated;
- Performance of adequate and well-controlled human clinical trials in accordance with applicable IND and other clinical trial-related regulations, sometimes collectively referred to as good clinical practice (*cGCP*) to establish the safety and efficacy of the proposed drug for each proposed indication;
- Submission to the FDA of an NDA for marketing approval of a new drug;
- A determination by the FDA within 60 days of its receipt of an NDA to accept and file the NDA for review; Satisfactory completion of a potential FDA pre-approval inspection of the manufacturing facility or facilities where the drug is produced to assess compliance with cGMP requirements to assure that the facilities, methods and controls are adequate to preserve the drug's identity, strength, quality and purity;
- Potential FDA audit of the non-clinical and/or clinical trial sites that generated the data in support of the NDA; and
- Payment of applicable user fees and FDA review and approval of the NDA, including consideration of the views of any FDA advisory committee, prior to any commercial marketing or sale of the drug in the United States.

The data required to support an NDA are generated in two distinct development stages: nonclinical and clinical. For NCEs, the nonclinical development stage generally involves synthesizing the active component, developing the formulation and determining the manufacturing process, as well as carrying out non-human toxicology, pharmacology and drug metabolism studies in the laboratory, which support subsequent clinical testing. Nonclinical tests include laboratory evaluation of product chemistry, formulation, stability and toxicity, as well as animal studies to assess the characteristics and potential safety and efficacy of the product. The conduct of the nonclinical tests must comply with federal laws and regulations, including, for animal studies, the Animal Welfare Act and cGLP. The sponsor must submit the results of the non-clinical tests, together with manufacturing information, analytical data, any available clinical data or literature and a proposed clinical protocol, to the FDA as part of the IND.

An IND is a request for authorization from the FDA to administer an investigational drug product to humans. Some non-clinical testing may continue even after the IND is submitted, but an IND must become effective before human clinical trials may begin. The central focus of an IND submission is on the general investigational plan and the protocols for human trials. The IND automatically becomes effective 30 days after receipt by the FDA, unless the FDA raises concerns or questions regarding the proposed clinical trials, including whether subjects will be exposed to unreasonable health risks, and places the IND on clinical hold within that 30-day time period. In such a case, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial can begin. The FDA may also impose clinical holds on a drug candidate at any time before or during clinical trials due to safety concerns or non- compliance. Accordingly, we cannot be sure that submission of an IND will result in the FDA allowing clinical trials to begin, or that, once begun, issues will not arise that could cause the trial to be suspended or terminated.

The clinical stage of development involves the administration of the drug candidate to healthy volunteers or to patients with the disease or condition being studied under the supervision of qualified investigators, generally physicians not employed by or under the trial sponsor's control. Clinical trials must be conducted in accordance with cGCPs, which include the requirement that all research subjects provide their informed consent for their participation in any given clinical trial. Clinical trials are conducted under protocols describing, among other details, the objectives of the clinical trial, dosing procedures, subject selection and exclusion criteria, and the parameters to be used to monitor subject safety and assess efficacy. Each protocol, and any subsequent amendments to the protocol, must be submitted to the FDA as part of the IND. Further, each clinical trial must be reviewed and approved by an IRB at or servicing each institution at which the clinical trial will be conducted. An IRB is charged with protecting the welfare and rights of trial participants, and considers such items as whether the risks to individuals participating in the clinical trials are minimized and are reasonable in relation to anticipated benefits. The IRB also approves the informed consent form that must be provided to each clinical trial subject or his or her legal representative and must monitor the clinical trial until completed. There are also requirements governing the reporting of ongoing clinical trials and completed clinical trial results to public registries.

A sponsor who wishes to conduct a clinical trial outside the U.S. may, but need not, obtain FDA authorization to conduct the clinical trial under an IND. If a foreign clinical trial is not conducted under an IND, the sponsor may submit data from the clinical trial to the FDA in support of an NDA so long as the clinical trial is conducted in compliance with cGCP, including review and approval by an independent ethics committee and compliance with informed consent principles, and FDA is able to validate the data from the study through an onsite inspection if deemed necessary.

**Clinical Trials**

Clinical trials are generally conducted in three phases that may overlap, known as Phase 1, Phase 2 and Phase 3 clinical trials.

- Phase 1 clinical trials generally involve a small number of healthy volunteers who are initially exposed to a single dose and then multiple doses of the product candidate. The primary purpose of these clinical trials is to assess the metabolism, pharmacologic action, side effect tolerability and safety of the drug.

- Phase 2 clinical trials typically involve studies in disease-affected patients to determine the dose required to produce the desired benefits. At the same time, safety and further pharmacokinetic and pharmacodynamic information is collected, as well as identification of possible adverse effects and safety risks and preliminary evaluation of efficacy.

- Phase 3 clinical trials generally involve large numbers of patients at multiple sites (typically from several hundred to several thousand subjects), and are designed to provide the data necessary to demonstrate the effectiveness of the product for its intended use, its safety in use, and to establish the overall benefit/risk relationship of the product and provide an adequate basis for product approval and labeling. Phase 3 clinical trials may include comparisons with placebo and/or other comparator treatments. The duration of treatment is often extended for drugs intended for chronic dosing to mimic the actual use of a product during marketing.

Post-approval trials, sometimes referred to as Phase 4 clinical trials, may be conducted after initial marketing approval. These trials are used to gain additional experience from the treatment of patients in the intended therapeutic indication. In certain instances, FDA may mandate the performance of Phase 4 clinical trials as a condition of approval of an NDA.

Progress reports detailing the results of the clinical trials must be submitted at least annually to the FDA and written IND safety reports must be submitted to the FDA and the investigators for serious and unexpected suspected adverse events, increased rates of serious suspected adverse events, or findings from other studies or from animal or in vitro testing that suggests a significant risk for human subjects. Phase 1, Phase 2 and Phase 3 clinical trials may not be completed successfully within any specified period, if at all. Success in one phase does not mean similar results will be observed in subsequent phases. Each phase may involve multiple studies. The FDA, the IRB, or the sponsor may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research subjects or patients are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution if the clinical trial is not being conducted in accordance with the IRB's requirements or if the drug has been associated with unexpected serious harm to patients. Additionally, some clinical trials are overseen by an independent group of qualified experts organized by the clinical trial sponsor, known as a data safety monitoring board or committee. This group provides authorization for whether or not a trial may move forward at designated check points based on access to certain data from the trial, and may suspend a clinical trial at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Concurrent with clinical trials, companies usually complete additional animal studies and must also develop additional information about the chemistry and physical characteristics of the drug 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, we must develop methods for testing the identity, strength, quality and purity of the final drug product. 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.

**NDA and FDA Review Process**

The results of nonclinical studies and of the clinical trials, together with other detailed information, including extensive manufacturing information and information on the composition of the drug and proposed labeling, are submitted to the FDA in the form of an NDA requesting approval to market the drug for one or more specified indications. The FDA reviews an NDA to determine, among other things, whether a drug is safe and effective for its intended use and whether the product is being manufactured in accordance with cGMP to assure and preserve the product's identity, strength, quality and purity. FDA approval of an NDA must be obtained before a drug may be offered for sale in the U.S.

In addition, under the Pediatric Research Equity Act (*PREA*) certain NDAs or supplements to an NDA must contain data to assess the safety and efficacy of the drug for the claimed indications in all relevant pediatric subpopulations and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDA may grant deferrals for submission of pediatric data or full or partial waivers. Under the Best Pharmaceuticals for Children Act (*BPCA*) the FDA may also issue a Written Request asking a sponsor to conduct pediatric studies related to a particular active moiety; if the sponsor agrees and meets certain requirements, the sponsor may be eligible to receive additional marketing exclusivity for its drug product containing such active moiety.

Under the Prescription Drug User Fee Act (*PDUFA*), as amended, each NDA must be accompanied by a user fee, unless subject to a waiver. The FDA adjusts the PDUFA user fees on an annual basis. According to the FDA's fee schedule, effective through September 30, 2019, the user fee for an application requiring clinical data, such as an NDA, is approximately $2.6 million. PDUFA also imposes an annual prescription drug program fee for human drugs of approximately $0.3 million. Fee waivers or reductions are available in certain circumstances, including a waiver of the application fee for the first application filed by a small business. Additionally, no user fees are assessed on NDAs for products designated as orphan drugs, unless the product also includes a non-orphan-designated indication.

The FDA reviews all NDAs submitted before it accepts them for filing, and may request additional information rather than accepting an NDA for filing. The FDA must make a decision on accepting an NDA for filing within 60 days of receipt. Once the submission is accepted for filing, the FDA begins an in-depth review of the NDA. Under the goals and policies agreed to by the FDA under PDUFA, the FDA aims to complete its initial review of an NDA and respond to the applicant within 10 months from the filing date for a standard NDA and, and within six months from the filing date for a priority NDA. The FDA does not always meet its PDUFA goal dates for standard and priority NDAs, and the review process is often significantly extended by FDA requests for additional information or clarification.

After the NDA submission is accepted for filing, the FDA reviews the NDA to determine, among other things, whether the proposed product is safe and effective for its intended use, and whether the product is being manufactured in accordance with cGMP to assure and preserve the product's identity, strength, quality and purity. Before approving an NDA, the FDA will generally conduct a pre-approval inspection of the manufacturing facilities for the new product to determine whether the facilities comply with cGMPs. The FDA will not approve the product unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Before approving an NDA, the FDA may also audit data from clinical trials to ensure compliance with GCP requirements and integrity of the data submitted in the NDA. Additionally, the FDA may refer applications for novel drug products or drug products which present difficult questions of safety or efficacy to an advisory committee, typically a panel that includes clinicians and other experts, for review, evaluation and a recommendation as to whether the application should be approved and under what conditions. For example, the advisory committee may recommend or the FDA may determine that a Risk Evaluation and Mitigtion Strategy (*REMS*) program is necessary to ensure safe use of the product. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions. The FDA will likely re-analyze the clinical trial data, which could result in extensive discussions between the FDA and the applicant during the review process. The review and evaluation process for an NDA by the FDA is extensive and time consuming and may take longer than originally planned to complete, and we may not receive a timely approval, if at all.

After the FDA evaluates an NDA, it may issue an approval letter or a Complete Response Letter. An approval letter authorizes commercial marketing of the drug with specific prescribing information for specific indications. A Complete Response Letter indicates that the review cycle of the application is complete and the application is not ready for approval. A Complete Response Letter usually describes all of the specific deficiencies in the NDA identified by the FDA. The Complete Response Letter may require additional clinical data and/or one or more additional pivotal Phase 3 clinical trials, and/or other significant and time-consuming requirements related to clinical trials, non-clinical studies or manufacturing. If a Complete Response Letter is issued, the applicant may either resubmit the NDA, addressing all of the deficiencies identified in the letter, or withdraw the application. Even if such additional data and information are submitted, the FDA may ultimately decide that the NDA does not satisfy the criteria for approval. Data obtained from clinical trials are not always conclusive, and the FDA may interpret data differently than we interpret the same data.

There is no assurance that the FDA will ultimately approve any of our drug product candidates for marketing in the U.S., and we may encounter significant difficulties or costs during the FDA review process. If a product receives marketing approval, the approval may be significantly limited to specific patient populations and dosages or the indications for use may otherwise be limited, which could restrict the commercial value of the product. Further, the FDA typically requires that certain contraindications, warnings or precautions be included in the product labeling, and may condition the approval of the NDA on other changes to the proposed labeling, development of adequate controls and specifications, or a commitment to conduct post-marketing testing or clinical trials and surveillance to monitor the effects of approved products. For example, the FDA may require Phase 4 testing which may involve clinical trials designed to further assess a drug's safety and/or efficacy and may require testing and surveillance programs to monitor the safety of approved products that have been commercialized. The FDA may also place other conditions on approvals including the requirement for a REMS to assure the safe use of the drug. If the FDA concludes a REMS is needed, the sponsor of the NDA must submit a proposed REMS. The FDA will not approve the NDA without an approved REMS, if the FDA determines that a REMS is required. A REMS could include medication guides, physician communication plans, or elements to assure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. Any limitations on approval, marketing or use for any of our products could restrict the commercial promotion, distribution, prescription or dispensing of those products. Product approvals may be withdrawn for non-compliance with regulatory requirements or if problems occur following initial marketing.

**Orphan Drug Designation**

Under the Orphan Drug Act, the FDA may grant orphan designation to a drug product intended to treat a "rare disease or condition," which is generally a disease or condition that affects fewer than 200,000 individuals in the United States, or more than 200,000 individuals in the United States, but for which there is no reasonable expectation that the cost of developing and making a drug product available in the United States for this type of disease or condition will be recovered from sales of the product. Orphan product designation must be requested before submitting an NDA for the drug for the proposed rare disease or condition. After the FDA grants orphan drug designation, the common name of the therapeutic agent and its designated orphan use are disclosed publicly by the FDA. Orphan product designation does not, by itself, convey any advantage in or shorten the duration of the regulatory review and approval process.

If a product that has orphan designation subsequently receives the first FDA approval for the disease or condition for which it has such designation, the product is entitled to orphan product exclusivity, which means that the FDA may not approve any other sponsors' applications to market the same drug for the same indication for seven years, except in limited circumstances, such as a showing of clinical superiority to the product with orphan exclusivity. Orphan exclusivity operates independently from other regulatory exclusivities and other protection against generic competition, including patents that we hold for our products. A sponsor of a product application that has received an orphan drug designation may also be granted tax incentives for clinical research undertaken to support the application. In addition, the FDA may coordinate with the sponsor on research study design for an orphan drug and may exercise its discretion to grant marketing approval on the basis of more limited product safety and efficacy data than would ordinarily be required, based on the limited size of the applicable patient population.

Competitors, however, may receive approval of different products for the indication for which the orphan product has exclusivity or obtain approval for the same product but for a different indication than that for which the orphan product has exclusivity. Orphan product exclusivity also could block the approval of one of our products for seven years if a competitor obtains approval of the same product as defined by the FDA or if our product candidate is determined to be contained within the competitor's product for the same indication or disease. If a drug designated as an orphan product receives marketing approval for an indication broader than what is designated, it may not be entitled to orphan product exclusivity. The FDA can revoke a product's orphan drug exclusivity under certain circumstances, including when the holder of the approved orphan drug application is unable to assure the availability of sufficient quantities of the drug to meet patient needs. Orphan drug status in the EU has similar, but not identical, benefits.

**Expedited Development and Review Programs**

The FDA has several programs that are intended to expedite or facilitate the process for reviewing new drugs that are intended to treat a serious or life-threatening condition and demonstrate the potential to address unmet medical needs for the condition and provides meaningful therapeutic benefit over existing treatments. Fast Track designation and Breakthrough Therapy designation are two of these programs and apply to the combination of the product and the specific indication for which it is being studied. The sponsor of a new drug or biologic may request the FDA to designate the drug as a Fast Track product at any time during the development of the product and may request the FDA to designate the drug as a Breakthrough Therapy based on preliminary clinical evidence which meet the criteria outlined in the FDA's programs. Under the Fast Track or Breakthrough Therapy expedited programs, the FDA may review sections of the marketing application on a rolling basis before the complete NDA is submitted if the sponsor provides a schedule for the submission of the sections of the application, the FDA agrees to accept sections of the application and determines that the schedule is acceptable, and the sponsor pays any required user fees upon submission of the first section of the application.

Any product submitted to the FDA for marketing, including under a Fast Track or Breakthrough Therapy program, may be eligible for other types of FDA programs intended to expedite development and review, such as priority review and accelerated approval.

Any product is eligible for priority review if it treats a serious condition and offers a significant improvement in the safety and effectiveness of treatment, diagnosis or prevention compared to marketed products. Significant improvement may be shown 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. The FDA will attempt to direct additional resources to the evaluation of an application for a new drug designated for priority review in an effort to facilitate the review, and to shorten the FDA's goal for taking action on a marketing application from ten months to six months from the date of the NDA filing.

A product may also be eligible for accelerated approval if the product is intended to treat a serious or life-threatening illness and provides meaningful therapeutic benefit over existing treatments. Accelerated approval for a product means that it may be approved on the basis of adequate and well-controlled clinical trials establishing that the product has an effect on a surrogate endpoint that is reasonably likely to predict a clinical benefit, or on the basis of an effect on a clinical endpoint other than survival or irreversible morbidity. As a condition of approval, the FDA may require that a sponsor of a drug receiving accelerated approval perform adequate and well-controlled post-marketing clinical trials. If the FDA concludes that a drug shown to be effective can be safely used only if distribution or use is restricted, it will require such post-marketing restrictions, as it deems necessary to assure safe use of the drug, such as:

- distribution restricted to certain facilities or physicians with special training or experience; or
- distribution conditioned on the performance of specified medical procedures.

The limitations imposed would be commensurate with the specific safety concerns presented by the drug. In addition, the FDA currently requires as a condition for accelerated approval pre-approval of promotional materials, which could adversely impact the timing of the commercial launch of the product.

Fast Track designation, priority review, accelerated approval and Breakthrough Therapy designation do not change the standards for approval, but may expedite the development or approval process.

**Pediatric Trials**

The Food and Drug Administration Safety and Innovation Act (*FDASIA*) which was signed into law on July 9, 2012, amended the FDCA to require that a sponsor who is planning to submit a marketing application for a drug that includes a new active ingredient, new indication, new dosage form, new dosing regimen or new route of administration submit an initial Pediatric Study Plan (*PSP*) within sixty days of an end-of-Phase 2 meeting or as may be agreed between the sponsor and FDA. The initial PSP must include an outline of the pediatric study or studies that the sponsor plans to conduct, including study objectives and design, age groups, relevant endpoints and statistical approach, or a justification for not including such detailed information, and any request for a deferral of pediatric assessments or a full or partial waiver of the requirement to provide data from pediatric studies along with supporting information. FDA and the sponsor must reach agreement on the PSP. A sponsor can submit amendments to an agreed-upon initial PSP at any time if changes to the pediatric plan need to be considered based on data collected from non-clinical studies, early phase clinical trials, and/or other clinical development programs. The FDA, if it learns of new information, may also request that the sponsor amend the initial PSP.

**Post-marketing Requirements**

Following approval of a new product, a pharmaceutical company and the approved product are subject to continuing regulation by the FDA, including, among other things, monitoring and recordkeeping activities, reporting to the applicable regulatory authorities of adverse experiences with the product, providing the regulatory authorities with updated safety and efficacy information, product sampling and distribution requirements, and complying with promotion and advertising requirements, which include, among others, standards for direct-to-consumer advertising, restrictions on promoting drugs for uses or in patient populations that are not described in the drug's approved labeling (known as *off-label use*), limitations on industry-sponsored scientific and educational activities, and requirements for promotional activities involving the Internet. Although physicians may prescribe legally available drugs for off-label uses, manufacturers may not market or promote such off-label uses. Prescription drug promotional materials must be submitted to the FDA in conjunction with their first use. Further, if there are any modifications to the drug, including changes in indications, labeling, or manufacturing processes or facilities, the applicant may be required to submit and obtain FDA approval of a new NDA or NDA supplement, which may require the applicant to develop additional data or conduct additional non-clinical studies and clinical trials. As with new NDAs, the review process is often significantly extended by FDA requests for additional information or clarification. Any distribution of prescription drug products and pharmaceutical samples must comply with the U.S. Prescription Drug Marketing Act (the *PDMA*) and the Drug Supply Chain Security Act (*DSCSA*).

FDA regulations also require that approved products be manufactured in specific approved facilities and in accordance with cGMP. We rely, and expect to continue to rely, on third parties for the production of clinical and commercial quantities of our products in accordance with cGMP regulations. NDA holders using contract manufacturers, laboratories or packagers are responsible for the selection and monitoring of qualified firms, and, in certain circumstances, qualified suppliers to these firms. These manufacturers must comply with cGMP regulations that require, among other things, quality control and quality assurance as well as the corresponding maintenance of records and documentation and the obligation to investigate and correct any deviations from cGMP. Drug manufacturers and other entities involved in the manufacture and distribution of approved drugs are required to register their establishments with the FDA and certain state agencies, and are subject to periodic unannounced inspections by the FDA and certain state agencies for compliance with cGMP and other laws. Accordingly, manufacturers must continue to expend time, money, and effort in the area of production and quality control to maintain cGMP compliance. The discovery of violative conditions, including failure to conform to cGMP, could result in enforcement actions that interrupt the operation of any such facilities or the ability to distribute products manufactured, processed or tested by them. Discovery of problems with a product after approval may result in restrictions on a product, manufacturer, or holder of an approved NDA, including, among other things, recall or withdrawal of the product from the market.

Discovery of previously unknown problems with a product or the failure to comply with applicable FDA requirements can have negative consequences, including adverse publicity, administrative enforcement, warning or untitled letters from the FDA, mandated corrective advertising or communications with doctors, and civil penalties or criminal prosecution, among others. Newly discovered or developed safety or effectiveness data may require changes to a product's approved labeling, including the addition of new warnings and contraindications, and also may require the implementation of other risk management measures. Also, new government requirements, including those resulting from new legislation, may be established, or the FDA's policies may change, which could delay or prevent regulatory approval of our products under development.

**Other Regulatory Matters**

Manufacturing, sales, promotion and other activities following product approval are also subject to regulation by numerous regulatory authorities in addition to the FDA, including, in the U.S., the Department of Health and Human Services; the Department of Justice; the DEA; the Consumer Product Safety Commission; the Federal Trade Commission; the Occupational Safety and Health Administration; the Environmental Protection Agency; and state and local governments.

In the U.S., a drug product approved by the FDA may also be subject to regulation under the Controlled Substances Act (*CSA*) as a controlled substance. The CSA is administered by the DEA and establishes, among other things, certain registration, security, recordkeeping, reporting, import, export and other requirements for controlled substances. The CSA classifies controlled substances into five schedules: Schedule I, II, III, IV or V. FDA approved pharmaceutical products may be listed in Schedule II, III, IV or V, with Schedule II substances considered to present the highest potential for abuse or dependence and Schedule V substances the lowest relative risk of abuse among such substances. An approved drug product or drug candidate that has not yet been approved by the FDA may be subject to scheduling as a controlled substance under the CSA, depending on the drug's potential for abuse. For a drug approved by the FDA and determined to require control under the CSA, the CSA requires the DEA to issue an interim final order scheduling the drug within 90 days after the FDA approves the drug and the DEA receives a scientific and medical evaluation and scheduling recommendation from the Department of Health and Human Services, after it has been completed by FDA. We do not expect FDA to recommend scheduling of any of our product candidates as a controlled substance, if approved.

In the U.S., arrangements and interactions with health care professionals, third-party payors, patients and others will expose us to broadly applicable anti-fraud and abuse, anti-kickback, false claims and other health care laws and regulations. These broadly applicable laws and regulations may constrain the business or financial arrangements or relationships through which we sell, market and distribute our products, if and when we obtain marketing approval. In the U.S., federal and state health care laws and regulations that may affect our operations include:

- The federal Anti-Kickback Statute, which makes it illegal for any person, including a company marketing a prescription drug (or a party acting on its behalf) to knowingly and willfully solicit, receive, offer, or pay any remuneration (including any kickback, bribe or rebate), directly or indirectly, in cash or in kind, that is intended to induce or reward the referral of an individual or purchase, lease or order, or the arranging for or recommending the purchase or order, of a particular item or service, for which payment may be made in whole or in part under a federal healthcare program, such as Medicare or Medicaid. This statute has been interpreted to apply to arrangements between pharmaceutical companies on one hand and prescribers, patients, purchasers and formulary managers on the other. Liability under the Anti-Kickback Statute may be established without proving 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. Although there are a number of statutory exemptions and regulatory safe harbors to the federal Anti-Kickback Statute protecting certain common business arrangements and activities from prosecution or regulatory sanctions, the exemptions and safe harbors are drawn narrowly. Practices that involve remuneration to those who prescribe, purchase, or recommend pharmaceutical and biological products, including certain discounts, or engaging such individuals as consultants, advisors, or speakers, may be subject to scrutiny if they do not fit squarely within an exemption or safe harbor. Our practices may not in all cases meet all of the criteria for safe harbor protection from anti-kickback liability. Moreover, there are no safe harbors for many common practices, such as educational and research grants, charitable donations, product support and patient assistance. Violations of this law are punishable by up to five years in prison, criminal fines, damages, administrative civil money penalties, and exclusion from participation in federal healthcare programs.

- The federal civil False Claims Act, which prohibits anyone from, among other things, knowingly presenting, or causing to be presented claims for payment of government funds that are false or fraudulent, or knowingly making, using, or causing to be made or used a false record or statement material to a false or fraudulent claim or knowingly and improperly avoiding, decreasing or concealing an obligation to pay money to the federal government. Actions under the False Claims Act may be brought by the federal government or as a qui tam action by a private individual in the name of the government. Many pharmaceutical manufacturers have been investigated and have reached substantial financial settlements with the federal government under the civil False Claims Act for a variety of alleged improper activities. The government may deem companies to have "caused" the submission of false or fraudulent claims by, for example, providing inaccurate billing or coding information to customers or promoting a product off-label. In addition, our future activities relating to the reporting of prices used to calculate Medicaid rebate information and other information affecting federal, state, and third-party reimbursement for our products, and the sale and marketing of our products, are subject to scrutiny under this law. Penalties for a False Claims Act violation may include three times the actual damages sustained by the government, plus significant civil penalties for each separate false or fraudulent claim, and the potential for exclusion from participation in federal healthcare programs.

- Numerous federal and state laws, including state security breach notification laws, state health information privacy laws, and federal and state consumer protection laws, govern the collection, use, and disclosure and protection of health-related and other personal information. Failure to comply with these laws and regulations could result in government enforcement actions and create liability, private litigation, or adverse publicity. In addition, we may obtain health information from third parties, such as hospitals, healthcare professionals, and research institutions from which we or our collaborators obtain patient health information, that are subject to privacy and security requirements under the federal Health Insurance Portability and Accountability Act of 1996, as amended by the Health Information Technology for Economic and Clinical Health Act (*HIPAA*). Although we are not directly subject to the HIPAA information privacy and security provisions, other than with respect to providing certain employee benefits, we could potentially be subject to criminal penalties if we or our agents knowingly obtain or disclose individually identifiable health information maintained by a HIPAA-covered entity in a manner that is not authorized or permitted by HIPAA. In addition, HIPAA does not replace federal, state, or other laws that may grant individuals even greater privacy protections.

- The HIPAA fraud provisions, which impose criminal and civil liability for knowingly and willfully executing a scheme to defraud any healthcare benefit program, including private third-party payors, and prohibit knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false, fictitious or fraudulent statement or representation, or making or using any false writing or document knowing the same to contain any materially false fictitious or fraudulent statement or entry, in connection with the delivery of or payment for healthcare benefits, items or services.

- The federal Physician Payment Sunshine Act, being implemented as the Open Payments Program, which requires manufacturers of drugs, devices, biologics, and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program (with certain exceptions) to report annually to the Centers for Medicare and Medicaid Services (*CMS*), the agency that administers the Medicare and Medicaid programs, information related to direct or indirect payments and other transfers of value to physicians and teaching hospitals, as well as ownership and investment interests held in the company by physicians and their immediate family members. Beginning in 2022, applicable manufacturers also will be required to report information regarding payments and transfers of value provided to physician assistants, nurse practitioners, clinical nurse specialists, certified nurse anesthetists, and certified nurse-midwives.

- Analogous state and local laws and regulations, such as state anti-kickback and false claims laws, which may apply to items or services reimbursed under Medicaid and other state programs or, in several states, regardless of the payer. We also may become subject to other state laws that require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government or otherwise restrict payments that may be made to healthcare providers; state laws that restrict the ability of manufacturers to offer co-pay support to patients for certain prescription drugs; state laws that require drug manufacturers to report information related to clinical trials, or information related to payments and other transfers of value to physicians and other healthcare providers or marketing expenditures; state laws and local ordinances that require identification or licensing of sales representatives; and state laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.Substantial resources are necessary to ensure that our business arrangements and interactions with health care professionals, third party payors, patients and others comply with applicable health care laws and regulations. Although compliance programs can mitigate the risk of investigation and prosecution for violations of these laws, the risks cannot be entirely eliminated. It is possible that governmental authorities will conclude that our business practices do not comply with current or future statutes, regulations or case law, and if we are found to be in violation of any of these laws or any other governmental regulations, we may be subject to significant civil, criminal and administrative penalties, imprisonment, damages, fines, exclusion from government funded health care programs such as Medicare and Medicaid, or the curtailment or restructuring of our operations. Any action against us for violation of these laws or regulations, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business.

Numerous other laws may apply to our products. Pricing and rebate programs must comply with the Medicaid rebate requirements of the U.S. Omnibus Budget Reconciliation Act of 1990 and more recent requirements in the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, collectively referred to herein as ACA. If products are made available to authorized users of the Federal Supply Schedule of the General Services Administration, additional laws and requirements apply. Products must meet applicable child-resistant packaging requirements under the U.S. Poison Prevention Packaging Act. Manufacturing, sales, promotion and other activities are also potentially subject to federal and state consumer protection and unfair competition laws.

The handling of any controlled substances must comply with the U.S. Controlled Substances Act and Controlled Substances Import and Export Act.

The distribution of pharmaceutical products is subject to additional requirements and regulations, including extensive record- keeping, licensing, storage and security requirements intended to prevent the unauthorized sale of pharmaceutical products. The failure to comply with any of these laws or regulatory requirements subjects firms to possible legal or regulatory action. Depending on the circumstances, failure to meet applicable regulatory requirements can result in criminal prosecution, fines or other penalties, injunctions, recall or seizure of products, total or partial suspension of production, denial or withdrawal of product approvals, or refusal to allow a firm to enter into supply contracts, including government contracts. Any action against us for violation of these laws, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business. Prohibitions or restrictions on sales or withdrawal of future products marketed by us could materially affect our business in an adverse way.

Changes in statutes, regulations or the interpretation of existing laws or regulations could impact our business in the future by requiring, for example: (i) changes to our manufacturing arrangements; (ii) additions or modifications to product labeling; (iii) the recall or discontinuation of our products; or (iv) additional record-keeping requirements. If any such changes were to be imposed, they could adversely affect the operation of our business.

**European Union Drug Development**

We plan to develop and commercialize our product candidates in the EU, either alone or with a collaborator. As in the U.S., in the EU, our future products also will be subject to extensive regulatory requirements. As in the U.S., medicinal products can only be marketed if a Marketing Authorization (*MA*) from the competent regulatory authorities in the EU has been obtained.

Similar to the U.S., the various phases of nonclinical and clinical research in the EU are subject to significant regulatory controls. Although the EU Clinical Trials Directive 2001/20/EC has sought to harmonize the EU clinical trials regulatory framework, setting out common rules for the control and authorization of clinical trials in the EU, the EU Member States have transposed and applied the provisions of the Directive in a manner that is often not uniform. This has led to variations in the rules governing the conduct of clinical trials in the individual EU Member States. The EU legislator has, therefore, adopted Regulation (EU) No 536/2014, or the EU Clinical Trials Regulation. The new EU Clinical Trials Regulation, which will replace the EU Clinical Trials Directive, introduces a complete overhaul of the existing regulation of clinical trials for medicinal products in the EU, including a new coordinated procedure for authorization of clinical trials that is reminiscent of the mutual recognition procedure for marketing authorization of medicinal products, and increased obligations on sponsors to publish clinical trial results. The Clinical Trials Regulation is expected to start to apply in late-2019 or in 2020.

Clinical trials in the EU must currently be conducted in accordance with the requirements of the EU Clinical Trials Directive and applicable good clinical practice standards, as implemented into national legislation by EU Member States. Under the current regime, before a clinical trial can be initiated it must be approved in each EU Member State where there is a site at which the trial is to be conducted by two distinct bodies: the National Competent Authority, or NCA, and one or more Ethics Committees (*ECs*). Under the current regime all suspected unexpected serious adverse reactions to the investigated drug that occur during the clinical trial have to be reported to the NCA and ECs of the Member State where they occurred.

In the EU, pediatric data or an approved Pediatric Investigation Plan (*PIP*) or waiver, is required to have been approved by the European Medicines Agency (*EMA*) prior to submission of a MA application to the EMA or the competent authorities of the EU Member States. In most EU countries, we are also required to have an approved PIP before we can begin enrolling pediatric patients in a clinical trial.

**European Union Drug Review and Approval and Post-marketing Requirements**

In the European Economic Area (*EEA*) (which is comprised of 28 Member States of the EU plus Norway, Iceland and Liechtenstein), medicinal products can only be commercialized after a related MA has been granted. A MA for medicinal products can be obtained through several different procedures. These are through a centralized, mutual recognition procedure, decentralized procedure, or national procedure (single EU Member State). The centralized procedure allows a company to submit a single application to the EMA. If a related positive opinion is provided by the EMA, the European Commission will grant a centralized MA that is valid in all EU Member States and three of the four European Free Trade Associations (*EFTA*) countries (Iceland, Liechtenstein and Norway).

The Centralized Procedure is mandatory for certain types of products, such as biotechnology medicinal products, orphan medicinal products, and medicinal products containing a new active substance indicated for the treatment of AIDS, cancer, neurodegenerative disorders, diabetes, auto-immune and viral diseases. The Centralized Procedure is optional for products containing a new active substance that is not yet authorized in the EEA, or for products that constitute a significant therapeutic, scientific or technical innovation or for which grant of centralized marketing authorization is in the interest of patients in the EU.

The decentralized authorization procedure permits companies to file identical applications for authorization to several EU Member States simultaneously for a medicinal product that has not yet been authorized in any EU Member State. The competent authorities of a single EU Member State, the reference member state, is appointed to review the application and provide an assessment report. The competent authorities of the other EU Member States, the concerned member states, are subsequently required to grant marketing authorization for their territories on the basis of this assessment. The only exception to this is where an EU Member State considers that there are concerns of potential serious risk to public health related to authorization of the product. In these circumstances, the matter is submitted to the Heads of Medicines Agencies (CMDh) for review. The mutual recognition procedure allows companies that have a medicinal product already authorized in one EU Member State to apply for this authorization to be recognized by the competent authorities in other EU Member States.

The maximum timeframe for the evaluation of a marketing authorization application in the EU is 210 days, not including clock stops during which applicants respond to questions from the competent authority. The initial marketing authorization granted in the EU is valid for five years. The authorization may be renewed and valid for an unlimited period unless the national competent authority or the European Commission decides on justified grounds to proceed with one additional five-year renewal period. The renewal of a marketing authorization is subject to a re-evaluation of the risk-benefit balance of the product by the national competent authorities or the EMA.

The holder of an EU MA for a medicinal product must also comply with the EU's pharmacovigilance legislation. This includes requirements to conduct pharmacovigilance, or the assessment and monitoring of the safety of medicinal products.

Various requirements apply to the manufacturing and placing on the EU market of medicinal products. Manufacture of medicinal products in the EU requires a manufacturing authorization. The manufacturing authorization holder must comply with various requirements set out in the applicable EU laws, regulations and guidance. These requirements include compliance with EU cGMP standards when manufacturing medicinal products and APIs, including the manufacture of APIs outside of the EU with the intention to import the APIs into the EU. Similarly, the distribution of medicinal products into and within the EU is subject to compliance with the applicable EU laws, regulations and guidelines, including the requirement to hold appropriate authorizations for distribution granted by the competent authorities of the EU Member States. MA holders may be subject to civil, criminal or administrative sanctions, including suspension of manufacturing authorization, in case of non-compliance with the EU or EU Member States' requirements applicable to the manufacturing of medicinal products.

In the EU, the advertising and promotion of medicinal products are subject to EU Member States' laws governing promotion of medicinal products, interactions with physicians, misleading and comparative advertising and unfair commercial practices. Breaches of the rules governing the promotion of medicinal products in the EU could be penalized by administrative measures, fines and imprisonment. These laws may further limit or restrict the advertising and promotion of medicinal products to the general public and may also impose limitations on promotional activities with healthcare professionals.

**European Union New Chemical Entity Exclusivity**

In the EU, innovative medicinal products that are subject to marketing authorization on the basis of a full dossier and do not fall within the scope of the concept of global marketing authorization, which prevents the same marketing authorization holder or members of the same group from obtaining separate data and market exclusivity periods for medicinal products that contain the same active substance, qualify for eight years of data exclusivity upon marketing authorization and an additional two years of market exclusivity. This data exclusivity, if granted, prevents regulatory authorities in the EU from referencing the innovator's data to assess a generic application or biosimilar application for eight years from the date of authorization of the innovative product, after which a generic or biosimilar marketing authorization application can be submitted, and the innovator's data may be referenced. However, the generic product or biosimilar products cannot be marketed in the EU for a further two years thereafter. The overall ten-year period may be extended for a further year 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.

**European Union Orphan Designation and Exclusivity**

In the EU, orphan drug designations are granted by the European Commission based on a scientific opinion by the EMA's Committee for Orphan Medicinal Products in relation to medicinal products that are intended for the diagnosis, prevention or treatment of life-threatening or chronically debilitating conditions affecting not more than 5 in 10,000 persons in the European Union and in relation to which no satisfactory method of diagnosis, prevention, or treatment has been authorized (or the product would be a significant benefit to those affected). Additionally, designation is granted for products intended for the diagnosis, prevention, or treatment of a life-threatening, seriously debilitating or serious and chronic condition and when, without incentives, it is unlikely that sales of the drug in the European Union would be sufficient to justify the necessary investment in developing the medicinal product.

Orphan medicinal products are entitled to ten years of exclusivity in all EU Member States and a range of other benefits during the development and regulatory review process. However, marketing authorization may be granted to a similar medicinal product with the same orphan indication during the ten-year period with the consent of the marketing authorization holder for the original orphan medicinal product or if the manufacturer of the original orphan medicinal product is unable to supply sufficient quantities of the product. Marketing authorization may also be granted to a similar medicinal product with the same orphan indication if the similar product is deemed safer, more effective or otherwise clinically superior to the original orphan medicinal product. The period of market exclusivity may, in addition, be reduced to six years if it can be demonstrated on the basis of available evidence that the original orphan medicinal product is sufficiently profitable not to justify maintenance of market exclusivity.

In addition, grant of orphan designation by the European Commission also entitles the holder of this designation to financial incentives such as reduction of fees or fee waivers. Orphan drug designation must be requested before submitting an application for marketing authorization. Orphan drug designation does not, in itself, convey any advantage in, or shorten the duration of, the regulatory review and authorization process.

**Rest of the World Regulation**

For other countries outside of the U.S. and the EU, such as countries in Eastern Europe, Latin America or Asia, the requirements governing the conduct of clinical trials, product licensing, pricing and reimbursement vary from countr- to-country. In all cases, the clinical trials must be conducted in accordance with cGCP requirements and the applicable regulatory requirements and the ethical principles that have their origin in the Declaration of Helsinki.

Approval by a regulatory authority in one jurisdiction does not guarantee approval by comparable regulatory authorities in other jurisdictions. If we fail to comply with applicable foreign regulatory requirements applicable to a given country, we may not be able to obtain regulatory approval for our product candidates in such country if we choose to seek such approval, or we may be subject to, among other things, fines, suspension or withdrawal of regulatory approvals, product recalls, seizure of products, operating restrictions and criminal prosecution.

**Coverage and Reimbursement**

*U.S. Healthcare Reform*

The containment of healthcare costs has become a priority of federal and state governments, and the prices of drugs have been a focus in this effort. Changes in government legislation or regulation and changes in private third-party payors' policies toward reimbursement for our products, if successfully developed and approved, may reduce reimbursement of our products' costs to physicians, pharmacies, patients, and distributors. The U.S. government, state legislatures and foreign governments have shown significant interest in implementing cost-containment programs, including price controls, restrictions on reimbursement and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could limit our net revenue and results for products, if any, we commercialize in the future.

The pricing and reimbursement environment for our products may change in the future and become more challenging due to, among other reasons, policies advanced by the Trump Administration, federal agencies, new healthcare legislation passed by Congress or fiscal challenges faced by all levels of government health administration authorities. The American Recovery and Reinvestment Act of 2009 (*ARRA*), for example, allocated new federal funding to compare the effectiveness of different treatments for the same condition. The plan for the research was published in 2012 by the Department of Health and Human Services, the Agency for Healthcare Research and Quality and the National Institutes for Health, and periodic reports on the status of the research and related expenditures are made to Congress. Although ARRA does not mandate the use of the results of comparative effectiveness studies for reimbursement purposes, it is not clear what effect, if any, the research will have on the sales of any products for which we receive marketing approval or on the reimbursement policies of public and private payors. It is possible that comparative effectiveness research demonstrating benefits in a competitor's product could adversely affect the sales of any product for which we receive marketing approval. For example, if third-party payors find our products not to be cost-effective compared to other available therapies, they may not cover our products after approval as a benefit under their plans or, if they do, the level of payment may not be sufficient to allow us to sell our products on a profitable basis.

The Affordable Care Act (*ACA*) is a sweeping measure intended to expand healthcare coverage within the U.S., primarily through the imposition of health insurance mandates on employers and individuals, the provision of subsidies to eligible individuals enrolled in plans offered on the health insurance exchanges, and the expansion of the Medicaid program. This law has substantially changed the way healthcare is financed by both governmental and private insurers and significantly impacts the pharmaceutical industry. Changes that may affect our business include those governing enrollment in federal healthcare programs, reimbursement changes, benefits for patients within a coverage gap in the Medicare Part D prescription drug program (commonly known as the *donut hole*), rules regarding prescription drug benefits under the health insurance exchanges, changes to the Medicaid Drug Rebate program, expansion of the Public Health Service's 340B drug pricing program, or 340B program, fraud and abuse and enforcement. These changes have impacted previously existing government healthcare programs and have resulted in the development of new programs, including Medicare payment for performance initiatives and improvements to the physician quality reporting system and feedback program.

One of the goals of ACA was to expand coverage for the uninsured while at the same time containing overall healthcare costs. With regard to pharmaceutical products, among other things, the ACA expanded and increased industry rebates for drugs covered under Medicaid. The ACA also imposed new reporting requirements on drug manufacturers for payments made to physicians and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members. Failure to submit required information may result in civil monetary penalties of $1,000 to $10,000 for each payment or ownership interest that is not timely, accurately, or completely reported (annual maximum of $150,000), and $10,000 to $100,000 for each knowing failure to report (annual maximum of $1 million). The reporting requirements apply only to manufacturers of products for which reimbursement is available under Medicare, Medicaid, or the Children's Health Insurance Program.

Some states have elected not to expand their Medicaid programs by raising the income limit to 133% of the federal poverty level, as is permitted under the ACA. For each state that does not choose to expand its Medicaid program, there may be fewer insured patients overall, which could impact sales of our approved products that are approved and that we successfully commercialize, and our business and financial condition. Where Medicaid patients receive insurance coverage under any of the new options made available through the ACA, the possibility exists that manufacturers may be required to pay Medicaid rebates on drugs used under these circumstances, a decision that could impact manufacturer revenues. In addition, there have been delays in the implementation of key provisions of the ACA, including the excise tax on generous employer-based health insurance plans. The implications of these delays for business and financial condition, if any, are not yet clear.

Moreover, additional legislative changes to or regulatory changes under the ACA remain possible. The Trump Administration has identified repeal and replacement of the ACA as one of its priorities, and has altered the implementation of the ACA and related laws. In this regard, the U.S. Tax Cuts and Jobs Act of 2017, signed into law in December 2017, includes a provision repealing, effective January 1, 2019, the tax-based shared responsibility payment imposed by the ACA on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the "individual mandate." The nature and extent of any additional legislative changes to the ACA are uncertain at this time. In addition, in December 2018, a federal district court judge, in a challenge brought by a number of state attorneys general, found the ACA unconstitutional in its entirety because once Congress repealed the "individual mandate" provision as part of tax reform legislation enacted in late 2017, there was no longer a basis to rely on Congressional taxing authority to support enactment of the law. The court reasoned that the "individual mandate" was not severable from the rest of the ACA and found the entire Act was an unconstitutional exercise of Congressional authority. While the Trump administration and CMS have both stated that the ruling will have no immediate effect, it is unclear how this decision, subsequent appeals, if any, and other efforts to repeal and replace the ACA will impact the ACA and our business. We expect that the ACA, as currently enacted or as it may be amended, and other healthcare reform measures that may be adopted in the future, could have a material adverse effect on our industry generally and on our ability to commercialize our product candidates, if approved.

Other legislative changes relating to reimbursement have been adopted in the U.S. since the ACA was enacted. For example, beginning April 1, 2013, Medicare payments for all items and services under Part A and B, including drugs and biologicals, and most payments to plans under Medicare Part D were reduced by 2% under the sequestration (i.e., automatic spending reductions) required by the Budget Control Act of 2011, or BCA, as amended by the American Taxpayer Relief Act of 2012. The BCA requires sequestration for most federal programs, excluding Medicaid, Social Security, and certain other programs. Subsequent legislation extended the 2% reduction to 2027 unless additional Congressional action is taken. As long as these cuts remain in effect, they could adversely impact payment for any products we may commercialize in the future. We expect that additional federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services, and in turn could significantly reduce the projected value of certain development projects and reduce our profitability.

**Pharmaceutical Pricing and Reimbursement**

If we are successful in developing and gaining regulatory approval for our product candidates, sales of our products will be dependent on the availability and extent of coverage and reimbursement from third-party payors, which are increasingly reducing reimbursements for medical products and services. Decreases in third-party reimbursement for our products or a decision by a third-party payor not to cover a product for which we received marketing approval could reduce physician usage of our products and have a material adverse effect on our sales, results of operations and financial condition. In the United States, healthcare providers are reimbursed for covered services and products they use through Medicare, Medicaid, and other government healthcare programs, as well as through commercial insurance and managed healthcare organizations. In the U.S. no uniform policy of coverage and reimbursement for drug products exists. Accordingly, decisions regarding the extent of coverage and amount of reimbursement to be provided for any of our products will be made on a payor-by-payor basis. 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 obtained.

If we are successful in developing and gaining regulatory approval for our product candidates, we may participate in the Medicaid Drug Rebate Program. The Medicaid Drug Rebate Program and other governmental programs impose obligations to report pricing figures to the federal government, meaning that we would be subject to these price reporting and other compliance obligations. Other programs impose limits on the price we will be permitted to charge certain entities for our products, if any, for which we receive regulatory approval. Statutory and regulatory changes or other agency action regarding these programs and their requirements could negatively affect the coverage and reimbursement by these programs of products for which we receive regulatory approval and could negatively impact our results of operations.

The Medicaid Drug Rebate Program was established by the Omnibus Budget Reconciliation Act of 1990 and amended by the Veterans Health Care Act of 1992 as well as subsequent legislation. If we participate in the Medicaid Drug Rebate Program, we will be required to pay a rebate to each state Medicaid program for our covered outpatient drugs that are dispensed to Medicaid beneficiaries and paid for by a state Medicaid program as a condition of having federal funds being made available to the state for our drugs under Medicaid and Medicare Part B. Those rebates will be based on pricing data reported by us on a monthly and quarterly basis to Centers for Medicare and Medicaid Services (*CMS*), previously known as the Health Care Financing Administration (*HCFA*) the federal agency that administers the Medicare and Medicaid programs. These data will include the average manufacturer price and, in the case of innovator products, the best price for each drug, which, in general, represents the lowest price available from the manufacturer to any entity in the U.S. in any pricing structure, calculated to include all sales and associated rebates, discounts, and other price concessions. The ACA made significant changes to the Medicaid Drug Rebate program, and CMS issued a final regulation, which became effective on April 1, 2016, to implement the changes to the Medicaid Drug Rebate Program under the ACA. Our failure to comply with these price reporting and rebate payment options could negatively impact our financial results.

Federal law requires that any company that participates in the Medicaid Drug Rebate Program also participate in the Public Health Service's 340B drug pricing discount program in order for federal funds to be available for the manufacturer's drugs under Medicaid and Medicare Part B. The 340B drug pricing program, which is administered by the Health Resources and Services Administration, or HRSA, requires participating manufacturers to agree to charge statutorily defined covered entities no more than the 340B "ceiling price" for the manufacturer's covered outpatient drugs. These 340B covered entities include a variety of community health clinics and other entities that receive health services grants from the Public Health Service, as well as hospitals that serve a disproportionate share of low-income patients. The ACA expanded the list of covered entities to include certain free-standing cancer hospitals, critical access hospitals, rural referral centers and sole community hospitals, but exempts "orphan drugs" from the ceiling price requirements for these covered entities. The 340B ceiling price is calculated using a statutory formula, which is based on the average manufacturer price and rebate amount for the covered outpatient drug as calculated under the Medicaid Drug Rebate Program, and in general, products subject to Medicaid price reporting and rebate liability are also subject to the 340B ceiling price calculation and discount requirement. Changes to the definition of average manufacturer price and the Medicaid Drug Rebate amount under the ACA or otherwise also could affect our 340B ceiling price calculations and negatively impact our results of operations.

HRSA issued a final regulation regarding the calculation of the 340B ceiling price and the imposition of civil monetary penalties on manufacturers that knowingly and intentionally overcharge covered entities, which became effective on January 1, 2019. It is currently unclear how HRSA will apply its enforcement authority under the new regulation. HRSA also is implementing a ceiling price reporting requirement related to the 340B program during the first quarter of 2019, pursuant to which we are required to report our 340B ceiling prices to HRSA on a quarterly basis. Implementation of the civil monetary penalties regulation and the issuance of any other final regulations and guidance could affect our obligations under the 340B program in ways we cannot anticipate. In addition, legislation may be introduced that, if passed, would further expand the 340B program to additional covered entities or would require participating manufacturers to agree to provide 340B discounted pricing on drugs used in the inpatient setting.

Federal law also requires that a company that participates in the Medicaid Drug Rebate Program report average sales price information each quarter to CMS for certain categories of drugs that are paid under the Medicare Part B program. Manufacturers calculate the average sales price based on a statutorily defined formula as well as regulations and interpretations of the statute by CMS. CMS uses these submissions to determine payment rates for drugs under Medicare Part B. Statutory or regulatory changes or CMS guidance could affect the average sales price calculations for our approved products that we successfully commercialize and the resulting Medicare payment rate, and could negatively impact our results of operations. Also, the Medicare Part B drug payment methodology is subject to change based on potential demonstration projects undertaken by CMS or potential legislation enacted by Congress.

Pricing and rebate calculations vary among products and programs. The calculations are complex and are often subject to interpretation by us, governmental or regulatory agencies and the courts. The Medicaid rebate amount will be computed each quarter based on our submission to CMS of our current average manufacturer prices and best prices for the quarter. If we participate in the Medicaid Drug Rebate Program and become aware that our reporting for a prior quarter was incorrect, or has changed as a result of recalculation of the pricing data, we are obligated to resubmit the corrected data for a period not to exceed 12 quarters from the quarter in which the data originally were due. Such restatements and recalculations would increase our costs for complying with the laws and regulations governing the Medicaid Drug Rebate Program. Any corrections to our rebate calculations could result in an overage or underage in our rebate liability for past quarters, depending on the nature of the correction. Price recalculations also may affect the ceiling price at which we are required to offer our products to certain covered entities, such as safety-net providers, under the 340B drug pricing program.

If we participate in the Medicaid Drug Rebate Program and consequently the 340B drug pricing program, we could be held liable for errors associated with our submission of pricing data. Civil monetary penalties can be applied if we are found to have made a misrepresentation in the reporting of our average sales price, or if we are found to have charged 340B covered entities more than the statutorily mandated ceiling price In addition to retroactive rebates and the potential for 340B program refunds, if we are found to have knowingly submitted false average manufacturer price or best price information to the government, we may be liable for significant civil monetary penalties per item of false information. Our failure to submit monthly/quarterly average manufacturer price and best price data on a timely basis could result in a significant civil monetary penalty per day for each day the information is late beyond the due date. Such failure also could be grounds for CMS to terminate our Medicaid drug rebate agreement, pursuant to which we will participate in the Medicaid program. In the event that CMS terminates our rebate agreement, no federal payments would be available under Medicaid or Medicare Part B for our covered outpatient drugs.

CMS and the Office of the Inspector General have pursued manufacturers that were alleged to have failed to report these data to the government in a timely manner. Governmental agencies may also make changes in program interpretations, requirements or conditions of participation, some of which may have implications for amounts previously estimated or paid. If we participate in the Medicaid Drug Rebate Program and consequently the 340B drug pricing program, we cannot assure you that our submissions will not be found by CMS to be incomplete or incorrect.

In order to be eligible to have our products paid for with federal funds under the Medicaid and Medicare Part B programs and purchased by the Department of Veterans Affairs (*VA*), Department of Defense (*DoD*), Public Health Service, and Coast Guard (the *Big Four agencies*) and certain federal grantees, we will be required to participate in the VA Federal Supply Schedule (*FSS*) pricing program, established under Section 603 of the Veterans Health Care Act of 1992. Under this program, we will be obligated to make our “covered” drugs (*i.e.*, innovator drugs and biologics) available for procurement on an FSS contract and charge a price to the Big Four agencies that is no higher than the Federal Ceiling Price (*FCP*), which is a price calculated pursuant to a statutory formula. The FCP is derived from a calculated price point called the “non-federal average manufacturer price” (*Non-FAMP*), which we will be required to calculate and report to the VA on a quarterly and annual basis. Pursuant to applicable law, knowing provision of false information in connection with a Non-FAMP filing can subject a manufacturer to significant civil monetary penalties for each item of false information. The FSS contract also contains extensive disclosure and certification requirements. In addition, Section 703 of the National Defense Authorization Act for FY 2008, will require us to pay quarterly rebates to DoD on utilization of covered drugs that are dispensed through DoD’s Tricare network pharmacies to Tricare beneficiaries. The rebates are calculated as the difference between the annual Non-FAMP and FCP for the calendar year that the product was dispensed. If we overcharge the government in connection with the FSS contract or Tricare Retail Pharmacy Rebate Program, whether due to a misstated FCP or otherwise, we will be required to refund the difference to the government. Failure to make necessary disclosures and/or to identify contract overcharges can result in allegations against us under the False Claims Act and other laws and regulations. Unexpected refunds to the government, and any response to government investigation or enforcement action, would be expensive and time-consuming, and could have a material adverse effect on our business, financial condition, results of operations and growth prospects.

In addition, in many foreign countries, the proposed pricing for a drug must be approved before it may be lawfully marketed. The requirements governing drug pricing vary widely from country to country. For example, the EU Member States have the power to restrict the range of medicinal products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. An EU Member State may approve a specific price for the medicinal product or it may instead adopt a system of direct or indirect controls on the profitability of the company placing the medicinal product on the market. 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 of our products, if approved. Historically, products launched in the EU do not follow price structures of the United States, and generally prices tend to be significantly lower.

In various EU Member States, we expect to be subject to continuous cost-cutting measures, such as lower maximum prices, lower or lack of reimbursement coverage and incentives to use cheaper, usually generic, products as an alternative. Health Technology Assessment, or HTA, of medicinal products is becoming an increasingly common part of the pricing and reimbursement procedures in some EU Member States, including countries representing major markets. The HTA process, which is governed by the national laws of these countries, is the procedure according to which the assessment of the public health impact, therapeutic impact and the economic and societal impact of use of a given medicinal product in the national healthcare systems of the individual country is conducted. The outcome of HTA regarding specific medicinal products will often influence the pricing and reimbursement status granted to these medicinal products by the competent authorities of individual EU Member States. On January 31, 2018, the European Commission adopted a proposal for a regulation on health technologies assessment. This legislative proposal is intended to boost cooperation among EU Member States in assessing health technologies, including new medicinal products, and providing the basis for cooperation at the EU level for joint clinical assessments in these areas. The proposal provides that EU Member States will be able to use common HTA tools, methodologies, and procedures across the EU, working together in four main areas, including joint clinical assessment of the innovative health technologies with the most potential impact for patients, joint scientific consultations whereby developers can seek advice from HTA authorities, identification of emerging health technologies to identify promising technologies early, and continuing voluntary cooperation in other areas. Individual EU Member States will continue to be responsible for assessing non-clinical (e.g., economic, social, ethical) aspects of health technology, and making decisions on pricing and reimbursement. The European Commission has stated that the role of the draft HTA regulation is not to influence pricing and reimbursement decisions in the individual EU Member States. However, this consequence cannot be excluded.

**Stem Cell Technology - United States**

With respect to our stem cell research and development in the U.S., the U.S. government has established requirements and procedures relating to the isolation and derivation of certain stem cell lines and the availability of federal funds for research and development programs involving those lines. All of the stem cell lines that we are using were either isolated under procedures that meet U.S. government requirements and are approved for funding from the U.S. government, or were isolated under procedures that meet U.S. government requirements.

All procedures we use to obtain clinical samples, and the procedures we use to isolate hESCs, are consistent with the informed consent and ethical guidelines promulgated by the U.S. National Academy of Science, the International Society of Stem Cell Research (*ISSCR*), or the NIH. These procedures and documentation have been reviewed by an external Stem Cell Research Oversight Committee, and all cell lines we use have been approved under one or more of these guidelines.

The U.S. government and its agencies on July 7, 2009 published guidelines for the ethical derivation of hESCs required for receiving federal funding for hESC research. Should we seek further NIH funding for our stem cell research and development, our request would involve the use of hESC lines that meet the NIH guidelines for NIH funding. In the U.S., the President’s Council on Bioethics monitors stem cell research, and may make recommendations from time to time that could place restrictions on the scope of research using human embryonic or fetal tissue. Although numerous states in the U.S. are considering, or have in place, legislation relating to stem cell research, it is not yet clear what affect, if any, state actions may have on our ability to commercialize stem cell technologies.

**Subsidiaries and Inter-Corporate Relationships**

VistaGen Therapeutics. Inc., a California corporation, dba VistaStem Therapeutics (*VistaStem*), is our wholly-owned subsidiary and has a wholly-owned subsidiary, Artemis Neuroscience, Inc., a corporation incorporated pursuant to the laws of the State of Maryland. The operations of VistaStem, and its wholly owned subsidiary are managed by our senior management team based in South San Francisco, California.

## Corporate History

VistaGen Therapeutics, Inc., a California corporation incorporated on May 26, 1998, dba VistaStem, is our wholly-owned subsidiary. Excaliber Enterprises, Ltd. (*Excaliber*), a publicly-held company (formerly OTCBB: EXCA) was incorporated under the laws of the State of Nevada on October 6, 2005. Pursuant to a strategic merger transaction on May 11, 2011, Excaliber acquired all outstanding shares of VistaStem in exchange for 341,823 shares of our common stock and assumed all of VistaStem's pre-Merger obligations (the *Merger*). Shortly after the Merger, Excaliber's name was changed to "VistaGen Therapeutics, Inc." (a Nevada corporation).

VistaStem, as the accounting acquirer in the Merger, recorded the Merger as the issuance of common stock for the net monetary assets of Excaliber, accompanied by a recapitalization. The accounting treatment for the Merger was identical to that resulting from a reverse acquisition, except that we recorded no goodwill or other intangible assets. A total of 78,450 shares of our common stock, representing the shares held by stockholders of Excaliber immediately prior to the Merger are reflected as outstanding for all periods presented in the Consolidated Financial Statements of the Company included in Item 8 of this Annual Report. Additionally, the Consolidated Balance Sheets reflect the $0.001 par value of Excaliber's common stock.

The Consolidated Financial Statements included in Item 8 of this Annual Report represent the activity of VistaStem from May 26, 1998, and the consolidated activity of VistaStem and Excaliber (now VistaGen Therapeutics, Inc., a Nevada corporation), from May 11, 2011 (the date of the Merger) through March 31, 2019. The Consolidated Financial Statements also include the accounts of VistaStem's two inactive wholly-owned subsidiaries, Artemis Neuroscience, Inc., a Maryland corporation (*Artemis*), and VistaStem Canada, Inc., a corporation organized under the laws of Ontario, Canada (*VistaStem Canada*).

## Employees

As of June 24, 2019, we employed nine full-time employees, four of whom have doctorate degrees. Five full-time employees work in research and development and laboratory support services and four full-time employees work in general and administrative roles. Staffing for all other functional areas is achieved through our diverse network of strategic relationships with CROs, CDMOs, and other third-party service providers and consultants, each of whom provides services on a real-time, as-needed basis, including human resources and payroll, information technology, facilities, legal, investor and public relations, regulatory affairs and FDA program management to complement our internal resources in these areas.

We have never had a work stoppage, and none of our employees is represented by a labor organization or under any collective bargaining agreement. We consider our employee relations to be good.

## Facilities

We lease our office and laboratory space, which consists of approximately 10,900 square feet located in South San Francisco, California, under a lease expiring on July 31, 2022.

## Legal Proceedings

None.

## Environmental Regulation

Our business does not require us to comply with any extraordinary environmental regulations.

**Item 1A. Risk Factors**

*Investing in our securities involves a high degree of risk. You should consider carefully the risks and uncertainties described below, together with all other information in this Annual Report before investing in our securities. The risks described below are not the only risks facing our Company. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also materially adversely affect our business, financial condition and/or operating results. If any of the following risks are realized, our business, financial condition and/or operating results could be materially and adversely affected.*

**Risks Related to Product Development, Regulatory Approval and Commercialization**

***We depend heavily on the success of one or more of our current drug candidates and we cannot be certain that we will be able to obtain regulatory approval for, or successfully commercialize any of our product candidates.***

We currently have no drug products for sale and may never be able to develop and commercialize marketable drug products. Our business currently depends heavily on the successful development, regulatory approval and commercialization of one or more of our current drug candidates, as well as, but to a more limited extent, our ability to acquire, license or produce, develop and commercialize additional product candidates. Each of our current drug candidates will require substantial additional nonclinical and clinical development and regulatory approval before any of them may be commercialized, and there can be no assurance that any of them will ever achieve regulatory approval. Any DR NCE we produce will require substantial nonclinical development, all phases of clinical development, and regulatory approval before it may be commercialized. The nonclinical and clinical development of our product candidates are, and the manufacturing and marketing of our product candidates will be, subject to extensive and rigorous review and regulation by numerous government authorities in the U.S. and in other countries where we intend to test and, if approved, market any product candidate. Before obtaining regulatory approvals for the commercial sale of any product candidate, we must demonstrate through numerous nonclinical and clinical studies that the product candidate is safe and effective for use in each target indication. Research and development of product candidates in the pharmaceutical industry is a long, expensive and uncertain process, and delay or failure can occur at any stage of any of nonclinical or clinical studies. This process takes many years and may also include post-marketing studies, surveillance obligations and drug safety programs, which would require the expenditure of substantial resources beyond the proceeds we have raised to date. Of the large number of drug candidates in development in the U.S., only a small percentage will successfully complete the required FDA regulatory approval process and will be commercialized. Accordingly, we cannot assure you that any of our current drug candidates or any future product candidates will be successfully developed or commercialized in the U.S. or any market outside the U.S..

We are not permitted to market our product candidates in the U.S. until we receive approval of a NDA from the FDA, or in any foreign countries until we receive the requisite approval from such countries. Obtaining FDA approval of a NDA is a complex, lengthy, expensive and uncertain process. The FDA may refuse to permit the filing of our NDA, delay, limit or deny approval of a NDA for many reasons, including, among others:

- if we submit a NDA and it is reviewed by a FDA advisory committee, the FDA may have difficulties scheduling an advisory committee meeting in a timely manner or the advisory committee may recommend against approval of our application or may recommend that the FDA require, as a condition of approval, additional nonclinical or clinical studies, limitations on approved labeling or distribution and use restrictions;

- a FDA advisory committee may recommend, or the FDA may require, a REMS safety program as a condition of approval or post-approval;

- a FDA advisory committee or the FDA or applicable regulatory agency may determine that there is insufficient evidence of overall effectiveness or safety in a NDA and require additional clinical studies;

- the FDA or the applicable foreign regulatory agency may determine that the manufacturing processes or facilities of third-party contract manufacturers with which we contract do not conform to applicable requirements, including current Good Manufacturing Practices (*cGMPs*); or

- the FDA or applicable foreign regulatory agency may change its approval policies or adopt new regulations.

Any of these factors, many of which are beyond our control, could jeopardize our ability to obtain regulatory approval for and successfully commercialize any current or future drug product candidate we may develop. Any such setback in our pursuit of regulatory approval for any product candidate would have a material adverse effect on our business and prospects.

In addition, we anticipate that certain of our product candidates, including PH94B and PH10, will be subject to regulation as combination products, which means that they are composed of both a drug product and device product. If marketed individually, each component would be subject to different regulatory pathways and reviewed by different centers within the FDA. Our product candidates that are considered to be drug-device combination products will require review and coordination by FDA's drug and device centers prior to approval, which may delay approval. A combination product with a drug primary mode of action generally would be reviewed and approved pursuant to the drug approval processes under the Federal Food, Drug and Cosmetic Act of 1938. In reviewing the NDA application for such a product, however, FDA reviewers in the drug center could consult with their counterparts in the device center to ensure that the device component of the combination product met applicable requirements regarding safety, effectiveness, durability and performance. Under FDA regulations, combination products are subject to cGMP requirements applicable to both drugs and devices, including the Quality System (*QS*) regulations applicable to medical devices. Problems associated with the device component of the combination product candidate may delay or prevent approval.

***We have been granted Fast Track designation from the FDA for development of AV-101 for the adjunctive treatment of MDD and for the treatment of NP. However, these designations may not actually lead to faster development or regulatory review or approval processes for AV-101. Further, there is no guarantee the FDA will grant Fast Track designation for AV-101 as a treatment option for other CNS indications or for any of our other product candidates in the future.***

The Fast Track designation is a program offered by the FDA, pursuant to certain mandates under the FDA Modernization Act of 1997, designed to facilitate drug development and to expedite the review of new drugs that are intended to treat serious or life threatening conditions. Compounds selected must demonstrate the potential to address unmet medical needs. The FDA's Fast Track designation allows for close and frequent interaction with the FDA. A designated Fast Track drug may also be considered for priority review with a shortened review time, rolling submission, and accelerated approval if applicable. The designation does not, however, guarantee FDA approval or expedited approval of any application for the product candidate.

In December 2017, the FDA granted Fast Track designation for development of AV-101 for the adjunctive (add-on) treatment of MDD in patients with an inadequate response to current antidepressants. In September 2018, the FDA granted Fast Track designation for development of AV-101 for the treatment of NP. However, these FDA Fast Track designations may not lead to a faster development or regulatory review or approval process for AV-101 and the FDA may withdraw Fast Track designation of AV-101 for either or both indications if it believes that the respective designation is no longer supported by data from our clinical development programs.

In addition, we may apply for Fast Track designation for AV-101 as a treatment option for other CNS indications, and for our other product candidates. The FDA has broad discretion whether or not to grant a Fast Track designation, and even if we believe AV-101, PH94B, PH10 and/or other product candidates may be eligible for this designation, we cannot be sure that the review or approval will compare to conventional FDA procedures.

***Results of earlier clinical trials may not be predictive of the results of later-stage clinical trials.***

The results of preclinical studies and early clinical trials of AV-101, PH94B, PH10 and/or our other future product candidates, if any, including positive results, may not be predictive of the results of later-stage clinical trials. AV-101, PH94B, PH10 or any other future product candidates in later stages of clinical development may fail to show the desired safety and efficacy results despite having progressed through nonclinical studies and initial clinical trials. Many companies in the biopharmaceutical industry have suffered significant setbacks in advanced clinical trials due to adverse safety profiles or lack of efficacy, notwithstanding promising results in earlier studies. Similarly, our future clinical trial results may not be successful for these or other reasons.

Moreover, nonclinical and clinical data are often susceptible to varying interpretations and analyses, and many companies that believed their product candidates performed satisfactorily in nonclinical studies and clinical trials nonetheless failed to obtain FDA approval. With respect to our current product candidates, if our ELEVATE Study, any future clinical study of AV-101, one or more of the future Phase 3 clinical trials of PH94B for SAD or a future Phase 2 clinical trial of PH10 for MDD fail(s) to produce positive results, the development timeline and regulatory approval and commercialization prospects for AV-101, PH94B, or PH10 and, correspondingly, our business and financial prospects, could be materially adversely affected.

This drug candidate development risk is heightened by any changes in planned timing or nature of clinical trials compared to completed clinical trials. As product candidates are developed through preclinical to early- and late-stage clinical trials towards regulatory approval and commercialization, it is customary that various aspects of the development program, such as manufacturing and methods of administration, are altered along the way in an effort to optimize processes and results. While these types of changes are common and are intended to optimize the product candidates for later stage clinical trials, approval and commercialization, such changes do carry the risk that they will not achieve these intended objectives.

For example, the results of planned clinical trials may be adversely affected if we or any of our collaborators seek to optimize and scale-up production of a product candidate. In such case, we will need to demonstrate comparability between the newly manufactured drug substance and/or drug product relative to the previously manufactured drug substance and/or drug product. Demonstrating comparability may cause us to incur additional costs or delay initiation or completion of our clinical trials, including the need to initiate a dose escalation study and, if unsuccessful, could require us to complete additional nonclinical or clinical studies of our product candidates.

***If serious adverse events or other undesirable side effects or safety concerns attributable to AV-101 are identified during the Baylor Study, other investigator-sponsored clinical trials, in our clinical trials of AV-101, including our ELEVATE study, or our clinical trials of PH94B or PH10, it may adversely affect or delay our clinical development and commercialization of AV-101, PH94B or PH10.***

Undesirable side effects caused by our product candidates could cause us or regulatory authorities to interrupt, delay or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval. AV-101 was previously tested by the NIMH in the NIMH Study, is currently being tested by Baylor in the Baylor Study and may be subjected to testing in the future for other CNS indications in additional investigator-sponsored clinical trials. Although no treatment-related serious adverse events (*SAEs*) were observed in the NIMH Study, if treatment-releated SAEs or other undesirable side effects or safety concerns, or unexpected characteristics attributable to AV-101 are observed in the Baylor Study other investigator-sponsored clinical trials of AV-101, our clinical trials of AV-101, including our ELEVATE Study, or in our future clinical trials of PH94B or PH10, it may adversely affect or delay our clinical development and commercialization of AV-101, PH94B or PH10, and the occurrence of these events could have a material adverse effect on our business and financial prospects. Results of our future clinical trials could reveal a high and unacceptable severity and prevalence of adverse side effects. In such an event, our trials could be suspended or terminated and the FDA or other regulatory agency could order us to cease further development of or deny approval of our product candidates for any or all targeted indications. The drug-related side effects could affect patient recruitment or the ability of enrolled patients to complete the trial or result in potential product liability claims.

Additionally, if any of our product candidates receives marketing approval and we or others later identify undesirable or unacceptable side effects caused by these product candidates, a number of potentially significant negative consequences could result, including:

- regulatory authorities may withdraw, suspend, or limit approvals of such product and require us to take them off the market;
- regulatory authorities may require the addition of labeling statements, specific warnings, a contraindication or field alerts to physicians and pharmacies;
- regulatory authorities may require a medication guide outlining the risks of such side effects for distribution to patients, or that we implement a REMS plan to ensure that the benefits of the product outweigh its risks;
- we may be required to change the way a product is distributed or administered, conduct additional clinical trials or change the labeling of a product;
- we may be required to conduct additional post-marketing studies or surveillance;
- we may be subject to limitations on how we may promote the product;
- sales of the product may decrease significantly;
- we may be subject to regulatory investigations, government enforcement actions, litigation or product liability claims; and
- our products may become less competitive or our reputation may suffer.

Any of these events could prevent us or any collaborators from achieving or maintaining market acceptance of our product candidates or could substantially increase commercialization costs and expenses, which in turn could delay or prevent us from generating significant revenue from the sale of our product candidates.

***Failures or delays in the commencement or completion of our planned clinical trials and nonclinical studies of AV-101, PH94B, PH10 or other our product candidates could result in increased costs to us and could delay, prevent or limit our ability to generate revenue and continue our business.***

We will need to complete our ELEVATE Study, at least two pivotal Phase 3 clinical trials, additional toxicology and other standard nonclinical and clinical safety studies, as well as certain standard smaller clinical studies prior to the submission of any NDA for regulatory approval for AV-101 as an adjunctive treatment for MDD in patients with an inadequate response to current ADs, or any other CNS indication. Similarly, we will need to complete at least two pivotal Phase 3 clinical studies of PH94B, additional toxicology and other standard nonclinical and clinical safety studies, as well as certain standard smaller clinical studies prior to our submission of an NDA for regulatory approval of PH94B as an on-demand treatment for SAD or any CNS other indication. For PH10, we will need to complete at least one additional Phase 2 clinical study, two pivotal Phase 3 clinical trials, additional toxicology and other standard nonclinical and clinical safety studies, as well as certain standard smaller clinical studies prior to the submission of an NDA for regulatory approval of PH10 as treatment for MDD, or any other CNS indication.Successful completion of our nonclinical and clinical trials is a prerequisite to submitting an NDA and, consequently, the ultimate approval required before commercial marketing of any product candidate we may develop. Except as disclosed herein, we do not know whether the Baylor Study, our ELEVATE Study or any of our future-planned nonclinical and clinical trials of AV-101, PH94B, PH10 or any other product candidate will be completed on schedule, if at all, as the commencement and completion of nonclinical and clinical trials can be delayed or prevented for a number of reasons, including, among others:

- the regulatory authority may deny permission to proceed with planned clinical trials or any other clinical trials we may initiate, or may place a planned or ongoing clinical trial on hold;
- delays in filing or receiving approvals from regulatory authorities of additional INDs that may be required;
- negative or ambiguous results from nonclinical or clinical studies;
- delays in reaching or failing to reach agreement on acceptable terms with prospective CROs, investigators and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs, investigators and clinical trial sites;
- delays in the manufacturing of, or insufficient supply of product candidates necessary to conduct nonclinical or clinical trials, including delays in the manufacturing of sufficient supply of drug substance or finished drug product;
- inability to manufacture or obtain clinical supplies of a product candidate meeting required quality standards;
- difficulties obtaining Institutional Review Board (*IRB*) approval to conduct a clinical trial at a prospective clinical site or sites;
- challenges in recruiting and enrolling patients to participate in clinical trials, including the proximity of patients to clinical trial sites;
- eligibility criteria for a clinical trial, the nature of a clinical trial protocol, the availability of approved effective treatments for the relevant disease and competition from other clinical trial programs for similar indications;
- severe or unexpected adverse drug-related side effects experienced by patients in a clinical trial;
- delays in validating any endpoints utilized in a clinical trial;
- the regulatory authority may disagree with our clinical trial design and our interpretation of data from prior nonclinical studies or clinical trials, or may change the requirements for approval even after it has reviewed and commented on the design for our clinical trials;
- reports from nonclinical or clinical testing of other CNS indications or therapies that raise safety or efficacy concerns; and
- difficulties retaining patients who have enrolled in a clinical trial but may be prone to withdraw due to rigors of the clinical trial, lack of efficacy, side effects, personal issues or loss of interest.

Clinical trials may also be delayed or terminated prior to completion as a result of ambiguous or negative interim results. In addition, a clinical trial may be suspended or terminated by us, the regulatory authority, the IRBs at the sites where the IRBs are overseeing a clinical trial, a data and safety monitoring board (*DSMB*), overseeing the clinical trial at issue or other regulatory authorities due to a number of factors, including, among others:

- failure to conduct the clinical trial in accordance with regulatory requirements or approved clinical protocols;
- inspection of the clinical trial operations or trial sites by the regulatory authority that reveals deficiencies or violations that require us to undertake corrective action, including the imposition of a clinical hold;
- unforeseen safety issues, including any that could be identified in nonclinical carcinogenicity studies, adverse side effects or lack of effectiveness;
- changes in government regulations or administrative actions;
- problems with clinical supply materials that may lead to regulatory actions; and
- lack of adequate funding to continue nonclinical or clinical studies.

***Changes in regulatory requirements, regulatory guidance or unanticipated events during our nonclinical studies and clinical trials of AV-101, PH94B, PH10 or other product candidates may occur, which may result in changes to nonclinical studies and clinical trial protocols or additional nonclinical studies and clinical trial requirements, which could result in increased costs to us and could delay our development timeline.***

Changes in regulatory requirements, guidance or unanticipated events during our nonclinical studies and clinical trials of AV-101, PH94B, PH10 or other product candidates may force us to amend nonclinical studies and clinical trial protocols or the regulatory authority may impose additional nonclinical studies and clinical trial requirements. Amendments or changes to our clinical trial protocols would require resubmission to the regulatory authority and IRBs for review and approval, which may adversely impact the cost, timing or successful completion of clinical trials. Similarly, amendments to our nonclinical studies may adversely impact the cost, timing, or successful completion of those nonclinical studies. If we experience delays completing, or if we terminate, any of our nonclinical studies or clinical trials, or if we are required to conduct additional nonclinical studies or clinical trials, the commercial prospects for AV-101, PH94B, PH10 or other product candidates may be harmed and our ability to generate product revenue will be delayed.

***We rely, and expect that we will continue to rely, on third parties to conduct our nonclinical and clinical trials of our current product candidates and will continue to do so for any other future product candidates. If these third parties do not successfully carry out their contractual duties and/or meet expected deadlines, completion of our nonclinical or clinical trials and development of AV-101, PH94B, PH10 or other future product candidates may be delayed and we may not be able to obtain regulatory approval for or commercialize AV-101, PH94B, PH10 or other future product candidates and our business could be substantially harmed.***

By strategic design, we do not have the internal staff resources to independently conduct nonclinical and clinical trials of our product candidates completely on our own. We rely on our extensive network of strategic relationships with various academic research centers, medical institutions, nonclinical and clinical investigators, contract laboratories and other third parties, such as CROs, to assist us to conduct and complete nonclinical and clinical trials of our product candidates. We enter into agreements with third-party CROs to provide monitors for and to manage data for our clinical trials, as well as provide other services necessary to prepare for, conduct and complete clinical trials. We rely heavily on these and other third-parties for execution of nonclinical and clinical trials for our product candidates and we control only certain aspects of their activities. As a result, we have less direct control over the conduct, timing and completion of these nonclinical and clinical trials and the management of data developed through nonclinical and clinical trials than would be the case if we were relying entirely upon our own internal staff resources. Communicating with outside parties can also be challenging, potentially leading to mistakes as well as difficulties in coordinating activities. Outside parties may:

- have staffing difficulties and/or undertake obligations beyond their anticipated capabilities and resources;
- fail to comply with contractual obligations;
- experience regulatory compliance issues;
- undergo changes in priorities or become financially distressed; or
- form relationships with other entities, some of which may be our competitors.

These factors may materially adversely affect the willingness or ability of third parties to conduct our nonclinical and clinical trials and may subject us to unexpected cost increases that are beyond our control. Nevertheless, we are responsible for ensuring that each of our nonclinical studies and clinical trials is conducted and completed in accordance with the applicable protocol, legal, regulatory and scientific requirements and standards, and our reliance on CROs, Baylor or other independent investigators does not relieve us of our regulatory responsibilities. We and our CROs, Baylor and any investigator in an investigator-sponsored study are required to comply with regulations and guidelines, including current Good Clinical Practice regulations (*cGCPs*) for conducting, monitoring, recording and reporting the results of clinical trials to ensure that the data and results are scientifically credible and accurate, and that the trial patients are adequately informed of the potential risks of participating in clinical trials. These regulations are enforced by the FDA, the Competent Authorities of the Member States of the European Economic Area and comparable foreign regulatory authorities for any products in clinical development. The FDA enforces cGCP regulations through periodic inspections of clinical trial sponsors, principal investigators and trial sites. If we, any of our CROs or any of our third-party collaborators fail to comply with applicable cGCPs, the clinical data generated in clinical trials involving our product candidates may be deemed unreliable and the FDA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. We cannot assure you that, upon inspection, the FDA will determine that any of our clinical trials comply with cGCPs. In addition, our clinical trials must be conducted with product candidates produced under cGMPs and will require a large number of test patients. Our failure or the failure of our CROs or other third-party collaborators to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory approval process and could also subject us to enforcement action up to and including civil and criminal penalties.

Although we design our clinical trials for our product candidates, our clinical development strategy involves having CROs and other third-party investigators and medical institutions conduct clinical trials of our product candidates. As a result, many important aspects of our drug development programs are outside of our direct control. In addition, although CROs, or independent investigators or medical institutions, as the case may be, may not perform all of their obligations under arrangements with us or in compliance with applicable regulatory requirements, under certain circumstances, we may be responsible and subject to enforcement action that may include civil penalties up to and including criminal prosecution for any violations of FDA laws and regulations during the conduct of clinical trials of our product candidates. If such third parties do not perform clinical trials of our product candidates in a satisfactory manner, breach their obligations to us or fail to comply with applicable regulatory requirements, the development and commercialization of our product candidates may be delayed or our development program materially and irreversibly harmed. In certain cases, including the Baylor Study and other investigator-sponsored clinical studies, we cannot control the amount and timing of resources these third-parties devote to clinical trials involving our product candidates. If we are unable to rely on nonclinical and clinical data collected by our third-party collaborators, we could be required to repeat, extend the duration of, or increase the size of our clinical trials and this could significantly delay commercialization and require significantly greater expenditures.

If our relationships with one or more of our third-party collaborators terminates, we may not be able to enter into arrangements with alternative third-party collaborators. If such third-party collaborators, including our CROs, Baylor or the VA do not successfully carry out their contractual duties or obligations or meet expected deadlines, if they need to be replaced or if the quality or accuracy of the clinical data they obtain is compromised due to their failure to adhere to applicable clinical protocols, regulatory requirements or for other reasons, any clinical trials that such third-parties are associated with may be extended, delayed or terminated, and we may not be able to obtain regulatory approval for or successfully develop and commercialize our product candidates. As a result, we believe that our financial results and the commercial prospects for our product candidates in the subject indication would be harmed, our costs would increase and our ability to generate revenue would be delayed.

***We rely completely on third-parties to manufacture, formulate, hold and distribute supplies of our product candidates for all nonclinical and clinical studies, and we intend to continue to rely on third parties to produce all nonclinical, clinical and commercial supplies of our product candidates in the future.***

By strategic design, we do not currently have, nor do we plan to acquire or develop, internal infrastructure or technical capabilities to manufacture, formulate, hold or distribute supplies of our product candidates, for use in nonclinical and clinical studies or commercial scale. As a result, with respect to all of our product candidates, we rely, and will continue to rely, completely on CMOs to manufacture API and formulate, hold and distribute final drug product. The facilities used by our CMOs to manufacture AV-101, PH94B and PH10 API and AV-101, PH94B and PH10 final drug product are subject to a pre-approval inspection by the FDA and other comparable foreign regulatory agencies to assess compliance with applicable regulatory guidelines and requirements, including cGMPs, and may be required to undergo similar inspections by the FDA or other comparable foreign regulatory agencies, after we submit INDs, NDAs or relevant foreign regulatory submission equivalent to the applicable regulatory agency.

We do not directly control the manufacturing process or the supply or quality of materials used in the manufacturing and formulation of our product candidates, and, with respect to all of our product candidates, we are completely dependent on our CMOs to comply with all applicable cGMPs for the manufacturing of both API and finished drug product. If our CMOs cannot secure adequate supplies of suitable raw materials or successfully manufacture our product candidates, including AV-101, PH94B and PH10 API and finished drug product, that conforms to our specifications and the strict regulatory requirements of the FDA or applicable foreign regulatory agencies, production of sufficient supplies of our product candidates, including AV-101, PH94B and PH10 API and finished drug product, may be delayed and our CMOs may not be able to secure and/or maintain regulatory approval for their manufacturing facilities, or the FDA may take other actions, including the imposition of a clinical hold. In addition, we have no direct control over our CMOs' ability to maintain adequate quality control, quality assurance and qualified personnel. All of our CMOs are engaged with other companies to supply and/or manufacture materials or products for such other companies, which exposes our CMOs to regulatory risks for the production of such materials and products. As a result, failure to satisfy the regulatory requirements for the production of those materials and products may affect the regulatory clearance of our CMO's facilities generally or affect the timing of manufacture of AV-101, PH94B and PH10 for required or planned nonclinical and/or clinical studies. If the FDA or an applicable foreign regulatory agency determines now or in the future that our CMOs' facilities are noncompliant, we may need to find alternative manufacturing facilities, which would adversely impact our ability to develop, obtain regulatory approval for or market our product candidates. Our reliance on CMOs also exposes us to the possibility that they, or third parties with access to their facilities, will have access to and may appropriate our trade secrets or other proprietary information.

With respect to AV-101, PH94B and PH10, we do not yet have long-term supply agreements in place with our CMOs and each batch of AV-101, PH94B and PH10 is or will be individually contracted under a separate supply agreement. If we engage new CMOs, such contractors must complete an inspection by the FDA and other applicable foreign regulatory agencies. We plan to continue to rely upon CMOs and, potentially, collaboration partners, to manufacture research and development scale, and, if approved, commercial quantities of our product candidates. Although we believe our current scale of API manufacturing for AV-101, and our contemplated scale of API manufacturing for PH94B and PH10, and the current and projected supply of AV-101, PH94B and PH10 API and finished drug product will be adequate to support our planned nonclinical and clinical studies of AV-101, PH94B and PH10, no assurance can be given that unanticipated supply shortages or CMO-related delays in the manufacture and formulation of AV-101, PH94B or PH10 API and/or finished drug product will not occur in the future.

Additionally, we anticipate that PH94B and PH10 will be considered drug-device combination products. Third-party manufacturers may not be able to comply with cGMP requirements applicable to drug/device combination products, including applicable provisions of the FDA's or a comparable foreign regulatory authority's drug cGMP regulations, device cGMP requirements embodied in the Quality System Regulation (*QSR*) or similar regulatory requirements outside the U.S. Our failure, or the failure of our third-party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us, including clinical holds, fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of product candidates, operating restrictions and criminal prosecutions, any of which could significantly affect supplies of our product candidates. The facilities used by our CMOs to manufacture our product candidates must be approved by the FDA anf comparable foreign regulatory authorities pursuant to inspections that will or may be conducted after we submit our NDA. We do not control the manufacturing process of, and are completely dependent on, our CMO partners for compliance with cGMPs and QSRs. If our CMOs cannot successfully manufacture material that conforms to our specifications and the strict regulatory requirements of the FDA or other comparable foreign regulatory authorities, they will not be able to secure and/or maintain regulatory approval for their manufacturing 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 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. CMOs 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 and QSR requirements. Any failure to comply with cGMP or QSR 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.

***Even if we receive marketing approval for AV-101, PH94B, PH10 or any other product candidate in the U.S., we may never receive regulatory approval to market AV-101, PH94B, PH10 or any other product candidate outside of the U.S.***

In order to market AV-101, PH94B, PH10 or any other product candidate outside of the U.S., we must establish and comply with the numerous and varying safety, efficacy and other regulatory requirements of other countries. Approval procedures vary among countries and can involve additional product candidate testing and additional administrative review periods. The time required to obtain approvals in other countries might differ from that required to obtain FDA approval. The marketing approval processes in other countries may implicate all of the risks detailed above regarding FDA approval in the U.S. as well as other risks. In particular, in many countries outside of the U.S., products must receive pricing and reimbursement approval before the product can be commercialized. Obtaining this approval can result in substantial delays in bringing products to market in such countries. Marketing approval in one country does not ensure marketing approval in another, but a failure or delay in obtaining marketing approval in one country may have a negative effect on the regulatory process in others. Failure to obtain marketing approval in other countries or any delay or other setback in obtaining such approval would impair our ability to market our product candidates in such foreign markets. Any such impairment would reduce the size of our potential market, which could have a material adverse impact on our business, results of operations and prospects.

***If any of our product candidates are ultimately regulated as controlled substances, we, our CMOs, as well as future distributors, prescribers, and dispensers will be required to comply with additional regulatory requirements which could delay the marketing of our product candidates, and increase the cost and burden of manufacturing, distributing, dispensing, and prescribing our product candidates.***

Before we can commercialize our product candidates in the U.S. or any market outside the U.S., the U.S. Drug Enforcement Administration (*DEA*) or its foreign counterpart may need to determine whether such product candidates will be considered to be a controlled substance, taking into account the recommendation of the FDA or its foreign counterpart, as the case may be. This may be a lengthy process that could delay our marketing of a product candidate and could potentially diminish any regulatory exclusivity periods for which we may be eligible, which would increase the cost associated with commercializing such products and, in turn, may have an adverse impact on our results of operations. Although we currently do not know whether the DEA or any foreign counterpart will consider any of our current or future product candidate to be controlled substances, we cannot yet give any assurance that such product candidates, including AV-101, PH94B and PH10 will not be regulated as controlled substances.

If any of our product candidates are regulated as controlled substances, depending on the DEA controlled substance schedule in which the product candidates are placed or that of its foreign counterpart, we, our CMOs, and any future distributers, prescribers, and dispensers of the scheduled product candidates may be subject to significant regulatory requirements, such as registration, security, recordkeeping, reporting, storage, distribution, importation, exportation, inventory, quota and other requirements administered by the DEA or a foreign counterpart of the DEA as the case may be. Moreover, if any of our product candidates are regulated as controlled substances, we and our CMOs would be subject to initial and periodic DEA inspection. If we or our CMOs are not able to obtain or maintain any necessary DEA registrations or comparable foreign registrations, we may not be able to commercialize any product candidates that are deemed to be controlled substances or we may need to find alternative CMOs, which would take time and cause us to incur additional costs, delaying or limit our commercialization efforts.

Because of their restrictive nature, these laws and regulations could limit commercialization of our product candidates, should they be deemed to contain controlled substances. Failure to comply with the applicable controlled substance laws and regulations can also result in administrative, civil or criminal enforcement. The DEA or its foreign counterparts may seek civil penalties, refuse to renew necessary registrations, or initiate administrative proceedings to revoke those registrations. In some circumstances, violations could result in criminal proceedings or consent decrees. Individual states also independently regulate controlled substances.

***If we are unable to establish sales and marketing capabilities or enter into agreements with third parties to market and sell our product candidates, we may not be able to generate any revenue.***

We do not currently have any internal resources for the sale, marketing and distribution of pharmaceutical products, and we may not create such internal capabilities in the foreseeable future. Therefore, to market our product candidates, if approved by the FDA or any other regulatory body, we must make contractual arrangements with third parties to perform services related to sales, marketing, managerial and other non-technical capabilities relating to the commercialization of our product candidates, or establish those capabilities prior to market approval. If we are unable to establish adequate contractual arrangements for such sales, marketing and distribution capabilities, or if we are unable to do so on commercially reasonable terms, or if we are unable to establish such capabilities on our own, our business, results of operations, financial condition and prospects will be materially adversely affected.

***Even if we receive marketing approval for our product candidates, our product candidates may not achieve broad market acceptance, which would limit the revenue that we generate from their sales.***

The commercial success of our product candidates, if approved by the FDA or other applicable regulatory authorities, will depend upon the awareness and acceptance of our product candidates among the medical community, including physicians, patients and healthcare payors. Market acceptance of our product candidates, if approved, will depend on a number of factors, including, among others:

- the efficacy and safety of our product candidates as demonstrated in clinical trials, and, if required by any applicable regulatory authority in connection with the approval for the applicable indications, to provide patients with incremental health benefits, as compared with other available therapies;
- limitations or warnings contained in the labeling approved for our product candidates by the FDA or other applicable regulatory authorities;
- the clinical indications for which our product candidates are approved;
- availability of alternative treatments already approved or expected to be commercially launched in the near future;
- the potential and perceived advantages of our product candidates over current treatment options or alternative treatments, including future alternative treatments;
- the willingness of the target patient population to try new therapies and of physicians to prescribe these therapies;
- the strength of marketing and distribution support and timing of market introduction of competitive products;
- publicity concerning our products or competing products and treatments;
- pricing and cost effectiveness;
- the effectiveness of our sales and marketing strategies;
- our ability to increase awareness of our product candidates through marketing efforts;
- our ability to obtain sufficient third-party coverage or reimbursement; or
- the willingness of patients to pay out-of-pocket in the absence of third-party coverage.

If our product candidates are approved but do not achieve an adequate level of acceptance by patients, physicians and payors, we may not generate sufficient revenue from our product candidates to become or remain profitable. Before granting reimbursement approval, healthcare payors may require us to demonstrate that our product candidates, in addition to treating these target indications, also provide incremental health benefits to patients. Our efforts to educate the medical community and third-party payors about the benefits of our product candidates may require significant resources and may never be successful.

***Our product candidates may cause undesirable safety concerns and side effects that could delay or prevent their regulatory approval, limit the commercial profile of an approved label, or result in significant negative consequences following marketing approval, if any.***

Undesirable safety concerns and side effects caused by our product candidates could cause us or regulatory authorities to interrupt, delay or halt nonclinical studies and clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or other regulatory authorities.

Further, clinical trials by their nature utilize a sample of potential patient populations. With a limited number of patients and limited duration of exposure, rare and severe side effects of our product candidates may only be uncovered with a significantly larger number of patients exposed to the product candidate. If our product candidates receive marketing approval and we or others identify undesirable safety concerns or side effects caused by such product candidates (or any other similar products) after such approval, a number of potentially significant negative consequences could result, including:

- regulatory authorities may withdraw or limit their approval of such product candidates;
- regulatory authorities may require the addition of labeling statements, such as a “black box” warning or a contraindication;
- we may be required to change the way such product candidates are distributed or administered, conduct additional clinical trials or change the labeling of the product candidates;
- we may be subject to regulatory investigations and government enforcement actions;
- we may decide to remove such product candidates from the marketplace;
- we could be sued and held liable for injury caused to individuals exposed to or taking our product candidates; and
- our reputation may suffer.

We believe that any of these events could prevent us from achieving or maintaining market acceptance of the affected product candidates and would substantially increase the costs of commercializing our product candidates and significantly impact our ability to successfully commercialize our product candidates and generate revenues.

***Even if we receive marketing approval for our product candidates, we may still face future development and regulatory difficulties.***

Even if we receive marketing approval for our product candidates, regulatory authorities may still impose significant restrictions on our product candidates, indicated uses or marketing or impose ongoing requirements for potentially costly post-approval studies. Our product candidates will also be subject to ongoing regulatory requirements governing the labeling, packaging, storage and promotion of the product and record keeping and submission of safety and other post-market information. The FDA and other regulatory authorities have significant post-marketing authority, including, for example, the authority to require labeling changes based on new safety information and to require post-marketing studies or clinical trials to evaluate serious safety risks related to the use of a drug. The FDA and other regulatory authorities also have the authority to require, as part of an NDA or post-approval, the submission of a REMS or comparable safety program. Any REMS or comparable safety program required by the FDA or other regulatory authority may lead to increased costs to assure compliance with new post-approval regulatory requirements and potential requirements or restrictions on the sale of approved products, all of which could lead to lower sales volume and revenue.

Manufacturers of drug and device products and their facilities are subject to continual review and periodic inspections by the FDA and other regulatory authorities for compliance with cGMPs and other regulations. If we or a regulatory agency discover problems with our product candidates, such as adverse events of unanticipated severity or frequency, or problems with the facility where our product candidates are manufactured, a regulatory agency may impose restrictions on our product candidates, the manufacturer or us, including requiring withdrawal of our product candidates from the market or suspension of manufacturing. If we, our product candidates, or the manufacturing facilities for our product candidates fail to comply with applicable regulatory requirements, a regulatory agency may, among other things:

- issue warning letters or untitled letters;
- seek an injunction or impose civil or criminal penalties or monetary fines;
- suspend or withdraw marketing approval;
- suspend any ongoing clinical trials;
- refuse to approve pending applications or supplements to applications submitted by us;
- suspend or impose restrictions on operations, including costly new manufacturing requirements; or
- seize or detain products, refuse to permit the import or export of products, or require that we initiate a product recall.

***Competing therapies could emerge adversely affecting our opportunity to generate revenue from the sale of our product candidates.***

The pharmaceutical industry is highly competitive. There are many public and private pharmaceutical companies, universities, governmental agencies and other research organizations actively engaged in the research and development of product candidates that may be similar to and compete with our product candidates or address similar markets. It is probable that the number of companies seeking to develop product candidates similar to and competitive with our product candidates will increase.

Currently, management is unaware of any FDA-approved oral adjunctive therapy for MDD patients with an inadequate response to standard antidepressants having the same mechanism of pharmacological action and safety profile as our orally-administered AV-101 or our intranasally-administered PH10. However, new antidepressant products with other mechanisms of pharmacological action or products approved for other indications, including the FDA-approved anesthetic ketamine hydrochloride administered intravenously, are being or may be used off-label for treatment of MDD, as well as other CNS indications for which AV-101 or PH10 may have therapeutic potential. Additionally, other non-pharmaceutical treatment options, such psychotherapy and electroconvulsive therapy (*ECT*) are used before or instead of standard antidepressant medications to treat patients with MDD. Management is also unaware of any FDA-approved rapid-onset, on-demand treatment for SAD having the same mechanism of pharmacological action and safety profile as our PH94B.

In the field of new generation, oral adjunctive treatments for adult patients with MDD with an inadequate response to standard FDA-approved ADs, we believe our principal competitors may be Axsome's AX-05, Alkermes' ALKS-5461, Allergan's AGN-241751 and Sage's Sage-217. Additional potential competitors may include, but not be limited to, academic and private commercial clinics providing intravenous ketamine therapy on an off-label basis and Janssen's intranasally-administered Spravato (esketamine). With respect to PH94B and current FDA-approved treatment options for SAD in the U.S., our competition may include, but is not limited to, certain current generic ADs approved by the FDA for treatment of SAD and certain classes of drugs used on an off-label basis for treatment of SAD, including benzodiazapines such as alprazolam, and beta blockers such as propranolol.

Many of our potential competitors, alone or with their strategic partners, have substantially greater financial, technical and human resources than we do and significantly greater experience in the discovery, and development of product candidates, obtaining FDA and other regulatory approvals of treatments and the commercialization of those treatments. With respect to AV-101 and PH10, we believe that a range of pharmaceutical and biotechnology companies have programs to develop drug candidates for the treatment of depression, including MDD, Parkinson's disease levodopa-induced dyskinesia, neuropathic pain, epilepsy, and other neurological conditions and diseases, including, but not limited to, Abbott Laboratories, Acadia, Allergan, Alkermes, Aptynix, AstraZeneca, Eli Lilly, GlaxoSmithKline, IntraCellular, Janssen, Lundbeck, Merck, Novartis, Ono, Otsuka, Pfizer, Roche, Sage, Sumitomo Dainippon, and Takeda, as well as any affiliates of the foregoing companies. With respect to PH94B, in addition to potential competition from certain current FDA-approved antidepressants and off-label use of benzodiazepines and beta blockers, we believe additional drug candidates in development for SAD may include, but potentially not be limited to, an oral fatty acid amide hydrolase inhibitor in development by Janssen and a sublingual formulation of the sodium channel blocker riluzole in development by Biohaven. Mergers and acquisitions in the biotechnology and pharmaceutical industries may result in even more resources being concentrated among a smaller number of our competitors. Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer, more effective, have fewer or less severe side effects, are more convenient or are less expensive than any products that we may develop. Our competitors also may obtain FDA or other regulatory approval for their products more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the market.

***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 drug development programs and the potential commercialization of our product candidates will require substantial additional cash to fund expenses. For some of our product candidates, we may decide to collaborate with pharmaceutical and biotechnology companies for the development and potential commercialization of those product candidates.

We face significant competition in seeking appropriate collaborators. Whether we reach a definitive agreement for collaboration will depend, among other things, upon our assessment of the collaborator's resources and expertise, the terms and conditions of the proposed collaboration and the proposed collaborator's evaluation of a number of factors. Those factors may include the design or results of nonclinical and clinical trials, the likelihood of approval by the FDA or similar regulatory authorities outside the United States, the potential markets for the subject product candidate, the costs and complexities of manufacturing and delivering such product candidate to patients, the potential of competing products, the existence of uncertainty with respect to our ownership of technology, which can exist if there is a challenge to such ownership without regard to the merits of the challenge and industry and market conditions generally. The collaborator may also consider alternative product candidates or technologies for similar indications that may be available to collaborate on and whether such collaboration could be more attractive than the one with us for our product candidate. The terms of any collaboration or other arrangements that we may establish may not be favorable to us.

We may also be restricted under existing collaboration agreements from entering into future agreements on certain terms with potential collaborators. Collaborations are complex and time-consuming to negotiate and document. In addition, there have been a significant number of recent business combinations among large pharmaceutical companies that have resulted in a reduced number of potential future collaborators.

We may not be able to negotiate 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 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.

In addition, any future collaboration that we enter into may not be successful. The success of our collaboration arrangements will depend heavily on the efforts and activities of our collaborators. Collaborators generally have significant discretion in determining the efforts and resources that they will apply to these collaborations. Disagreements between parties to a collaboration arrangement regarding clinical development and commercialization matters can lead to delays in the development process or commercializing the applicable product candidate and, in some cases, termination of the collaboration arrangement. These disagreements can be difficult to resolve if neither of the parties has final decision-making authority. Collaborations with pharmaceutical or biotechnology companies and other third parties often are terminated or allowed to expire by the other party. Any such termination or expiration would adversely affect us financially and could harm our business reputation.

***We may not be successful in our efforts to identify or discover additional product candidates, or we may expend our limited resources to pursue a particular product candidate or indication and fail to capitalize on product candidates or indications that may be more profitable or for which there is a greater likelihood of success.***

The success of our business depends primarily upon our ability to identify, develop and commercialize product candidates with commercial and therapeutic potential. Although AV-101 is in Phase 2 clinical development for treatment of MDD, and we are planning for Phase 2a studies of AV-101 for treatment of NP and LID, for Phase 3 development of PH94B for on-demand treatment of SAD, and a Phase 2b study of PH10 for treatment of MDD, we may fail to pursue additional development opportunities for AV-101, PH94B or PH10, or identify additional product candidates for clinical development for a number of reasons. Our research methodology may be unsuccessful in identifying new product candidates or our product candidates may be shown to have harmful side effects or may have other characteristics that may make the products unmarketable or unlikely to receive marketing approval.

Because we currently have limited financial and management resources, we necessarily focus on a limited number of research and development programs and product candidates and are currently focused primarily on development of AV-101, PH94B and PH10, with additional limited focus on NCE DR and, through a third-party collaboration, RM. As a result, we may forego or delay pursuit of opportunities with other product candidates or for other potential CNS-related indications for AV-101, PH94B and/or PH10 that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial drugs or profitable market opportunities. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable drugs. 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 future collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate.

If any of these events occur, we may be forced to abandon our development efforts for a program or programs, which would have a material adverse effect on our business and could potentially cause us to cease operations. Research and development programs to identify and advance new product candidates require substantial technical, financial and human resources. We may focus our efforts and resources on potential programs or product candidates that ultimately prove to be unsuccessful.

***We are subject to healthcare laws and regulations, which could expose us to criminal sanctions, civil penalties, contractual damages, reputational harm and diminished profits and future earnings.***

Although we do not currently have any products on the market, once we begin commercializing our product candidates, we may be subject to additional healthcare statutory and regulatory requirements and enforcement by the federal government and the states and foreign governments in which we conduct our business. Healthcare providers, physicians and others will play a primary role in the recommendation and prescription of our product candidates, if approved. Our future arrangements with third-party payors will 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 market, sell and distribute our product candidates, if we obtain marketing approval. Restrictions under applicable federal and state healthcare laws and regulations include the following:

- The federal anti-kickback statute prohibits, among other things, persons from knowingly and willfully soliciting, offering, 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 under federal healthcare programs such as Medicare and Medicaid.

- The federal False Claims Act imposes criminal and civil penalties, including those from civil whistleblower or qui tam actions, against individuals or entities for knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent or making a false statement to avoid, decrease, or conceal an obligation to pay money to the federal government.

- The federal Health Insurance Portability and Accountability Act of 1996, as amended by the Health Information Technology for Economic and Clinical Health Act, imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program and also imposes obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of individually identifiable health information.

- The federal false statements statute prohibits knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services.

- The federal transparency requirements, sometimes referred to as the “Sunshine Act,” under the Patient Protection and Affordable Care Act, require manufacturers of drugs, devices, biologics and medical supplies that are reimbursable under Medicare, Medicaid, or the Children’s Health Insurance Program to report to the Department of Health and Human Services information related to physician payments and other transfers of value and physician ownership and investment interests.

- Analogous state laws and regulations, such as state anti-kickback and false claims laws and transparency laws, may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers, and 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 drug manufacturers to report information related to payments to physicians and other healthcare providers or marketing expenditures and drug pricing.

- Foreign Corrupt Practices Act and its application to marketing and selling practices as well as to clinical trials.

Ensuring that our future business arrangements with third parties comply with applicable healthcare laws and regulations could be costly. It is possible that governmental authorities will conclude that our business practices do not comply with current or future statutes, regulations or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our operations were 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 and exclusion from government funded healthcare programs, such as Medicare and Medicaid, any of which could substantially disrupt our operations. If any of the physicians or other providers or entities with whom we expect to do business are found to be out of compliance with applicable laws, they may be subject to criminal, civil or administrative sanctions, including exclusions from government funded healthcare programs.

***The FDA and other regulatory agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses. If we are found to have improperly promoted off-label uses, we may become subject to significant liability.***

The FDA and other regulatory agencies strictly regulate the promotional claims that may be made about prescription products, such as AV-101, PH94B and PH10, if approved. In particular, a product may not be promoted for uses that are not approved by the FDA or such other regulatory agencies as reflected in the product's approved labeling. For example, if we receive FDA marketing approval for AV-101 as an adjunctive treatment of MDD, physicians may prescribe AV-101 to their patients in a manner that is inconsistent with the FDA-approved label. However, if we are found to have promoted such off-label uses, we may become subject to significant liability. The federal government has levied large civil and criminal fines against companies for alleged improper off-label promotion and has enjoined several companies from engaging in off-label promotion. The FDA has also requested that companies enter into consent decrees or imposed permanent injunctions under which specified promotional conduct is changed or curtailed. If we cannot successfully manage the promotion of our product candidates, if approved, we could become subject to significant liability, which would materially adversely affect our business and financial condition.

***Even if approved, reimbursement policies could limit our ability to sell our product candidates.***

Market acceptance and sales of our product candidates will depend heavily on reimbursement policies and may be affected by healthcare reform measures. Government authorities and third-party payors, such as private health insurers and health maintenance organizations, decide which medications they will pay for and establish reimbursement levels for those medications. Cost containment is a primary concern in the United States healthcare industry and elsewhere. Government authorities and these third-party payors have attempted to control costs by limiting coverage and the amount of reimbursement for particular medications. We cannot be sure that reimbursement will be available for our product candidates and, if reimbursement is available, the level of such reimbursement. Reimbursement may impact the demand for, or the price of, our product candidates. If reimbursement is not available or is available only at limited levels, we may not be able to successfully commercialize our product candidates.

In some foreign countries, particularly in Canada and European countries, the pricing of prescription pharmaceuticals is subject to strict governmental control. In these countries, pricing negotiations with governmental authorities can take six months or longer after the receipt of regulatory approval and product launch. To obtain favorable reimbursement for the indications sought or pricing approval in some countries, we may be required to conduct a clinical trial that compares the cost-effectiveness of our product candidates with other available therapies. If reimbursement for our product candidates is unavailable in any country in which we seek reimbursement, if it is limited in scope or amount, if it is conditioned upon our completion of additional clinical trials, or if pricing is set at unsatisfactory levels, our operating results could be materially adversely affected.

***We may seek FDA Orphan Drug designation for one or more of our product candidates. Even if we have obtained FDA Orphan Drug designation for a product candidate, there may be limits to the regulatory exclusivity afforded by such designation.***

We may, in the future, choose to seek FDA Orphan Drug designation for one or more of our current or future product candidates. Even if we obtain Orphan Drug designation from the FDA for a product candidate, there are limitations to the exclusivity afforded by such designation. In the U.S., the company that first obtains FDA approval for a designated orphan drug for the specified rare disease or condition receives orphan drug marketing exclusivity for that drug for a period of seven years. This orphan drug exclusivity prevents the FDA from approving another application, including a full NDA to market the same drug for the same orphan indication, except in very limited circumstances, including when the FDA concludes that the later drug is safer, more effective or makes a major contribution to patient care. For purposes of small molecule drugs, the FDA defines "same drug" as a drug that contains the same active moiety and is intended for the same use as the drug in question. To obtain Orphan Drug status for a drug that shares the same active moiety as an already approved drug, it must be demonstrated to the FDA that the drug is safer or more effective than the approved orphan designated drug, or that it makes a major contribution to patient care. In addition, a designated orphan drug may not receive orphan drug exclusivity if it is approved for a use that is broader than the indication for which it received orphan designation. In addition, orphan drug exclusive marketing rights in the U.S. may be lost if the FDA later determines that the request for designation was materially defective or if the manufacturer is unable to assure sufficient quantity of the drug to meet the needs of patients with the rare disease or condition or if another drug with the same active moiety is determined to be safer, more effective, or represents a major contribution to patient care.

***Our future growth may depend, in part, on our ability to penetrate foreign markets, where we would be subject to additional regulatory burdens and other risks and uncertainties.***

Our future profitability may depend, in part, on our ability to commercialize our product candidates in foreign markets for which we may rely on collaboration with third parties. If we commercialize our product candidates in foreign markets, we would be subject to additional risks and uncertainties, including:

- our customers' ability to obtain reimbursement for our product candidates in foreign markets;
- our inability to directly control commercial activities because we are relying on third parties;
- the burden of complying with complex and changing foreign regulatory, tax, accounting and legal requirements;
- different medical practices and customs in foreign countries affecting acceptance in the marketplace;
- import or export licensing requirements;
- longer accounts receivable collection times;
- longer lead times for shipping;
- language barriers for technical training;
- reduced protection of intellectual property rights, different standards of patentability and different availability of prior art in some foreign countries as compared with the U.S.;
- the existence of additional potentially relevant third party intellectual property rights;
- foreign currency exchange rate fluctuations; and
- the interpretation of contractual provisions governed by foreign laws in the event of a contract dispute.

Foreign sales of our product candidates could also be adversely affected by the imposition of governmental controls, political and economic instability, trade restrictions and changes in tariffs.

***We are a development stage biopharmaceutical company with no current revenues or approved products, and limited experience developing new therapeutic product candidates, including conducting clinical trials and other areas required for the successful development and commercialization of therapeutic products, which makes it difficult to assess our future viability.***

We are a development stage biopharmaceutical company. Although we have one drug candidate in Phase 2 development and are preparing to advance another drug candidate into Phase 2 development and a third drug candidate into pivotal Phase 3 clinical trials, we currently have no approved products and currently generate no revenues, and we have not yet fully demonstrated an ability to overcome many of the fundamental risks and uncertainties frequently encountered by development stage companies in new and rapidly evolving fields of technology, particularly biotechnology. To execute our business plan successfully, we will need to accomplish the following fundamental objectives, either on our own or with collaborators:

- develop and obtain required regulatory approvals for commercialization of AV-101, PH94B, PH10 and/or other product candidates;
- maintain, leverage and expand our intellectual property portfolio;
- establish and maintain sales, distribution and marketing capabilities, and/or enter into strategic partnering arrangements to access such capabilities;
- gain market acceptance for our product candidates; and
- obtain adequate capital resources and manage our spending as costs and expenses increase due to research, production, development, regulatory approval and commercialization of product candidates.

***Our future success is highly dependent upon our ability to successfully develop and commercialize any of our current product candidates, acquire or license additional product candidates, or discover, as well as produce, develop and commercialize proprietary DR NCEs using our stem cell technology, and we cannot provide any assurance that we will successfully develop and commercialize AV-101, PH94B, PH10 or acquire or license additional product candidates or discover and develop DR NCEs, or that, if produced, AV-101, PH94B, PH10 or any other product candidate will be successfully commercialized.***

Business development and research and development programs designed to identify, acquire or license additional product candidates, or, as the case may be, produce DR NCEs require substantial technical, financial and human resources, whether or not any additional product candidate is acquired or licensed or NCEs are ultimately identified and produced.

In addition, we do not have a sales or marketing infrastructure, and we, including our executive officers, do not have any significant pharmaceutical sales, marketing or distribution experience. We may seek to collaborate with others to develop and commercialize AV-101, PH94B, PH10, drug rescue NCEs and/or other product candidates if and when they are acquired and developed, or we may seek to establish those commercial capabilities ourselves. If we enter into arrangements with third parties to perform sales, marketing and distribution services for our products, the resulting revenues or the profitability from these revenues to us are likely to be lower than if we had sold, marketed and distributed our products ourselves. In addition, we may not be successful entering into arrangements with third parties to sell, market and distribute AV-101, PH94B, PH10, any drug rescue NCEs or other product candidates or may be unable to do so on terms that are favorable to us. We likely will have little control over such third parties, and any of these third parties may fail to devote the necessary resources and attention to sell, market and distribute our products effectively. If we do not establish sales, marketing and distribution capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our product candidates.

***We have limited operating history with respect to drug development, including our anticipated focus on the identification and acquisition of additional product candidates or the assessment of potential DR NCEs and no operating history with respect to the production of DR NCEs, and we may never be able to produce a DRNCE.***

If we are unable to develop and commercialize AV-101, PH94B, PH10 or acquire or license additional product candidates, or produce suitable DR NCEs, we may not be able to generate sufficient revenues to execute our business plan, which likely would result in significant harm to our financial position and results of operations, which could adversely impact our stock price.

With respect to DR, there are a number of factors, in addition to the utility of *CardioSafe* 3D, that may impact our ability to identify and produce, develop or out-license and commercialize DR NCEs, independently or with partners, including:

- our ability to identify potential DR candidates in the public domain, obtain sufficient quantities of them, and assess them using our bioassay systems;
- if we seek to rescue DR candidates that are not available to us in the public domain, the extent to which third parties may be willing to out-license or sell certain DR candidates to us on commercially reasonable terms;
- our medicinal chemistry collaborator’s ability to design and produce proprietary DR NCEs based on the novel biology and structure-function insight we provide using *CardioSafe* 3D; and
- financial resources available to us to develop and commercialize lead DR NCEs internally, or, if we sell or out-license them to partners, the resources such partners choose to dedicate to development and commercialization of any DR NCEs they acquire or license from us.

Even if we do acquire additional product candidates or produce proprietary DR NCEs, we can give no assurance that we will be able to develop and commercialize them as marketable drugs, on our own or in collaboration with others. Before we generate any revenues from AV-101, PH94B, PH10 or additional acquired or licensed products candidates or any DR NCEs, we or our potential collaborators must complete preclinical and clinical development programs, submit clinical and manufacturing data to the FDA, qualify a third party CMO, receive regulatory approval in one or more jurisdictions, satisfy the FDA that our CMO is capable of manufacturing the product in compliance with cGMP, build a commercial organization, make substantial investments and undertake significant marketing efforts ourselves or in partnership with others. We are not permitted to market or promote any of our product candidates before we receive regulatory approval from the FDA or comparable foreign regulatory authorities, and we may never receive such regulatory approval for any of our product candidates.

***If CardioSafe 3D fails to predict accurately and efficiently the cardiac effects, both toxic and nontoxic, of DR candidates and DR NCEs, then our DR programs will be adversely affected.***

Success of our subsidiary, VistaStem, is partly dependent on our ability to use *CardioSafe* 3D to identify and predict, accurately and efficiently, the potential toxic and nontoxic cardiac effects of DR candidates and DR NCEs. If *CardioSafe* 3D is not capable of providing physiologically relevant and clinically predictive information regarding human cardiac biology, our DR business will be adversely affected.

***CardioSafe 3D may not be meaningfully more predictive of the behavior of human cells than existing methods.***

DR drug rescue programs is highly dependent upon *CardioSafe* 3D being more accurate, efficient and clinically predictive than long-established surrogate safety models, including animal cells and live animals, and immortalized, primary and transformed cells, currently used by pharmaceutical companies and others. We cannot give assurance that *CardioSafe* 3D will be more efficient or accurate at predicting the heart safety of new drug candidates than the testing models currently used. If *CardioSafe* 3D fails to provide a meaningful difference compared to existing or new models in predicting the behavior of human heart, respectively, their utility for DR will be limited and our DR business will be adversely affected.

***We may invest in producing DR NCEs for which there proves to be no demand.***

To generate revenue from our DR activities, we must produce proprietary DR NCEs for which there proves to be demand within the healthcare marketplace, and, if we intend to out-license a particular DR NCE for development and commercialization prior to market approval, then also among pharmaceutical companies and other potential collaborators. However, we may produce DR NCEs for which there proves to be no or limited demand in the healthcare market and/or among pharmaceutical companies and others. If we misinterpret market conditions, underestimate development costs and/or seek to rescue the wrong DR candidates, we may fail to generate sufficient revenue or other value, on our own or in collaboration with others, to justify our investments, and our DR business may be adversely affected.

***We may experience difficulty in producing human cells and our future stem cell technology research and development efforts may not be successful within the timeline anticipated, if at all.***

Our hPSC technology is technically complex, and the time and resources necessary to develop various human cell types and customized bioassay systems, although not significant at present, are difficult to predict in advance. We might decide to devote significant additional personnel and financial resources to research and development activities designed to expand, in the case of DR, and explore, in the case of drug discovery and RM, potential applications of our stem cell technology platform. In particular, we may conduct exploratory nonclinical RM programs involving blood, bone, cartilage, and/or liver cells. Although we and our third-party collaborators have developed proprietary protocols to produce multiple differentiated cell types, we could encounter difficulties in differentiating and producing sufficient quantities of particular cell types, even when following these proprietary protocols. These difficulties could result in delays in production of certain cells, assessment of certain DR candidates and DR NCEs, design and development of certain human cellular assays and performance of certain exploratory nonclinical RM studies. In the past, our stem cell research and development projects have been significantly delayed when we encountered unanticipated difficulties in differentiating hPSCs into heart and liver cells. Although we have overcome such difficulties in the past, we may have similar delays in the future, and we may not be able to overcome them or obtain any benefits from our future stem cell technology research and development activities. Any delay or failure by us, for example, to produce functional, mature blood, bone, cartilage, and liver cells could have a substantial and material adverse effect on our potential drug discovery, DR and RM business opportunities and results of operations.

***Restrictions on research and development involving human embryonic stem cells and religious and political pressure regarding such stem cell research and development could impair our ability to conduct or sponsor certain potential collaborative research and development programs and adversely affect our prospects, the market price of our common stock and our business model.***

Some of our research and development programs may involve the use of human cells derived from our controlled differentiation of human embryonic stem cells (*hESCs*). Some believe the use of hESCs gives rise to ethical and social issues regarding the appropriate use of these cells. Our research related to differentiation of hESCs may become the subject of adverse commentary or publicity, which could significantly harm the market price of our common stock. Although now substantially less than in years past, certain political and religious groups in the U.S. and elsewhere voice opposition to hESC technology and practices. We may use hESCs derived from excess fertilized eggs that have been created for clinical use in *in vitro* fertilization (*IVF*) procedures and have been donated for research purposes with the informed consent of the donors after a successful IVF procedure because they are no longer desired or suitable for IVF. Certain academic research institutions have adopted policies regarding the ethical use of human embryonic tissue. These policies may have the effect of limiting the scope of future collaborative research opportunities with such institutions, thereby potentially impairing our ability to conduct certain research and development in this field that we believe is necessary to expand the DR capabilities of our technology, which would have a material adverse effect on our business.

The use of embryonic or fetal tissue in research (including the derivation of hESCs) in other countries is regulated by the government, and such regulation varies widely from country to country. Government-imposed restrictions with respect to use of hESCs in research and development could have a material adverse effect on us by harming our ability to establish critical collaborations, delaying or preventing progress in our research and development, and causing a decrease in the market interest in our stock.

The foregoing potential ethical concerns do not apply to our use of induced pluripotent stem cells *(iPSCs*) because their derivation does not involve the use of embryonic tissues.

***We have assumed that the biological capabilities of iPSCs and hESCs are likely to be comparable. If it is discovered that this assumption is incorrect, our exploratory research and development activities focused on potential regenerative medicine applications of our stem cell technology platform could be harmed.***

We may use both hESCs and iPSCs to produce human cells for our customized *in vitro* assays for drug discovery and drug rescue purposes. However, we anticipate that our future exploratory research and development, if any, focused on potential regenerative medicine applications of our stem cell technology platform primarily will involve iPSCs. With respect to iPSCs, we believe scientists are still somewhat uncertain about the clinical utility, life span, and safety of such cells, and whether such cells differ in any clinically significant ways from hESCs. If we discover that iPSCs will not be useful for whatever reason for potential regenerative medicine programs, this would negatively affect our ability to explore expansion of our platform in that manner, including, in particular, where it would be preferable to use iPSCs to reproduce rather than approximate the effects of certain specific genetic variations.

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

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our operations involve the use of hazardous and flammable materials, including chemicals and biological materials. Our operations also produce hazardous waste products. We generally contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials. In the event of contamination or injury resulting from our use of 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.

Although we maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees resulting from the use of hazardous materials, this insurance may not provide adequate coverage against potential liabilities. We do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us in connection with our storage or disposal of biological, hazardous or radioactive materials.

In addition, we may incur substantial costs to comply with current or future environmental, health and safety laws and regulations. These current or future laws and regulations may impair our research, development, or production efforts. Failure to comply with these laws and regulations also may result in substantial fines, penalties, or other sanctions, which could have a material adverse effect on our operations.

***To the extent our research and development activities involve using iPSCs, we will be subject to complex and evolving laws and regulations regarding privacy and informed consent. Many of these laws and regulations are subject to change and uncertain interpretation, and could result in claims, changes to our research and development programs and objectives, increased cost of operations or otherwise harm the Company.***

To the extent that we pursue research and development activities involving iPSCs, we will be subject to a variety of laws and regulations in the U.S. and abroad that involve matters central to such research and development activities, including obligations to seek informed consent from donors for the use of their blood and other tissue to produce, or have produced for us, iPSCs, as well as state and federal laws that protect the privacy of such donors. U.S. federal and state and foreign laws and regulations are constantly evolving and can be subject to significant change. If we engage in iPSC-related research and development activities in countries other than the U.S., we may become subject to foreign laws and regulations relating to human-subjects research and other laws and regulations that are often more restrictive than those in the U.S. In addition, both the application and interpretation of these laws and regulations are often uncertain, particularly in the rapidly evolving stem cell technology sector. Compliance with these laws and regulations can be costly, can delay or impede our research and development activities, result in negative publicity, increase our operating costs, require significant management time and attention and subject us to claims or other remedies, including fines or demands that we modify or cease existing business practices.

***Legal, social and ethical concerns surrounding the use of iPSCs, biological materials and genetic information could impair our operations.***

To the extent that our future stem cell research and development activities involve the use of iPSCs and the manipulation of human tissue and genetic information, the information we derive from such iPSC-related research and development activities could be used in a variety of applications, which may have underlying legal, social and ethical concerns, including the genetic engineering or modification of human cells, testing for genetic predisposition for certain medical conditions and stem cell banking. Governmental authorities could, for safety, social or other purposes, call for limits on or impose regulations on the use of iPSCs and genetic testing or the manufacture or use of certain biological materials involved in our iPSC-related research and development programs. Such concerns or governmental restrictions could limit our future research and development activities, which could have a material adverse effect on our business, financial condition and results of operations.

***Our human cellular bioassay systems and human cells we derive from human pluripotent stem cells, although not currently subject to regulation by the FDA or other regulatory agencies as biological products or drugs, could become subject to regulation in the future.***

The human cells we produce from hPSCs and our customized bioassay systems using such cells, including *CardioSafe* 3D, are not currently sold, for research purposes or any other purpose, to biotechnology or pharmaceutical companies, government research institutions, academic and nonprofit research institutions, medical research organizations or stem cell banks, and they are not therapeutic procedures. As a result, they are not subject to regulation as biological products or drugs by the FDA or comparable agencies in other countries. However, if, in the future, we seek to include human cells we derive from hPSCs in therapeutic applications or product candidates, such applications and/or product candidates would be subject to the FDA's pre- and post-market regulations. For example, if we seek to develop and market human cells we produce for use in performing RM applications, such as tissue engineering or organ replacement, we would first need to obtain FDA pre-market clearance or approval. Obtaining such clearance or approval from the FDA is expensive, time-consuming and uncertain, generally requiring many years to obtain, and requiring detailed and comprehensive scientific and clinical data. Notwithstanding the time and expense, these efforts may not result in FDA approval or clearance. Even if we were to obtain regulatory approval or clearance, it may not be for the uses that we believe are important or commercially attractive.

**Risks Related to Our Financial Position**

***We have incurred significant net losses since inception and we will continue to incur substantial operating losses for the foreseeable future. We may never achieve or sustain profitability, which would depress the market price of our common stock and could cause you to lose all or a part of your investment.***

We have incurred significant net losses in each fiscal year since our inception in 1998, including net losses of approximately $24.6 million and $14.3 million during our fiscal years ended March 31, 2019 and 2018, respectively. At March 31, 2019, we had an accumulated deficit of approximately $181.1 million. We do not know whether or when we will become profitable. Substantially all of our operating losses have resulted from costs incurred in connection with our research and development programs and from general and administrative costs associated with our operations. We expect to incur increasing levels of operating losses over the next several years and for the foreseeable future. Our prior losses, combined with expected future losses, have had and will continue to have an adverse effect on our stockholders' equity and working capital. We expect our research and development expenses to significantly increase in connection with nonclinical studies and clinical trials of our product candidates. In addition, if we obtain marketing approval for our product candidates, we may incur significant sales, marketing and outsourced-manufacturing expenses should we elect not to collaborate with one or more third parties for such services and capabilities. As a public company, we incur additional costs associated with operating as a public company. As a result, we expect to continue to incur significant and increasing operating losses for the foreseeable future. Because of the numerous risks and uncertainties associated with developing pharmaceutical products, we are unable to predict the extent of any future losses or when we will become profitable, if at all. Even if we do become profitable, we may not be able to sustain or increase our profitability on a quarterly or annual basis.

Our ability to become profitable depends upon our ability to generate revenues. To date, we have generated approximately $17.7 million in revenues, consisting of receipt of non-dilutive cash payments from collaborators, sublicense revenue, and research and development grant awards from the NIH. We have not yet commercialized any product or generated any revenues from product sales, and we do not know when, or if, we will generate any revenue from product sales. We do not expect to generate significant revenue unless and until we obtain marketing approval of, and begin to experience sales of, AV-101, PH94B, PH10 or another future product candidate, or we enter into one or more development and commercialization agreements with respect to AV-101, PH94B, PH10 or one or more other future product candidates. Our ability to generate revenue depends on a number of factors, including, but not limited to, our ability to:

- initiate and successfully complete nonclinical and clinical trials that meet their prescribed endpoints;
- initiate and successfully complete all safety studies required to obtain U.S. and foreign marketing approval for our product candidates;
- timely complete and compose successful regulatory submissions such as NDAs or comparable documents for both the U.S. and foreign jurisdictions;
- commercialize our product candidates, if approved, by developing a sales force or entering into collaborations with third parties for sales and marketing capabilities; and
- achieve market acceptance of our product candidates in the medical community and with third-party payors.

Unless we enter into a commercialization collaboration or partnership with respect to the commercialization of our product candidates, we expect to incur significant sales and marketing costs as we prepare to commercialize our product candidates. Even if we initiate and successfully complete pivotal clinical trials of our product candidates, and our product candidates are approved for commercial sale, and despite expending these costs, our product candidates may not be commercially successful. We may not achieve profitability soon after generating product sales, if ever. If we are unable to generate product revenue, we will not become profitable and may be unable to continue operations without continued funding.

***We require additional financing to execute our business plan and continue to operate as a going concern.***

Our audited consolidated financial statements for the year ended March 31, 2019 included elsewhere in this Annual Report on Form 10-K for the year ended March 31, 2019 (*Annual Report*) were prepared assuming we will continue to operate as a going concern, although we and our auditors have indicated that our continuing losses and negative cash flows from operations raise substantial doubt about our ability to continue as such. Because we continue to experience net operating losses, our ability to continue as a going concern is subject to our ability to obtain necessary funding from outside sources, including obtaining additional funding from this offering as well as future sales of our securities or potentially obtaining loans and grant awards from financial institutions and/or government agencies where possible. Our continued net operating losses increase the difficulty in completing such sales or securing alternative sources of funding, and there can be no assurances that we will be able to obtain any future funding on favorable terms or at all. If we are unable to obtain sufficient financing from the sale of our securities or from alternative sources, we may be required to reduce, defer, or discontinue certain or all of our research and development activities or we may not be able to continue as a going concern.

Since our inception, most of our resources have been dedicated to research and development of AV-101 and the DR capabilities of VistaStem's stem cell technology platform. In particular, we have expended substantial resources on research and development of methods and processes relating to the production of AV-101 API and drug product, advancing AV-101 through IND-enabling preclinical development, Phase 1 clinical safety studies, and into ongoing Phase 2 clinical development, including preparation for and launch of our ELEVATE Study, as well as research and development and regulatory expenses related to the production of PH94B and PH10 and our stem cell technology platform, including development of *CardioSafe* 3D for DR and our cardiac stem cell technology for potential RM applications in connection with the Bluerock Agreement, and we expect to continue to expend substantial resources for the foreseeable future developing and commercializing our product candidates on our own or in collaborations. These expenditures will include costs associated with general and administrative costs, facilities costs, research and development, acquiring new technologies, manufacturing product candidates, conducting nonclinical experiments and clinical trials and obtaining regulatory approvals, as well as commercializing any products approved for sale.

At March 31, 2019, we had cash and cash equivalents of approximately $13.1 million. We do not believe this amount alone is sufficient to enable us to fund our planned operations for at least the twelve months following the issuance of the financial statements included elsewhere in this Annual Report. We expect to seek additional capital to produce PH94B study material, conduct PH94B pivotal Phase 3 clinical trials, produce additional AV-101 study material for future nonclinical and clinical studies, conduct AV-101 Phase 3-enabling toxicology studies, conduct pivotal Phase 3 clinical studies of AV-101 in MDD, conduct AV-101 Phase 2 studies in LID, MDD, NP and SI, produce PH10 study material and conduct a Phase 2b clinical trial of PH10 in MDD, acquire or license and conduct research and development of additional product candidates and to fund our internal operations.

Further, we have no current source of revenue to sustain our present activities, and we do not expect to generate revenue until, and unless, we (i) out-license or sell a product candidate to a third-party, (ii) enter into additional license arrangements involving our stem cell technology, or (iii) obtain approval from the FDA or other regulatory authorities and successfully commercialize, on our own or through a future collaboration, one or more of our product candidates.

As the outcome of our ongoing research and development activities, including the outcome of ongoing and future anticipated clinical trials is highly uncertain, we cannot reasonably estimate the actual amounts necessary to successfully complete the development and commercialization of our product candidates, on our own or in collaboration with others. In addition, other unanticipated costs may arise. As a result of these and other factors, we will need to seek additional capital in the near term to meet our future operating requirements, including capital necessary to develop, obtain regulatory approval for, and to commercialize our product candidates, and may seek additional capital in the event there exists favorable market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. We have completed in the past, and are currently considering a range of potential financing transactions, including public or private equity or debt financings, government or other third-party funding, marketing and distribution arrangements and other collaborations, strategic alliances and licensing arrangements or a combination of these approaches, and we may complete additional financing arrangements later in 2019 and thereafter. Raising funds in the current economic environment may present additional challenges. Even if we believe we have sufficient funds for our current or future operating plans, we may seek additional capital if market conditions are favorable or if we have specific strategic considerations.

Our future capital requirements depend on many factors, including:

- the number and characteristics of the product candidates we pursue;
- the scope, progress, results and costs of researching and developing our product candidates, and conducting preclinical and clinical studies;
- the timing of, and the costs involved in, obtaining regulatory approvals for our product candidates;
- the cost of commercialization activities if any of our product candidates are approved for sale, including marketing, sales and distribution costs;
- the cost of manufacturing our product candidates and any products we successfully commercialize;
- our ability to establish and maintain strategic partnerships, licensing or other collaborative arrangements and the financial terms of such agreements;
- market acceptance of our product candidates;
- the effect of competing technological and market developments;
- our ability to obtain government funding for our research and development programs;
- the costs involved in obtaining, maintaining and enforcing patents to preserve our intellectual property;
- the costs involved in defending against such claims that we infringe third-party patents or violate other intellectual property rights and the outcome of such litigation;
- the timing, receipt and amount of potential future licensee fees, milestone payments, and sales of, or royalties on, our future products, if any; and
- the extent to which we may acquire or invest in additional businesses, product candidates and technologies.

Any additional fundraising efforts will divert certain members of our management team from their day-to-day activities, which may adversely affect our ability to develop and commercialize our product candidates. In addition, our ability to engage in certain types of capital raising transactions may be limited by the Listing Rules of the Nasdaq Stock Market and/or General Instruction I.B.6 of Form S-3 so long as the market value of our common stock held by non-affiliates remains below $75 million. We cannot guarantee that future financing will be available in sufficient amounts, in a timely manner, or on terms acceptable to us, if at all. The terms of any future financing may adversely affect the holdings or the rights of our stockholders and the issuance of additional securities, whether equity or debt, by us, or the possibility of such issuance, may cause the market price of our shares to decline. The sale of additional equity securities and the conversion, exchange or exercise of certain of our outstanding securities will dilute all of our stockholders. The incurrence of debt could result in increased fixed payment obligations and we could be required to agree to certain restrictive covenants, such as limitations on our ability to incur additional debt, limitations on our ability to acquire, sell or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. We could also be required to seek funds through arrangements with collaborative partners or otherwise at an earlier stage than otherwise would be desirable and we may be required to relinquish rights to some of our technologies or product candidates or otherwise agree to terms unfavorable to us, any of which may have a material adverse effect on our business, operating results and prospects.

If we are unable to obtain additional funding on a timely basis and on acceptable terms, we may be required to significantly curtail, delay or discontinue one or more of our research or product development programs or the commercialization of any product candidate or be unable to continue or expand our operations or otherwise capitalize on our business opportunities, as desired, which could materially affect our business, financial condition and results of operations.

***We have identified material weaknesses in our internal control over financial reporting, and our business and stock price may be adversely affected if we do not adequately address those weaknesses or if we have other material weaknesses or significant deficiencies in our internal control over financial reporting.***

We have identified material weaknesses in our internal control over financial reporting. In particular, we concluded that (i) the size and capabilities of our staff does not permit appropriate segregation of duties to prevent one individual from overriding the internal control system by initiating, authorizing and completing all transactions, and (ii) we utilize accounting software that does not prevent erroneous or unauthorized changes to previous reporting periods and/or can be adjusted so as to not provide an adequate auditing trail of entries made in the accounting software.

The existence of one or more material weaknesses or significant deficiencies could result in errors in our financial statements, and substantial costs and resources may be required to rectify any internal control deficiencies. If we cannot produce reliable financial reports, investors could lose confidence in our reported financial information, we may be unable to obtain additional financing to operate and expand our business and our business and financial condition could be harmed.

***Raising additional capital will cause substantial dilution to our existing stockholders, may restrict our operations or require us to relinquish rights, and may require us to seek stockholder approval to authorize additional shares of our common stock.***

We intend to pursue private and public equity offerings, debt financings, strategic collaborations and licensing arrangements during 2019 and beyond. To the extent that we raise additional capital through the sale of common stock or securities convertible or exchangeable into common stock, or to the extent, for strategic purposes, we convert or exchange certain of our outstanding securities into common stock, our current stockholders' ownership interest in our company will be substantially diluted. In addition, the terms of any such securities may include liquidation or other preferences that materially adversely affect rights of our stockholders. Debt financing, if available, would increase our fixed payment obligations and may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through collaboration, strategic partnerships and licensing arrangements with third parties, we may have to relinquish valuable rights to our product candidates, our intellectual property, future revenue streams or grant licenses on terms that are not favorable to us.

***Some of our programs have been partially supported by government grant awards, which may not be available to us in the future.***

Since inception, we have received substantial funds under grant award programs funded by state and federal governmental agencies, such as the NIH, the NIH's National Institute of Neurological Disease and Stroke (*NINDS*) and the NIMH, and the California Institute for Regenerative Medicine (*CIRM*). To fund a portion of our future research and development programs, we may apply for additional grant funding from such or similar governmental organizations. However, funding by these governmental organizations may be significantly reduced or eliminated in the future for a number of reasons. For example, some programs are subject to a yearly appropriations process in Congress. In addition, we may not receive funds under future grants because of budgeting constraints of the agency administering the program. Therefore, we cannot assure you that we will receive any future grant funding from any government organization or otherwise. A restriction on the government funding available to us could reduce the resources that we would be able to devote to future research and development efforts. Such a reduction could delay the introduction of new products and hurt our competitive position.

***Our ability to use net operating losses to offset future taxable income is subject to certain limitations.***

As of March 31, 2019, we had federal and state net operating loss carryforwards of approximately $109.0 million and $63.6 million, respectively, which begin to expire in fiscal 2020. Under Section 382 of the Internal Revenue Code of 1986, as amended (the *Code*), changes in our ownership may limit the amount of our net operating loss carryforwards that could be utilized annually to offset our future taxable income, if any. This limitation would generally apply in the event of a cumulative change in ownership of our company of more than 50% within a three-year period. Any such limitation may significantly reduce our ability to utilize our net operating loss carryforwards and tax credit carryforwards before they expire. Any such limitation, whether as the result of future offerings, prior private placements, sales of our common stock by our existing stockholders or additional sales of our common stock by us in the future, could have a material adverse effect on our results of operations in future years. We have not completed a study to assess whether an ownership change for purposes of Section 382 has occurred, or whether there have been multiple ownership changes since our inception, due to the significant costs and complexities associated with such study.

**General Company-Related Risks**

***If we fail to attract and retain senior management and key scientific personnel, we may be unable to successfully produce, develop and commercialize our product candidates.***

Our success depends in part on our continued ability to attract, retain and motivate highly qualified management and scientific and technical personnel. We are highly dependent upon our Chief Executive Officer, President and Chief Scientific Officer, Chief Medical Officer, Chief Financial Officer, and Vice President – Corporate Development as well as our other employees, consultants and scientific collaborators. As of the date of this Annual Report, we have nine full-time employees, which may make us more reliant on our individual employees than companies with a greater number of employees. The loss of services of any of these individuals could delay or prevent the successful development of our product candidates or disrupt our administrative functions.

Although we have not historically experienced unique difficulties attracting and retaining qualified employees, we could experience such problems in the future. For example, competition for qualified personnel in the biotechnology and pharmaceuticals field is intense. We will need to hire additional personnel should we elect to expand our research and development and administrative activities. We may not be able to attract and retain quality personnel on acceptable terms.

In addition, we rely on a broad and diverse range of strategic consultants and advisors, including manufacturing, nonclinical and clinical development, and regulatory advisors, to assist us in designing and implementing our research and development and regulatory strategies and plans for our product candidates. Our consultants and advisors may be employed by employers other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us.

As we seek to advance development of our product candidates, we may need to expand our research and development capabilities and/or contract with third parties to provide these capabilities for us. As our operations expand, we expect that we will need to manage additional relationships with various strategic partners and other third parties. Future growth will impose significant added responsibilities on members of management. Our future financial performance and our ability to develop and commercialize our product candidates and to compete effectively will depend, in part, on our ability to manage any future growth effectively. To that end, we must be able to manage our research and development efforts effectively and hire, train and integrate additional management, administrative and technical personnel. The hiring, training and integration of new employees may be more difficult, costly and/or time-consuming for us because we have fewer resources than a larger organization. We may not be able to accomplish these tasks, and our failure to accomplish any of them could prevent us from successfully growing the company.

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

As we develop our product candidates. either on our own or in collaboration with others, we will face inherent risks of product liability as a result of the required clinical testing of such product candidates, and will face an even greater risk if we or our collaborators commercialize any such product candidates. For example, we may be sued if AV-101, PH94B, PH10, any DR NCE, other product candidate, or RM product candidate we develop allegedly causes injury or is found to be otherwise unsuitable during product testing, manufacturing, marketing or sale. Any such product liability claims may include allegations of defects in manufacturing, defects in design, a failure to warn of dangers inherent in the product, negligence, strict liability, and a breach of warranties. Claims could also be asserted under state consumer protection acts. If we cannot successfully defend ourselves against product liability claims, we may incur substantial liabilities or be required to limit commercialization of our product candidates. Even successful defense would require significant financial and management resources. Regardless of the merits or eventual outcome, liability claims may result in:

- decreased demand for product candidates that we may develop;
- injury to our reputation;
- withdrawal of clinical trial participants;
- costs to defend the related litigation;
- a diversion of management's time and our resources;
- substantial monetary awards to trial participants or patients; or
- product recalls, withdrawals or labeling, marketing or promotional restrictions.

Our inability to obtain and retain sufficient product liability insurance at an acceptable cost to protect against potential product liability claims could prevent or inhibit the commercialization of products we develop. Although we maintain general and product liability insurance, any claim that may be brought against us could result in a court judgment or settlement in an amount that is not covered, in whole or in part, by our insurance or that is in excess of the limits of our insurance coverage. Our insurance policies also have various exclusions, and we may be subject to a product liability claim for which we have no coverage. We will have to pay any amounts awarded by a court or negotiated in a settlement that exceed our coverage limitations or that are not covered by our insurance, and we may not have, or be able to obtain, sufficient capital to pay such amounts.

***As a public company, we incur significant administrative workload and expenses to comply with U.S. regulations and requirements imposed by the Nasdaq Stock Market concerning corporate governance and public disclosure.***

As a public company with common stock listed on the Nasdaq Capital Market, we must comply with various laws, regulations and requirements, including certain provisions of the Sarbanes-Oxley Act of 2002, as well as rules implemented by the SEC and the Nasdaq Stock Market. Complying with these statutes, regulations and requirements, including our public company reporting requirements, continues to occupy a significant amount of the time of management and involves significant accounting, legal and other expenses. Our efforts to comply with these regulations are likely to result in increased general and administrative expenses and management time and attention directed to compliance activities.

***Unfavorable global economic or political conditions could adversely affect our business, financial condition or results of operations.***

Our results of operations could be adversely affected by global political conditions, as well as general conditions in the global economy and in the global financial and stock markets. Global financial and political crises cause extreme volatility and disruptions in the capital and credit markets. A severe or prolonged economic downturn, such as the recent global financial crisis, could result in a variety of risks to our business, including, weakened demand for our product candidates and our ability to raise additional capital when needed on acceptable terms, if at all. A weak or declining economy could also strain our suppliers, possibly resulting in supply disruption, or cause our customers to delay making payments for our services. Any of the foregoing could harm our business and we cannot anticipate all of the ways in which the current economic climate and financial market conditions could adversely impact our business.

***We or the third parties upon whom we depend may be adversely affected by natural disasters and our business continuity and disaster recovery plans may not adequately protect us from a serious disaster.***

Natural disasters could severely disrupt our operations, and have a material adverse effect on our business, results of operations, financial condition and prospects. If a natural disaster, power outage or other event occurred that prevented us from using all or a significant portion of our headquarters, that damaged critical infrastructure, such as the manufacturing facilities of our third-party CMOs, or that otherwise disrupted operations, it may be difficult or, in certain cases, impossible for us to continue our business for a substantial period of time. The disaster recovery and business continuity plans we have in place may prove inadequate in the event of a serious disaster or similar event. We may incur substantial expenses as a result of the limited nature of our disaster recovery and business continuity plans, which could have a material adverse effect on our business.

***Our business and operations would suffer in the event of cybersecurity or other system failures. Our business depends on complex information systems, and any failure to successfully maintain these systems or implement new systems to handle our changing needs could result in a material disruption of our product candidates' development programs or otherwise materially harm our operations.***

In the ordinary course of our business, we collect and store sensitive data, including intellectual property, our proprietary business information and that of our suppliers, as well as personally identifiable information of employees. Similarly, our third-party CROs, CMOs and other contractors and consultants possess certain of our sensitive data. The secure maintenance of this information is material to our operations and business strategy. Despite the implementation of security measures, our internal computer systems and those of our third-party CROs, CMOs and other contractors and consultants are vulnerable to attacks by hackers, damage from computer viruses, unauthorized access, breach due to employee error, malfeasance or other disruptions, natural disasters, terrorism and telecommunication and electrical failures. Any such attack or breach could compromise our networks and the information stored there could be accessed, publicly disclosed, lost or stolen. The legislative and regulatory landscape for privacy and data protection continues to evolve, and there has been an increasing amount of focus on privacy and data protection issues with the potential to affect our business, including recently enacted laws in a majority of states requiring security breach notification. Thus, any access, disclosure or other loss of information, including our data being breached at our partners or third-party providers, could result in legal claims or proceedings and liability under laws that protect the privacy of personal information, disruption of our operations, and damage to our reputation, which could adversely affect our business.

While we have not experienced any such system failure, accident, or security breach to date, if such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our programs. For example, the loss of clinical trial data for AV-101, PH94B, PH10 or other product candidates could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. To the extent that any disruption or security breach results in a loss of or damage to our data or applications or other data or applications relating to our technology or product candidates, or inappropriate disclosure of confidential or proprietary information, we could incur liabilities and the further development of our product candidates could be delayed.

***We may acquire businesses or product candidates, or form strategic alliances, in the future, and we may not realize the benefits of such acquisitions.***

We may acquire additional businesses or product candidates, form strategic alliances or create joint ventures with third parties that we believe will complement or augment our existing business. If we acquire businesses with promising markets or technologies, we may not be able to realize the benefit of acquiring such businesses if we are unable to successfully integrate them with our existing operations and company culture. We may encounter numerous difficulties in developing, manufacturing and marketing any new product candidates resulting from a strategic alliance, licensing transaction or acquisition that delay or prevent us from realizing their expected benefits or enhancing our business. We cannot assure you that, following any such acquisition or licensing transaction, we will achieve the expected synergies to justify the transaction.

**Risks Related to Our Intellectual Property Rights**

***If we are unable to adequately protect our proprietary technology or obtain and maintain issued patents that are sufficient to protect our product candidates, others could compete against us more directly, which would have a material adverse impact on our business, results of operations, financial condition and prospects.***

We strive to protect and enhance the proprietary technologies that we believe are important to our business, including seeking patents intended to cover our product candidates, their compositions and formulations, their methods of use and methods of manufacturing and any other inventions we consider important to the development of our business. We also rely on trade secrets to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection.

Our success will depend significantly on our ability to obtain and maintain patent and other proprietary protection for commercially important technology, inventions and know-how related to our business, to defend and enforce our patents, to preserve the confidentiality of our trade secrets and to operate without infringing the valid and enforceable patents and proprietary rights of third parties. We also rely on know-how, continuing technological innovation and in-licensing opportunities to develop, strengthen and maintain the proprietary position of our product candidates. We own and have licensed patents and patent applications related to product candidates AV-101, PH94B, PH10 and also to hPSC technology.

Although we own and have licensed issued and allowed patents and patent applications relating to AV-101, PH94B and PH10 in the U.S., selected countries in the EU and other jurisdictions, we cannot yet provide any assurances that any of our pending U.S. and additional foreign patent applications will mature into issued patents and, if they do, that any of our patents will include claims with a scope sufficient to protect our product candidates or otherwise provide any competitive advantage.

Moreover, other parties may have developed technologies that may be related or competitive to our approach and may have filed or may file patent applications and may have received or may receive patents that may overlap or conflict with our patent properties, for example, either by claiming the same methods or formulations or by claiming subject matter that could dominate our patent position. Such third-party patent positions may limit or even eliminate our ability to obtain or maintain patent protection.

The uncertainty about adequate protection includes changes to the patent laws through either legislative action to change statutory patent law or court action that may reinterpret existing law in ways affecting the scope or validity of issued patents. Moreover, relevant laws differ from country-to-country.

***The patent positions of biotechnology and pharmaceutical companies, including our patent portfolio with respect to our product candidates, involve complex legal and factual questions, and, therefore, the issuance, scope, validity and enforceability of any additional patent claims that we may obtain cannot be predicted with certainty.***

Our ability to obtain valid and enforceable patents depends in large measure on whether the differences between our technology and the prior art allow our inventions to be patentable over relevant prior art. Such prior art includes scientific publications, investment blogs, granted patents and published patent applications. Patent uncertainty cannot be eliminated because of the potential existence of other prior art about which we are currently unaware that may be relevant to our patent applications and patents, which may prevent a pending patent application from being granted or result in an issued patent being held invalid or unenforceable.

In addition, some patent-related uncertainty exists because of the challenge in finding and addressing all of the relevant and material prior art in the biotechnology and pharmaceutical fields. For example, there are numerous reports in the scientific literature of compounds that target similar cellular receptors as certain of our product candidates or were evaluated in early (often pre-clinical) studies. In addition, even some reports in the trade press and public announcements made us us before the filing date of our AV-101 patent applications mentioned that AV-101 was in development for certain therapeutic purposes. For example, we published a web post on the NIH clinical trials website prior to our filing of our initial AV-101 patent applications, which describes unit doses for a then future study, but does not mention treatment of depression and does not provide any preclinical or clinical study data relating to depression or any other medical condition, disease or disorder. This post was not submitted to the United States Patent and Trademark Office (*USPTO*) in our two granted U.S. patents related to (i) unit dose formulations of AV-101 effective to treat depression and (ii) methods of treating depression with AV-101, respectively. However, it was submitted in our pending AV-101 patent applications that make similar claims, and we are considering entering this web post in the record of the aforementioned two issued U.S. patents. Another source of uncertainty pertains to patent properties that were in-licensed by us for which prior art submissions were under the control of the licensor. We rely on these licensors to have satisfied the relevant disclosure obligations.

In the event any previously published prior art is deemed to be invalidating prior art, it may cause certain of our issued patents to be invalid and/or unenforceable which would cause us to lose at least part, and perhaps all, of the patent protection on our product candidates. Such a loss of patent protection would have a material adverse impact on our business.

***Obtaining and maintaining our 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.***

The USPTO, the European Patent Office (*EPO*) and various other 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.

***Even if patents do successfully issue, third parties may challenge the validity, enforceability or scope of such issued patents or any other issued patents we own or license, which may result in such patents being narrowed, invalidated or held unenforceable.***

United States and foreign patents and patent applications may be subject to various types of infringement and validity proceedings, including interference proceedings, *ex parte* reexamination, *inter partes* review proceedings, supplemental examination and challenges in district court. Patents may be subjected to opposition, post-grant review, invalidity actions, or comparable proceedings lodged in various foreign, both national and regional, patent offices or courts. These proceedings could result in loss of the patent or denial of the patent application or loss or reduction in the scope of one or more of the claims of the patent or patent in such a way that they no longer cover our product candidates or competitive products.

Furthermore, though an issued patent is presumed valid and enforceable, its issuance is not conclusive as to its validity or its enforceability and it may not provide us with adequate proprietary protection or competitive advantages against competitors with similar products. Even if a patent issues and is held to be valid and enforceable, competitors may be able to design around our patents, for example, by using pre-existing or newly developed technology. Other parties may develop and obtain patent protection for more effective technologies, designs or methods.

If we or one of our licensing partners initiated legal proceedings against a third-party to enforce a patent covering one of our product candidates, including patents related to AV-101, PH94B or PH10, the defendant could counterclaim that the patent covering our product candidate is invalid and/or unenforceable. In patent litigation in the United States, defendant counterclaims alleging invalidity and/or unenforceability are commonplace. Grounds for a validity challenge include alleged failures to meet any of several statutory requirements, including lack of novelty, obviousness or non-enablement. Grounds for unenforceability assertions include allegations that someone connected with prosecution of the patent withheld relevant information from the USPTO or made a misleading statement during prosecution. Third parties may also raise similar claims before administrative bodies in the United States or abroad, even outside the context of litigation. If a defendant were to prevail on a legal assertion of invalidity and/or unenforceability, we would lose at least part, and perhaps all, of the patent protection on our product candidates. Such a loss of patent protection would have a material adverse impact on our business.

In addition, such patent-related proceedings may be costly. Thus, any patent properties that we may own or exclusively license ultimately may not provide commercially meaningful protection against competitors. Furthermore, an adverse decision in an interference proceeding can result in a third party receiving the patent right sought by us, which in turn could affect our ability to develop, market or otherwise commercialize our product candidates.

We may not be able to prevent the unauthorized disclosure or use of our technical knowledge or trade secrets by consultants, vendors, or former or current employees. The laws of some foreign countries do not protect our proprietary rights to the same extent as the laws of the United States, and we may encounter significant problems in protecting our proprietary rights in these countries. If these developments were to occur, they could have a material adverse effect on our sales.

Our ability to enforce our patent rights also depends on our ability to detect infringement. It is difficult to detect infringers who do not advertise the components or manufacturing processes that are used in their products. Moreover, it may be difficult or impossible to obtain evidence of infringement in a competitor's or potential competitor's product. Any litigation to enforce or defend our patent rights, even if we were to prevail, could be costly and time-consuming and would divert the attention of our management and key personnel from our business operations. We may not prevail in any lawsuits that we initiate and the damages or other remedies awarded if we were to prevail may not be commercially meaningful.

In addition, proceedings to enforce or defend our patents could put our patents at risk of being invalidated, held unenforceable, or interpreted narrowly. Such proceedings could also provoke third parties to assert claims against us, including that some or all of the claims in one or more of our patents are invalid or otherwise unenforceable. If any patents covering our product candidates are invalidated or found unenforceable, our financial position and results of operations would be materially and adversely impacted. In addition, if a court found that valid, enforceable patents held by third parties covered our product candidates, our financial position and results of operations would also be materially and adversely impacted.

Overall, the degree of future protection for our proprietary rights is uncertain, and we cannot ensure that:

- any issued patents related to AV-101, PH94B, PH10 or any pending patent applications, if issued and challenged by others, will include or maintain claims having a scope sufficient to protect AV-101, PH94B, PH10 or any other products or product candidates against generic or other competition, particularly considering that any patent rights to these compounds *per se* have expired;
- any of our pending patent applications will issue as patents at all;
- we will be able to successfully commercialize our product candidates, if approved, before our relevant patents expire;
- we were the first to make the inventions covered by each of our patents and pending patent applications;
- we were the first to file patent applications for these inventions;
- others will not develop similar or alternative technologies that do not infringe our patents;
- others will not use pre-existing technology to effectively compete against us;
- any of our patents, if issued, will ultimately be found to be valid and enforceable, including on the basis of prior art relating to our patent applications and patents;
- any patents currently held or issued to us in the future will provide a basis for an exclusive market for our commercially viable products, will provide us with any competitive advantages or will not be challenged by third parties;
- we will develop additional proprietary technologies or product candidates that are separately patentable; or
- our commercial activities or products will not infringe upon the patents or proprietary rights of others.

We also rely upon unpatented trade secrets, unpatented know-how and continuing technological innovation to develop and maintain our competitive position, which we seek to protect, in part, by confidentiality agreements with our employees and our collaborators and consultants. It is possible that technology relevant to our business will be independently developed by a person that is not a party to such an agreement. Furthermore, if the employees, collaborators and consultants who are parties to these agreements breach or violate the terms of these agreements, we may not discover or have adequate remedies for any such breach or violation, and we could lose our trade secrets through such breaches or violations. Further, our trade secrets could otherwise become known or be independently discovered by our competitors.

***Third parties may initiate legal proceedings against us alleging that we infringe their intellectual property rights, which may prevent or delay our product development efforts and stop us from commercializing candidate products or increase the costs of commercializing them, if approved. Also, we may file counterclaims or initiate other legal proceedings against third parties to challenge the validity or scope of their intellectual property rights, the outcomes of which also would be uncertain and could have a material adverse effect on the success of our business.***

We cannot assure that our business, product candidates and methods do not or will not infringe the patents or other intellectual property rights of third parties. Third parties may initiate legal proceedings against us or our licensors or collaborators alleging that we or our licensors or collaborators infringe their intellectual property rights. In addition, we or our licensors or collaborators may file counterclaims in such proceedings or initiate separate legal proceedings against third parties to challenge the validity or scope of their intellectual property rights, including in oppositions, interferences, reexaminations, *inter partes* reviews or derivation proceedings before the United States or other jurisdictions.

Our success will depend in part on our ability to operate without infringing the intellectual property and proprietary rights of third parties. Success also will depend on our ability to prevail in litigation if we are sued for infringement or to resolve litigation matters with rights and at costs favorable to us.

The pharmaceutical industry is characterized by extensive litigation regarding patents and other intellectual property rights. Other parties may allege that our product candidates or the use of our technologies infringes patent claims or other intellectual property rights held by them or that we are employing their proprietary technology without authorization. As we continue to develop and, if approved, commercialize our current product candidates and future product candidates, competitors may claim that our technology infringes their intellectual property rights as part of their business strategies designed to impede our successful commercialization. There may be third-party patents or patent applications with claims to materials, formulations, methods of manufacture or methods for treatment related to the use or manufacture of our product candidates. Because patent applications can take many years to issue, third parties may have currently pending patent applications that later result in issued patents that our product candidates may infringe, or that such third parties assert are infringed by our technologies.

The foregoing types of proceedings can be expensive and time-consuming and many of our own or our licensors' or collaborators' adversaries in these proceedings may have the ability to dedicate substantially greater resources to prosecuting these legal actions than we or our licensors or collaborators can. Our defense of litigation or other proceedings may fail and, even if successful, may result in substantial costs and distract our management and other employees. We may not be able to prevent, alone or with our licensors, misappropriation of our intellectual property rights, particularly in countries where the laws may not protect those rights as fully as in the United States or European Union.

The outcome of intellectual property litigation is subject to uncertainties that cannot be adequately quantified in advance. The coverage of patents is subject to interpretation by the courts, and the interpretation is not always uniform. If we are 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, and we may not be able to do this. 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 have a material adverse effect on us. In addition, we may not have sufficient financial resources to bring these actions to a successful conclusion.

An unfavorable outcome in the foregoing kinds of proceedings could require us or our licensors or collaborators to cease using the related technology or developing or commercializing our product candidates, or to attempt to license rights to it from the prevailing party. Our business could be harmed if the prevailing party does not offer us or our licensors or collaborators a license on commercially reasonable terms or at all. Even if we or our licensors or collaborators obtain a license, it may be non-exclusive, thereby giving our competitors access to the same technologies licensed to us or our licensors or collaborators.

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 materially harm our business.

Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation. There could also be public announcements of the results of hearings, motions or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a material adverse effect on the price of our common stock.

Patent and other types of intellectual property litigation can involve complex factual and legal questions, and their outcomes are uncertain. Any claim relating to intellectual property infringement that is successfully asserted against us may require us to pay substantial damages, including treble damages and attorney's fees if we are found to have willfully infringed a third party's patents, for past use of the asserted intellectual property and royalties and other consideration going forward if we are forced to take a license. In addition, if any such claim is successfully asserted against us and we could not obtain such a license, we may be forced to stop or delay developing, manufacturing, selling or otherwise commercializing our product candidates.

Patent litigation is costly and time-consuming. We may not have sufficient resources to bring these actions to a successful conclusion. Even if we are successful in these proceedings, we may incur substantial costs and divert management time and attention in pursuing these proceedings, which could have a material adverse effect on us. If we are unable to avoid infringing the patent rights of others, we may be required to seek a license, defend an infringement action or challenge the validity of the patents in court, or redesign our products.

In addition, intellectual property litigation or claims could force us to do one or more of the following:

- cease developing, selling or otherwise commercializing our product candidates;
- pay substantial damages for past use of the asserted intellectual property;
- obtain a license from the holder of the asserted intellectual property, which license may not be available on reasonable terms, if at all; and
- in the case of trademark claims, redesign, or rename, some or all of our product candidates to avoid infringing the intellectual property rights of third parties, which may not be possible and, even if possible, could be costly and time-consuming.

Any of these risks coming to fruition could have a material adverse effect on our business, results of operations, financial condition and prospects.

***The Company may be subject to claims challenging the inventorship or ownership of our patents and other intellectual property.***

We enter into confidentiality and intellectual property assignment agreements with our employees, consultants, outside scientific collaborators, sponsored researchers and other advisors. These agreements generally provide that inventions conceived by the party in the course of rendering services to us will be our exclusive property. However, these agreements may not be honored and may not effectively assign intellectual property rights to us. For example, even if we have a consulting agreement in place with an academic advisor pursuant to which such academic advisor is required to assign any inventions developed in connection with providing services to us, such academic advisor may not have the right to assign such inventions to us, as it may conflict with his or her obligations to assign their intellectual property to his or her employing institution.

Litigation may be necessary to defend against these and other claims challenging inventorship or ownership. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights, such as exclusive ownership of, or right to use, valuable intellectual property. Such an outcome could have a material adverse effect on our business. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees.

***We do not seek to protect our intellectual property rights in all jurisdictions throughout the world and we may not be able to adequately enforce our intellectual property rights even in the jurisdictions where we seek protection.***

Filing, prosecuting and defending patents on product candidates in all countries and jurisdictions throughout the world is prohibitively expensive, and our intellectual property rights in some countries outside the U.S. could be less extensive than those in the United States, assuming that rights are obtained in the U.S. In addition, the laws of some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the U.S. Consequently, we may not be able to prevent third parties from practicing our inventions in all countries outside the U.S., or from selling or importing products made using our inventions in and into the United States or other jurisdictions. The statutory deadlines for pursuing patent protection in individual foreign jurisdictions are based on the priority date of each of our patent applications. For the pending patent applications relating to AV-101, as well as for other of the patent families that we own or license, the relevant statutory deadlines have not yet expired. Thus, for each of the patent families that we believe provide coverage for our lead product candidates or technologies, we will need to decide whether and where to pursue protection outside the U.S.

Competitors may use our technologies in jurisdictions where we do not pursue and obtain patent protection to develop their own products and further, may export otherwise infringing products to territories where we have patent protection, but enforcement is not as strong as that in the U.S. 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. Even if we pursue and obtain issued patents in particular jurisdictions, our patent claims or other intellectual property rights may not be effective or sufficient to prevent third parties from so competing.

The laws of some foreign countries do not protect intellectual property rights to the same extent as the laws of the U.S. Many companies have encountered significant problems in protecting and defending intellectual property rights in certain foreign jurisdictions. The legal systems of some countries, particularly developing countries, do not favor the enforcement of patents and other intellectual property protection, especially those relating to biotechnology and pharmaceuticals. This could make it difficult for us to stop the infringement of our patents, if obtained, 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 under certain circumstances. In addition, many countries limit the enforceability of patents against third parties, including government agencies or government contractors. In these countries, patents may provide limited or no benefit. Patent protection must ultimately be sought on a country-by-country basis, which is an expensive and time-consuming process with uncertain outcomes. Accordingly, we may choose not to seek patent protection in certain countries, and we will not have the benefit of patent protection in such countries.

An unfavorable outcome could require us or our licensors or collaborators to cease using the related technology or developing or commercializing our product candidates, or to attempt to license rights to it from the prevailing party. Our business could be harmed if the prevailing party does not offer us or our licensors or collaborators a license on commercially reasonable terms or at all. Even if we or our licensors or collaborators obtain a license, it may be non-exclusive, thereby giving our competitors access to the same technologies licensed to us or our licensors or collaborators. 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 materially harm our business.

Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation. There could also be public announcements of the results of hearings, motions or other interim proceedings or developments. If securities analysts or investors perceive these results to be negative, it could have a material adverse effect on the price of our common stock.

Furthermore, proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business, could put our patents at risk of being invalidated or interpreted narrowly, could put 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. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

***We are dependent, in part, on licensed intellectual property. If we were to lose our rights to licensed intellectual property, we may not be able to continue developing or commercializing our product candidates, if approved. If we breach any of the agreements under which we license the use, development and commercialization rights to our product candidates or technology from third parties or, in certain cases, we fail to meet certain development or payment deadlines, we could lose license rights that are important to our business.***

For our PH10, PH94B and certain stem cell technologies, we are a party to a number of license agreements under which we are granted rights to intellectual properties that are or could become important to our business, and we expect that we may need to enter into additional license agreements in the future. Our existing license agreements impose, and we expect that future license agreements will impose on us, various development, regulatory and/or commercial diligence obligations, payment of fees, milestones and/or royalties and other obligations. If we fail to comply with our obligations under these agreements, or we are subject to a bankruptcy, the licensor may have the right to terminate the license, in which event we would not be able to develop or market products, which could be covered by the license. Our business could suffer, for example, if any current or future licenses terminate, if the licensors fail to abide by the terms of the license, if the licensed patents or other rights are found to be invalid or unenforceable, or if we are unable to enter into necessary licenses on acceptable terms.

As we have done previously, we may need to obtain licenses from third parties to advance our research or allow commercialization of our product candidates, and we cannot provide any assurances that third-party patents do not exist that might be enforced against our current product candidates or future products in the absence of such a license. We may fail to obtain any of these licenses on commercially reasonable terms, if at all. Even if we are able to obtain a license, it may be non-exclusive, thereby giving our competitors access to the same technologies licensed to us. In that event, we may be required to expend significant time and resources to develop or license replacement technology. If we are unable to do so, we may be unable to develop or commercialize the affected product candidates, which could materially harm our business and the third parties owning such intellectual property rights could seek either an injunction prohibiting our sales, or, with respect to our sales, an obligation on our part to pay royalties and/or other forms of compensation.

Licensing of intellectual property is of critical importance to our business and involves complex legal, business and scientific issues. Disputes may arise between us and our licensors regarding intellectual property subject to a license agreement, including:

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

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

We have entered into several licenses, both in-license agreements and out-license agreements, to support and leverage our various stem cell technology-related programs. We may enter into additional license(s) to third-party intellectual property that are necessary or useful to our business. Our current licenses and any future licenses that we may enter into impose various royalty payments, milestone, and other obligations on us. For example, the licensor may retain control over patent prosecution and maintenance under a license agreement, in which case, we may not be able to adequately influence patent prosecution or prevent inadvertent lapses of coverage due to failure to pay maintenance fees. If we fail to comply with any of our obligations under a current or future license agreement, our licensor(s) may allege that we have breached our license agreement and may accordingly seek to terminate our license with them. In addition, future licensor(s) may decide to terminate our license at will. Termination of any of our current or future licenses could result in our loss of the right to use the licensed intellectual property, which could materially adversely affect our ability to develop and commercialize a product candidate or product, if approved, as well as harm our competitive business position and our business prospects.

In addition, if our licensors fail to abide by the terms of the license, if the licensors fail to prevent infringement by third parties, if the licensed patents or other rights are found to be invalid or unenforceable, or if we are unable to enter into necessary licenses on acceptable terms our business could suffer.

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

Some of the intellectual property rights we have licensed or will license in the future may have been generated through the use of U.S. government funding and may therefore be subject to certain federal regulations. As a result, the U.S. government may have certain rights to intellectual property embodied in our current or future product candidates pursuant to the Bayh-Dole Act of 1980 (*Bayh-Dole Act*). These U.S. government rights in certain inventions developed under a government-funded program include a non-exclusive, non-transferable, irrevocable worldwide license to use inventions for any governmental purpose.

In addition, the U.S. government has the right to require us to grant exclusive, partially exclusive, or non-exclusive licenses to any of these inventions to a third party if it determines that: (i) adequate steps have not been taken to commercialize the invention; (ii) government action is necessary to meet public health or safety needs; or (iii) government action is necessary to meet requirements for public use under federal regulations (also referred to as "march-in rights"). The U.S. government also has the right to take title to these inventions if we fail, or the applicable licensor fails, to disclose the invention to the government and fail to file an application to register the intellectual property within specified time limits. Also, the U.S. government may acquire title to these inventions in any country in which a patent application is not filed within specified time limits.

Intellectual property generated under a government funded program is further subject to certain reporting requirements, compliance with which may require us, or the applicable licensor, to expend substantial resources. In addition, the U.S. government requires that any products embodying the subject invention or produced through the use of the subject invention be manufactured substantially in the U.S. The manufacturing preference requirement can be waived if the owner of the intellectual property can show that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the U.S. or that under the circumstances domestic manufacture is not commercially feasible. This preference for U.S. manufacturers may limit our ability to contract with non-U.S. product manufacturers for products covered by such intellectual property.

In the event we apply for additional U.S.government funding, and we discover compounds or drug candidates as a result of such funding, intellectual property rights to such discoveries may be subject to the applicable provisions of the Bayh-Dole Act.

***If we do not obtain additional protection under the Hatch-Waxman Amendments and similar foreign legislation by extending the patent terms and obtaining data exclusivity for our product candidates, our business may be materially harmed.***

In the U.S., depending upon the timing, duration and specifics of FDA marketing approval of our product candidates, one or more of the U.S.patents we own or license may be eligible for limited patent term restoration under the Drug Price Competition and Patent Term Restoration Act of 1984, referred to as the Hatch-Waxman Amendments. The Hatch-Waxman Amendments permit a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. However, we may not be granted an extension because of, for example, failing to apply within applicable deadlines, failing to apply prior to expiration of relevant patents or otherwise failing to satisfy applicable requirements. For example, we may not be granted an extension, for example, if the active ingredient of AV-101, PH94B or PH10 is used in another drug company's product candidate and that product candidate is the first to obtain FDA approval.

Moreover, the applicable time period or the scope of patent protection afforded could be less than we request. If we are unable to obtain patent term extension or restoration or the term of any such extension is less than we request, our competitors may obtain approval of competing products following our patent expiration, and our ability to generate revenues could be materially adversely affected.

Similar kinds of patent term and regulatory and data protection periods are available outside of the U.S. We will pursue such opportunities to extend the exclusivity of our products, but we cannot predict the availability of such exclusivity pathways or that we will be successful in pursuing them.

***Changes in U.S. patent law could diminish the value of patents in general, thereby impairing our ability to protect our products.***

As is the case with other pharmaceutical and biotechnology companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biotechnology industry involve both technological and legal complexity, and is therefore costly, time-consuming and inherently uncertain. In addition, the U.S.in recent years enacted and is currently implementing wide-ranging patent reform legislation: the Leahy-Smith America Invents Act, referred to as the America Invents Act. The America Invents Act includes a number of significant changes to U.S.patent law. These include provisions that affect the way patent applications will be prosecuted and may also affect patent litigation. It is not yet clear what, if any, impact the America Invents Act will have on the operation of our business. However, the America Invents Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of any patents that may issue from our patent applications, all of which could have a material adverse effect on our business and financial condition.

In addition, recent U.S.Supreme Court rulings have narrowed the scope of patent protection available in certain circumstances and weakened the rights of patent owners in certain situations. The full impact of these decisions is not yet known. For example, on March 20, 2012 in *Mayo Collaborative Services, DBA Mayo Medical Laboratories, et al. v. Prometheus Laboratories, Inc.*, the Court held that several claims drawn to measuring drug metabolite levels from patient samples and correlating them to drug doses were not patentable subject matter. The decision appears to impact diagnostics patents that merely apply a law of nature via a series of routine steps and it has created uncertainty around the ability to obtain patent protection for certain inventions. Additionally, on June 13, 2013 in *Association for Molecular Pathology v. Myriad Genetics, Inc.*, the Court held that claims to isolated genomic DNA are not patentable, but claims to complementary DNA molecules are patent eligible because they are not a natural product. The effect of the decision on patents for other isolated natural products is uncertain.

Additionally, on March 4, 2014, the USPTO issued a memorandum to patent examiners providing guidance for examining claims that recite laws of nature, natural phenomena or natural products under the Myriad and Prometheus decisions. This guidance did not limit the application of Myriad to DNA but, rather, applied the decision to other natural products. Further, in 2015, in *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, the Court of Appeals for the Federal Circuit held that methods for detecting fetal genetic defects were not patent eligible subject matter. Other more recent court decisions and related USPTO examination guidelines must be taken into account, particularly as they relate to changes in what types of inventions are eligible for patent protection. Foreign patent and intellectual property laws also are evolving and are not predictable as to their impact on the Company and other biopharmaceutical companies.

In addition to increasing uncertainty regarding our ability to obtain future patents, this combination of events has created uncertainty with respect to the value of patents, once obtained. Depending on these and other decisions by the U.S.Congress, the federal courts and the USPTO, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce any patents that may issue in the future.

***We may be subject to damages resulting from claims that we or our employees have wrongfully used or disclosed alleged trade secrets of their former employers.***

Certain of our current employees have been, and certain of our future employees may have been, previously employed at other biotechnology or pharmaceutical companies, including our competitors or potential competitors. We also engage advisors and consultants who are concurrently employed at universities or who perform services for other entities.

Although we are not aware of any claims currently pending or threatened against us, we may be subject to claims that we or our employees, advisors or consultants have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of a former employer or other third party. We have and may in the future also be subject to claims that an employee, advisor or consultant performed work for us that conflicts with that person’s obligations to a third party, such as an employer, and thus, that the third party has an ownership interest in the intellectual property arising out of work performed for us. Litigation may be necessary to defend against these claims. Even if we are successful in defending against these claims, litigation could result in substantial costs and be a distraction to management. If we fail in defending such claims, in addition to paying monetary claims, we may lose valuable intellectual property rights or personnel. A loss of key personnel or their work product could hamper or prevent our ability to commercialize our product candidates, which would materially adversely affect our commercial development efforts.

***Numerous factors may limit any potential competitive advantage provided by our intellectual property rights.***

The degree of future protection afforded by our intellectual property rights is uncertain because intellectual property rights have limitations, and may not adequately protect our business, provide a barrier to entry against our competitors or potential competitors, or permit us to maintain our competitive advantage. Moreover, if a third party has intellectual property rights that cover the practice of our technology, we may not be able to fully exercise or extract value from our intellectual property rights. The following examples are illustrative:

- others may be able to develop and/or practice technology that is similar to our technology or aspects of our technology but that is not covered by the claims of patents, should such patents issue from our patent applications;
- we might not have been the first to make the inventions covered by a pending patent application that we own;
- we might not have been the first to file patent applications covering an invention;
- others may independently develop similar or alternative technologies without infringing our intellectual property rights;
- pending patent applications that we own or license may not lead to issued patents;
- patents, if issued, that we own or license may not provide us with any competitive advantages, or may be held invalid or unenforceable or be narrowed, as a result of legal challenges by our competitors;
- third parties may compete with us in jurisdictions where we do not pursue and obtain patent protection;
- we may not be able to obtain and/or maintain necessary or useful licenses on reasonable terms or at all; and
- the patents of others may have an adverse effect on our business.

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

With regard to our stem cell technology, if, instead of identifying DR candidates based on information available to us in the public domain, we seek to in-license DR candidates from biotechnology, medicinal chemistry and pharmaceutical companies, academic, governmental and nonprofit research institutions, including the NIH, or other third parties, there can be no assurances that we will obtain material ownership or economic participation rights over intellectual property we may derive from such licenses or similar rights to the DR NCEs that we may produce and develop. If we are unable to obtain ownership or substantial economic participation rights over intellectual property related to DR NCEs we produce and develop, our DR business may be adversely affected.

**Risks Related to our Securities**

***If we fail to comply with the continued listing requirements of the Nasdaq Capital Market, our common stock may be delisted and the price of our common stock and our ability to access the capital markets could be negatively impacted.***

On June 17, 2019, we were notified by the Nasdaq Stock Market, LLC (*Nasdaq*) that we were not in compliance with the minimum bid price requirements set forth in Nasdaq Listing Rule 5550(a)(2) for continued listing on the Nasdaq Capital Market. Nasdaq Listing Rule 5550(a)(2) requires listed securities to maintain a minimum bid price of $1.00 per share, and Nasdaq Listing Rule 5810(c)(3)(A) provides that a failure to meet the minimum bid price requirement exists if the deficiency continues for a period of 30 consecutive business days. The notification provided that we had 180 calendar days, or until December 16, 2019, to regain compliance with Nasdaq Listing Rule 5550(a)(2). To regain compliance, the bid price of our common stock must have a closing bid price of at least $1.00 per share for a minimum of 10 consecutive business days. If we do not regain compliance by December 16, 2019, an additional 180 days may be granted to regain compliance, so long as we meet the Nasdaq Capital Market continued listing requirements (except for the bid price requirement) and notify Nasdaq in writing of our intention to cure the deficiency during the second compliance period. If we do not qualify for the second compliance period or fail to regain compliance during the second 180-day period, then Nasdaq will notify us of its determination to delist our common stock, at which point we will have an opportunity to appeal the delisting determination to a hearings panel.

No assurance can be given that we will meet applicable Nasdaq continued listing standards. Failure to meet applicable Nasdaq continued listing standards could result in a delisting of our common stock, which could materially reduce the liquidity of our common stock and result in a corresponding material reduction in the price of our common stock. In addition, delisting could harm our ability to raise capital through alternative financing sources on terms acceptable to us, or at all, and may result in the inability to advance our drug development programs, potential loss of confidence by investors and employees, and fewer business development opportunities.

***Market volatility may affect our stock price and the value of your investment.***

The market price for our common stock, similar to other biopharmaceutical companies, is likely to be highly volatile. The market price of our common stock may fluctuate significantly in response to a number of factors, most of which we cannot control, including, among others:

- plans for, progress of or results from nonclinical and clinical development activities related to our product candidates;
- the failure of the FDA or other regulatory authority to approve our product candidates;
- announcements of new products, technologies, commercial relationships, acquisitions or other events by us or our competitors;
- the success or failure of other CNS therapies;
- regulatory or legal developments in the U.S. and other countries;
- announcements regarding our intellectual property portfolio;
- failure of our product candidates, if approved, to achieve commercial success;
- fluctuations in stock market prices and trading volumes of similar companies;
- general market conditions and overall fluctuations in U.S. equity markets;
- variations in our quarterly operating results;
- changes in our financial guidance or securities analysts' estimates of our financial performance;
- changes in accounting principles;
- our ability to raise additional capital and the terms on which we can raise it;
- sales or purchases of large blocks of our common stock, including sales or purchases by our executive officers, directors and significant stockholders;
- establishment of short positions by holders or non-holders of our stock or warrants;
- additions or departures of key personnel;
- discussion of us or our stock price by the press and by online investor communities; and
- other risks and uncertainties described in these risk factors.

***Future sales and issuances of our common stock may cause our stock price to decline.***

Sales or issuances of a substantial number of shares of our common stock in the public market, or the perception that such sales or issuances are occurring or might occur, could significantly reduce the market price of our common stock and impair our ability to raise adequate capital through the sale of additional equity securities.

The stock market in general, and small biopharmaceutical companies like ours in particular, have frequently experienced significant volatility in the market prices for securities that often has been unrelated to the operating performance of the underlying companies. These broad market and industry fluctuations may adversely affect the market price of our common stock, regardless of our actual operating performance. In certain situations in which the market price of a stock has been volatile, holders of that stock have instituted securities class action litigation against the company that issued the stock. If any of our stockholders were to bring a lawsuit against us, the defense and disposition of the lawsuit could be costly and divert the time and attention of our management and harm our operating results. Additionally, if the trading volume of our common stock remains low and limited there will be an increased level of volatility and you may not be able to generate a return on your investment.

***A portion of our total outstanding shares are restricted from immediate resale but may be sold into the market in the near future. Future sales of shares by existing stockholders could cause our stock price to decline, 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. Historically, there has been a limited public market for shares of our common stock. Future sales and issuances of a substantial number of shares of our common stock in the public market, including shares issued upon the conversion of our Series A Preferred, Series B Preferred or Series C Preferred, and the exercise of outstanding options and warrants for common stock which are issuable upon exercise, in the public market, or the perception that these sales and issuances are occurring or might occur, could significantly reduce the market price for our common stock and impair our ability to raise adequate capital through the sale of equity securities.

***A limited number of institutional stockholders could limit your ability to influence the outcome of key transactions, including changes in control.***

A limited number of institutional stockholders own a substantial portion of our outstanding preferred stock, consisting of shares of our Series A Preferred, Series B Preferred, and Series C Preferred, all of which is convertible, at the option of the holders (but subject to certain beneficial ownership restrictions), into a substantial number of shares of our common stock. Accordingly, should a few of these institutional holders convert their shares of preferred stock into common stock, such stockholders may exert influence over us and over the outcome of any corporate actions requiring approval of holders of our common stock, including the election of directors and amendments to our organizational documents, such as increases in our authorized shares of common stock, any merger, consolidation or sale of all or substantially all of our assets or any other significant corporate transactions. These stockholders may also delay or prevent a change of control of the Company, even if such a change of control is approved by our Board and would benefit our other stockholders. Furthermore, the interests of such institutional stockholders may not always coincide with your interests or the interests of other common stockholders and an institutional holder may act in a manner that advances its best interests and not necessarily those of other stockholders.

***If equity research analysts do not publish research or reports about our business or if they issue unfavorable commentary or downgrade our common stock, the price of our common stock could decline.***

The trading market for our common stock relies in part on the research and reports that equity research analysts publish about us and our business. We do not control these analysts. The price of our common stock could decline if one or more equity research analysts downgrade our common stock or if such analysts issue other unfavorable commentary or cease publishing reports about us or our business.

***There may be additional issuances of shares of preferred stock in the future.***

Our Restated Articles of Incorporation, as amended (the *Articles*), permit us to issue up to 10.0 million shares of preferred stock. Our Board has authorized the issuance of (i) 500,000 shares of Series A Preferred, all of which shares are issued and outstanding at March 31, 2019; (ii) 4.0 million shares of Series B 10% Convertible Preferred stock, of which approximately 1.2 million shares remain issued and outstanding at March 31, 2019; and (iii) 3.0 million shares of Series C Convertible Preferred Stock, of which approximately 2.3 million shares are issued and outstanding at March 31, 2019. Our Board could authorize the issuance of additional series of preferred stock in the future and such preferred stock could grant holders preferred rights to our assets upon liquidation, the right to receive dividends before dividends would be declared to holders of our common stock, and the right to the redemption of such shares, possibly together with a premium, prior to the redemption of the common stock. In the event and to the extent that we do issue additional preferred stock in the future, the rights of holders of our common stock could be impaired thereby, including without limitation, with respect to liquidation.

***We do not intend to pay dividends on our common stock and, consequently, our stockholders' ability to achieve a return on their investment will depend on appreciation in the price of our common stock.***

We have never declared or paid any cash dividend on our common stock and do not currently intend to do so in the foreseeable future. We currently anticipate that we will retain future earnings for the development, operation and expansion of our business and do not anticipate declaring or paying any cash dividends in the foreseeable future. Therefore, the success of an investment in shares of our common stock will depend upon any future appreciation in their value. There is no guarantee that shares of our common stock will appreciate in value or even maintain the price at which our stockholders purchased them.

***We incur significant costs to ensure compliance with corporate governance, federal securities law and accounting requirements.***

We are subject to the reporting requirements of the Securities Exchange Act of 1934, as amended (*Exchange Act*), which requires that we file annual, quarterly and current reports with respect to our business and financial condition, and the rules and regulations implemented by the SEC, the Sarbanes-Oxley Act of 2002, the Dodd-Frank Act, and the Public Company Accounting Oversight Board, each of which imposes additional reporting and other obligations on public companies. We have incurred and will continue to incur significant costs to comply with these public company reporting requirements, including accounting and related audit costs, legal costs to comply with corporate governance requirements and other costs of operating as a public company. These legal and financial compliance costs will continue to require us to divert a significant amount of resources that we could otherwise use to achieve our research and development and other strategic objectives.

The filing and internal control reporting requirements imposed by federal securities laws, rules and regulations on companies that are not "smaller reporting companies" under federal securities laws are rigorous and, once we are no longer a smaller reporting company, we may not be able to meet them, resulting in a possible decline in the price of our common stock and our inability to obtain future financing. Certain of these requirements may require us to carry out activities we have not done previously and complying with such requirements may divert management's attention from other business concerns, which could have a material adverse effect on our business, results of operations, financial condition and cash flows. Any failure to adequately comply with applicable federal securities laws, rules or regulations could subject us to fines or regulatory actions, which may materially adversely affect our business, results of operations and financial condition.

In addition, changing laws, regulations and standards relating to corporate governance and public disclosure are creating uncertainty for public companies, increasing legal and financial compliance costs and making some activities more time consuming. These laws, regulations and standards are 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. We will continue to invest resources to comply with evolving laws, regulations and standards, however this investment may result in increased general and administrative expenses and a diversion of management's time and attention from revenue-generating activities to compliance activities. If our efforts to comply with new laws, regulations and standards differ from the activities intended by regulatory or governing bodies due to ambiguities related to their application and practice, regulatory authorities may initiate legal proceedings against us and our business may be adversely affected.

**Item 1B. Unresolved Staff Comments**

The disclosures in this section are not required since we qualify as a smaller reporting company.

**Item 2. Properties**

Our corporate headquarters and laboratories are located at 343 Allerton Avenue, South San Francisco, California 94080, where we occupy approximately 10,900 square feet of office and lab space under a lease expiring on July 31, 2022. We believe that our facilities are suitable and adequate for our current and foreseeable needs.

**Item 3. Legal Proceedings**

None.

**Item 4. Mine Safety Disclosures**

Not applicable.

## PART II

### Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

**Market Information**

Our common stock was approved for listing and has traded since May 11, 2016 on The Nasdaq Capital Market under the symbol "VTGN". From June 21, 2011 through May 10, 2016, our common stock traded on the OTC Marketplace, under the symbol "VSTA". There was no established trading market for our common stock prior to June 21, 2011.

Shown below is the range of high and low sales prices for our common stock for the periods indicated as reported by the Nasdaq Capital Market. The market quotations reflect inter-dealer prices, without retail mark-up, mark-down or commissions and may not necessarily represent actual transactions.

| | High | Low |
|---|---|---|
| **Year Ending March 31, 2019** | | |
| First quarter ending June 30, 2018 | $ 1.76 | $ 0.81 |
| Second quarter ended September 30, 2018 | $ 1.53 | $ 1.20 |
| Third quarter ended December 31, 2018 | $ 2.44 | $ 1.26 |
| Fourth quarter ended March 31, 2019 | $ 1.86 | $ 1.05 |
| | | |
| **Year Ending March 31, 2018** | | |
| First quarter ending June 30, 2017 | $ 2.40 | $ 1.72 |
| Second quarter ended September 30, 2017 | $ 2.05 | $ 1.53 |
| Third quarter ended December 31, 2017 | $ 2.65 | $ 0.69 |
| Fourth quarter ended March 31, 2018 | $ 1.79 | $ 0.86 |

On June 24, 2019 the closing price of our common stock on the Nasdaq Capital Market was $0.7544 per share.

As of June 24, 2019, we had 42,622,965 shares of common stock outstanding and approximately 6,000 stockholders of record. On the same date, two stockholders held all 500,000 outstanding restricted shares of our Series A Preferred Stock, which shares are convertible into 750,000 shares of common stock; two stockholders held 1,160,240 outstanding shares of our Series B 10% Convertible Preferred Stock, which shares are convertible into 1,160,240 shares of common stock; and one stockholder held all 2,318,012 outstanding shares of our Series C Preferred stock, which shares are convertible into 2,318,012 shares of common stock.

**Dividend Policy**

We have never paid or declared any cash dividends on our common stock, and we do not anticipate paying any cash dividends on our common stock in the foreseeable future. Our Series B Preferred accrues dividends at a rate of 10% per annum, which dividends are payable solely in unregistered shares of our common stock at the time the Series B Preferred is converted into common stock.

**Recent Sales of Unregistered Securities**

None.

### Item 6. Selected Financial Data

The disclosures in this section are not required because we qualify as a smaller reporting company under federal securities laws.

## Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

### Cautionary Note Regarding Forward-Looking Statements

*This Annual Report on Form 10-K (Annual Report) includes forward-looking statements. All statements contained in this Annual Report other than statements of historical fact, including statements regarding our future results of operations and financial position, our business strategy and plans, and our objectives for future operations, are forward- looking statements. The words "believe," "may," "estimate," "continue," "anticipate," "intend," "expect" and similar expressions are intended to identify forward-looking statements. We have based these forward- looking statements largely on our current expectations and projections about future events and trends that we believe may affect our financial condition, results of operations, business strategy, short-term and long-term business operations and objectives, and financial needs. These forward-looking statements are subject to a number of risks, uncertainties and assumptions. Our business is subject to significant risks including, but not limited to, our ability to obtain additional financing, the results of our research and development efforts, the results of non-clinical and clinical testing, the effect of regulation by the United States Food and Drug Administration (FDA) and other agencies, the impact of competitive products, product development, commercialization and technological difficulties, the effect of our accounting policies, and other risks as detailed in the section entitled "Risk Factors" in this Annual Report. Further, even if our product candidates appear promising at various stages of development, our share price may decrease such that we are unable to raise additional capital without significant dilution or other terms that may be unacceptable to our management, Board of Directors and stockholders.*

*Moreover, we operate in a very competitive and rapidly changing environment. New risks emerge from time to time. It is not possible for our management or Board to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. In light of these risks, uncertainties and assumptions, the future events and trends discussed in this Annual Report may not occur and actual results could differ materially and adversely from those anticipated or implied in the forward-looking statements.*

*You should not rely upon forward-looking statements as predictions of future events. The events and circumstances reflected in the forward-looking statements may not be achieved or occur. Although we believe that the expectations reflected in the forward-looking statements are reasonable, we cannot guarantee future results, levels of activity, performance or achievements. We are under no duty to update any of these forward-looking statements after the date of this Annual Report or to conform these statements to actual results or revised expectations. If we do update one or more forward-looking statements, no inference should be drawn that we will make additional updates with respect to those or other forward-looking statements.*

### Business Overview

We are a clinical-stage biopharmaceutical company committed to developing and commercializing new generation medicines to treat diseases and disorders of the central nervous system (*CNS*) with high unmet need. Our portfolio of three clinical-stage product candidates is currently focused predominantly on major depressive disorder (*MDD*) and social anxiety disorder (*SAD*).

MDD is a serious neurobiologically-based mood disorder, affecting approximately 16 million adults in the United States, according to the U.S. National Institutes of Health (*NIH*). Individuals diagnosed with MDD exhibit depressive symptoms, such as a depressed mood or a loss of interest or pleasure in daily activities, for more than a two-week period, as well as impaired social, occupational, educational or other important functioning which has a negative impact on their quality of life. Globally, MDD affects nearly 300 million people of all ages and is the leading cause of disability worldwide.

SAD affects as many as 15 million Americans and is the third most common psychiatric condition after depression and substance abuse. SAD is characterized by a persistent and unreasonable fear of one or more social or performance situations, where the individual fears that he or she will act in a way or show symptoms that will be embarrassing or humiliating, leading to avoidance of the situations when possible and anxiety or distress when they occur. These fears have a significant impact on the person's employment, social activities and overall quality of life. Only three drugs, all antidepressants, are approved by the U.S Food and Drug Administration (*FDA*) for treatment of SAD. However, for treatment of both MDD and SAD, current oral antidepressants (*ADs*) have slow onset of effect (often several weeks to months) and significant side effects that may make them inadequate treatment alternatives for many individuals affected by MDD and SAD.

Our most advanced product candidate, PH94B neuroactive nasal spray, is fundamentally different from all current treatments for SAD. Developed from proprietary compounds called pherines and administered as a nasal spray, PH94B activates nasal chemosensory receptors that trigger neural circuits in the brain that suppress fear and anxiety. In a published double-blind, placebo-controlled Phase 2 clinical trial, PH94B neuroactive nasal spray was significantly more effective than placebo in reducing public-speaking and social interaction anxiety on laboratory challenges of individuals with SAD. Its novel mechanism of pharmacological action, rapid-onset of therapeutic effects and exceptional safety and tolerability profile in clinical trials to date make PH94B neuroactive nasal spray an excellent product candidate with potential to become the first FDA-approved on-demand, as-needed, or PRN, treatment for SAD.

AV-101 (4-Cl-KYN), one of our two product candidates for MDD, belongs to a new generation of investigational medicines in neuropsychiatry and neurology known as NMDA (N-methyl-D-aspartate) glutamate receptor modulators. The NMDA receptor is a pivotal receptor in the brain and abnormal NMDA function is associated with multiple CNS diseases and disorders, including MDD, chronic neuropathic pain, epilepsy, Parkinson's disease levodopa-induced dyskinesia and many others. AV-101 is an oral prodrug of 7-Cl-KYNA which binds uniquely at the glycine site of the NMDA receptor and has potential to be a new at-home treatment for MDD. AV-101 is currently in Phase 2 development in the U.S. for MDD. ELEVATE is our Phase 2 multicenter, multi-dose, double blind, placebo-controlled clinical study to evaluate the efficacy and safety of AV-101 as an add-on treatment for MDD in adult patients with an inadequate therapeutic response to current FDA-approved ADs (the *ELEVATE Study*). Dr. Maurizio Fava, Professor of Psychiatry at Harvard Medical School and Director, Division of Clinical Research, Massachusetts General Hospital (*MGH*) Research Institute, is the Principal Investigator of the ELEVATE Study assisting our internal team, which is led by Mark Smith, MD, PhD, our Chief Medical Officer. Dr. Fava was the co-Principal Investigator with Dr. A. John Rush of the STAR*D study, the largest clinical trial conducted in depression to date, whose findings were published in journals such as the *New England Journal of Medicine* (*NEJM*) and the *Journal of the American Medical Association* (*JAMA*). We currently anticipate top line results from the ELEVATE Study in the second half of 2019. The FDA has granted Fast Track designation for development of AV-101 as a potential add-on treatment of MDD.

Our other product candidate for MDD in Phase 2 development for MDD is PH10 neuroactive nasal spray. PH10 is a potential first-in-class, CNS neurosteroid nasal spray administered in microgram doses for MDD. PH10 nasal spray activates nasal chemosensory receptors that, in turn, engage GABA (gamma-aminobutyric acid) and CRH (corticotropin-releasing hormone) neurons in the limbic amygdala system. The activation of these neural circuits is believed to have the potential to lead to rapid antidepressant effects without psychological side effects, systemic exposure or safety concerns often associated with current antidepressants. Based on positive results of a small exploratory Phase 2a study in MDD in which rapid-onset antidepressant effects were observed without psychological side effects or systemic exposure, we are preparing for planned Phase 2b clinical development of PH10 as a first-line treatment for MDD.

Additional potential indications for PH94B include post-tramautic stress disorder (PTSD) and general anxiety disorder (*GAD*) and others neuropsychiatric indications. Additional potential indications for AV-101 include as a non-addictive, non-sedating treatment of chronic neuropathic pain (*CNP*), epilepsy, and to reduce dyskinesia induced by levodopa therapy for Parkinson’s disease (*PD LID*).

In addition to our CNS business, we have two pipeline-enabling programs through our wholly-owned subsidiary, VistaStem Therapeutics (*VistaStem*). VistaStem is focused on applying pluripotent stem cell (*hPSC*) technology to discover, rescue, develop and commercialize proprietary new chemical entities (*NCEs*) for CNS and other diseases and regenerative medicine (*RM*) involving hPSC-derived blood, cartilage, heart and liver cells. Our internal drug rescue programs are designed to utilize *CardioSafe 3D*, our customized cardiac bioassay system, to discover and develop small molecule NCEs for our CNS pipeline or for out-licensing. To advance potential RM applications of our cardiac stem cell technology, we have sublicensed to BlueRock Therapeutics LP, a next generation cell therapy and RM company established by Bayer AG and Versant Ventures (*BlueRock Therapeutics*), rights to certain proprietary technologies relating to the production of cardiac stem cells for the treatment of heart disease (the *BlueRock Agreement*). In a manner similar to the BlueRock Agreement, we may pursue additional collaborations or licensing transactions involving blood, cartilage, and/or liver cells derived from hPSCs for cell-based therapy, cell repair therapy, RM and/or tissue engineering.

**Critical Accounting Policies and Estimates**

We consider certain accounting policies related to revenue recognition, impairment of long-lived assets, research and development, stock-based compensation, warrant liability and income taxes to be critical accounting policies that require the use of significant judgments and estimates relating to matters that are inherently uncertain and may result in materially different results under different assumptions and conditions. The preparation of financial statements in conformity with United States generally accepted accounting principles (*GAAP*) requires us to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes to the consolidated financial statements. These estimates include useful lives for property and equipment and related depreciation calculations, and assumptions for valuing options, warrants and other stock-based compensation. Our actual results could differ from these estimates.

*Revenue Recognition*

We have historically generated revenue principally from collaborative research and development arrangements, licensing and technology access fees and government grants. We adopted Accounting Standards Update (*ASU*) No. 2014-09, *Revenue from Contracts with Customers (Topic 606)* and its related amendments, collectively referred to as ASC (*Accounting Standards Codification*) Topic 606, as of April 1, 2018, using the modified retrospective transition method. At adoption and currently, we have only the BlueRock Agreement as a potential revenue generating arrangement. Upon adoption of ASC Topic 606, there was no change to the units of accounting previously identified with respect to the BlueRock Agreement under legacy GAAP, which are now considered performance obligations under ASC Topic 606, and there was no change to the revenue recognition pattern for the performance obligation. Accordingly, there was no cumulative effect change to our opening accumulated deficit balance upon the adoption of ASC Topic 606. We did not recognize any revenue in our fiscal years ended March 31, 2019 or 2018.

Under ASC Topic 606, we recognize revenue when our customer obtains control of promised goods or services, in an amount that reflects the consideration that we expect to receive in exchange for those goods or services. To determine revenue recognition for arrangements that we determine are within the scope of Topic 606, we perform the following five steps: (i) identify the contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price, including variable consideration, if any; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) we satisfy a performance obligation. We only apply the five-step model to contracts when it is probable that we will collect the consideration to which we are entitled in exchange for the goods or services we transfer to a customer.

Once a contract is determined to be within the scope of Topic 606, we assesses the goods or services promised within each contract and determine those that are performance obligations. Arrangements that include rights to additional goods or services that are exercisable at a customer's discretion are generally considered options. We assess whether these options provide a material right to the customer and if so, they are considered performance obligations. The exercise of a material right may be accounted for as a contract modification or as a continuation of the contract for accounting purposes.

We assess whether each promised good or service is distinct for the purpose of identifying the performance obligations in the contract. This assessment involves subjective determinations and requires judgments about the individual promised goods or services and whether such are separable from the other aspects of the contractual relationship. Promised goods and services are considered distinct provided that: (i) the customer can benefit from the good or service either on its own or together with other resources that are readily available to the customer (that is, the good or service is capable of being distinct) and (ii) our promise to transfer the good or service to the customer is separately identifiable from other promises in the contract (that is, the promise to transfer the good or service is distinct within the context of the contract). In assessing whether a promised good or service is distinct in the evaluation of a collaboration arrangement subject to Topic 606, we consider factors such as the research, manufacturing and commercialization capabilities of the collaboration partner and the availability of the associated expertise in the general marketplace. We also consider the intended benefit of the contract in assessing whether a promised good or service is separately identifiable from other promises in the contract. If a promised good or service is not distinct, we are required to combine that good or service with other promised goods or services until we identifies a bundle of goods or services that is distinct.

The transaction price is then determined and allocated to the identified performance obligations in proportion to their standalone selling prices (*SSP*) on a relative SSP basis. SSP is determined at contract inception and is not updated to reflect changes between contract inception and satisfaction of the performance obligations. Determining the SSP for performance obligations requires significant judgment. In developing the SSP for a performance obligation, we consider applicable market conditions and relevant Company-specific factors, including factors that were contemplated in negotiating the agreement with the customer and estimated costs. In certain circumstances, we may apply the residual method to determine the SSP of a good or service if the standalone selling price is considered highly variable or uncertain. We validate the SSP for performance obligations by evaluating whether changes in the key assumptions used to determine the SSP will have a significant effect on the allocation of arrangement consideration between multiple performance obligations.

If the consideration promised in a contract includes a variable amount, we estimate the amount of consideration to which we will be entitled in exchange for transferring the promised goods or services to a customer. We determine the amount of variable consideration by using the expected value method or the most likely amount method. We include the unconstrained amount of estimated variable consideration in the transaction price. The amount included in the transaction price is constrained to the amount for which it is probable that a significant reversal of cumulative revenue recognized will not occur. At the end of each subsequent reporting period, we re-evaluate the estimated variable consideration included in the transaction price and any related constraint, and if necessary, adjust our estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis in the period of adjustment.

If an arrangement includes development and regulatory milestone payments, we evaluate whether the milestones are considered probable of being reached and estimate the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within our control or the licensee's control, such as regulatory approvals, are generally not considered probable of being achieved until those approvals are received.

In determining the transaction price, we adjust consideration for the effects of the time value of money if the timing of payments provides us with a significant benefit of financing. We do not assess whether a contract has a significant financing component if the expectation at contract inception is such that the period between payment by the licensee and the transfer of the promised goods or services to the licensee will be one year or less. For arrangements with licenses of intellectual property that include sales-based royalties, including milestone payments based on the level of sales, and the license is deemed to be the predominant item to which the royalties relate, we recognize royalty revenue and sales-based milestones at the later of (i) when the related sales occur, or (ii) when the performance obligation to which the royalty has been allocated has been satisfied.

We then recognize as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) each performance obligation is satisfied at a point in time or over time, and if over time, based on the use of an output or input method.

*Impairment of Long-Lived Assets*

In accordance with ASC 360-10, *Property, Plant & Equipment—Overall*, we review long-lived assets for impairment whenever events or changes in circumstances indicate that the carrying amount of property and equipment may not be recoverable. Determination of recoverability is based on an estimate of undiscounted future cash flows resulting from the use of the asset and its eventual disposition. In the event that such cash flows are not expected to be sufficient to recover the carrying amount of the assets, we write down the assets to their estimated fair values and recognize the loss in the Consolidated Statements of Operations and Comprehensive Loss.

*Research and Development Expenses*

Research and development expenses are composed of both internal and external costs. Internal costs include salaries and employment-related expenses, including stock-based compensation expense, of scientific personnel and direct project costs. External research and development expenses consist primarily of costs associated with clinical and non-clinical development of AV-101, PH94B and PH10, stem cell research and development costs, and costs related to the application and prosecution of patents related to AV-101, PH94B, PH10 and our stem cell technology platform. All such costs are charged to expense as incurred.

We also record accruals for estimated ongoing clinical trial costs. Clinical trial costs represent costs incurred by contract research organizations (*CRO*s) and clinical trial sites. Progress payments are generally made to CROs, clinical sites, investigators and other professional service providers. We analyze the progress of the clinical trial, including levels of subject enrollment, invoices received and contracted costs when evaluating the adequacy of accrued liabilities. Significant judgments and estimates must be made in determining the clinical trial accrual in any reporting period. Actual results could differ from those estimates under different assumptions. Revisions are charged to research and development expense in the period in which the facts that give rise to the revision become known.

Costs incurred in obtaining product or technology licenses are charged immediately to research and development expense if the product or technology licensed has not achieved regulatory approval or reached technical feasibility and has no alternative future uses. In September 2018, we acquired an exclusive license to develop and commercialize PH94B and an option to acquire a license to develop and commercialize PH10 by issuing an aggregate of 1,630,435 unregistered shares of our common stock having a fair market value of $2,250,000. In October 2018, we exercised our option to acquire an exclusive license to develop and commercialize PH10 by issuing 925,926 shares of our unregistered common stock having a fair market value of $2,000,000. Since, at the date of each acquisition, neither product candidate had achieved regulatory approval and each will require significant additional development and expense, we recorded the costs related to acquiring the licenses and the option as research and development expense.

*Stock-Based Compensation*

We recognize non-cash compensation expense for all stock-based awards to employees based on the grant date fair value of the award. We record this expense over the period during which the employee is required to perform services in exchange for the award, which generally represents the scheduled vesting period. We have granted no restricted stock awards, nor do we have any awards with market or performance conditions. For option grants to non-employees, we have historically re-measured the fair value of the awards as they vest and any resulting increase in value has been recognized as an expense during the period over which the services are performed. Noncash expense attributable to compensatory grants of stock to non-employees is determined by the quoted market price of the stock on the date of grant and is either recognized as fully-earned at the time of the grant or expensed ratably over the term of the related service agreement, depending on the terms of the specific agreement.

We use the Black-Scholes option pricing model to estimate the fair value of stock-based awards as of the grant date. The Black-Scholes model is complex and dependent upon key data input estimates. The primary data inputs with the greatest degree of judgment are the expected term of the stock options and the estimated volatility of our stock price. The Black-Scholes model is highly sensitive to changes in these two inputs. The expected term of the options represents the period of time that options granted are expected to be outstanding. We use the simplified method in accordance with guidance provided by the Securities and Exchange Commission (*SEC*) to estimate the expected term as an input into the Black-Scholes option pricing model. We determine expected volatility using the historical method, which, because of the limited period during which our stock has been publicly traded and its historically limited trading volume, is based on the historical daily trading data of the common stock of a peer group of public companies over the expected term of the option.

*Warrants Issued in Connection with Equity Financing*

We generally account for warrants issued in connection with equity financings as a component of equity, unless there is a deemed possibility that we may have to settle the warrants in cash or the warrants contain other features requiring them to be treated as liabilities. For warrants issued with the possibility of cash settlement or otherwise requiring liability treatment, we record the fair value of the issued warrants as a liability at each reporting period and record changes in the estimated fair value as noncash gain or loss in the Consolidated Statements of Operations and Comprehensive Loss.

*Income Taxes*

We account for income taxes using the asset and liability approach for financial reporting purposes. We recognize deferred tax assets and liabilities for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date. Valuation allowances are established, when necessary, to reduce the deferred tax assets to an amount expected to be realized.

*Recent Accounting Pronouncements*

See Note 3 to the Consolidated Financial Statements included in Item 8 in this Annual Report on Form 10-K for information on recent accounting pronouncements.

**Financial Operations Overview and Results of Operations**

*Net Loss*

We have not yet achieved recurring revenue-generating status from any of our product candidates or technologies. Since inception, we have devoted substantially all of our time and efforts to developing our initial CNS product candidate, AV-101, from early nonclinical studies to our ongoing Phase 2 clinical development program in MDD. In addition, we have devoted resourced to stem cell technology research and development, bioassay development and small molecule drug development, as well as creating, protecting and patenting intellectual property (*IP*) related to our product candidates and technologies, with the corollary initiatives of recruiting and retaining personnel and raising working capital. As discussed in greater detail in Part I, Item 1. Business in the Annual Report, during our fiscal year ended March 31, 2019 (*Fiscal 2019*), we acquired the rights to develop and commercialize PH94B and PH10. As of March 31, 2019, we had an accumulated deficit of approximately $181.1 million. Our net loss for Fiscal 2019 and the fiscal year ended March 31, 2018 (*Fiscal 2018*) was approximately $24.6 million and $14.3 million, respectively. We expect losses to continue for the foreseeable future, primarily as we complete our ELEVATE Study later in 2019, pursue further clinical development of AV-101 for the adjunctive treatment of MDD and for a range of other CNS indications, and further develop PH94B and PH10.

*Summary of Our Fiscal Year Ended March 31, 2019*

During Fiscal 2019, we continued to (i) advance both nonclinical development, including manufacturing, and clinical development of AV-101 as a potential new generation antidepressant and as a potential new therapeutic alternative for several CNS indications with significant unmet need, (ii) expand the regulatory and intellectual property foundation to support broad clinical development and, ultimately, commercialization of AV-101 in the U.S. and foreign markets, (iii) expand our neuropsychiatry pipeline by acquiring exclusive worldwide licenses to PH94B and PH10, and (iv) on a limited basis, advance drug rescue applications of our stem cell technology to further expand our CNS pipeline. Each of these initiatives is futher described below.

With respect to development of AV-101 during Fiscal 2019, we continued to conduct our ELEVATE Study throughout the fiscal year, in addition to producing supplies of AV-101 and conducting certain Phase 3-enabling nonclinical studies involving AV-101.

In addition, pursuant to our MT CRADA with the VA and our arrangements with Baylor, Baylor commenced the Baylor Study to define a dose-response relationship between AV-101 and relevant biomarkers related to NMDA function and others possibly related to suicidal ideation in U.S. Military Veterans.

During Fiscal 2019, we expanded our portfolio of product candidates by acquiring licenses from Pherin giving us the exclusive worldwide rights to develop and commercialize PH94B, a rapid-onset neuroactive nasal spray with potential to be the first FDA-approved on-demand treatment for SAD, and PH10, a rapid-onset neuroactive nasal spray for treatment of MDD. We completed the acquisitions of PH94B and PH10 on a noncash basis through the issuance of an aggregate of 2,556,361 shares of our common stock. We are actively pursuing nonclinical and regulatory initiatives necessary to facilitate pivotal Phase 3 clinical development of PH94B for SAD and Phase 2b clinical development of PH10 for MDD.

We continue to pursue initiatives to secure a broad portfolio of patent protection for AV-101 that covers the treatment of multiple CNS indications, unit dose formulations of AV-101 effective to treat depression and chemical synthesis methods. With respect to CNS treatments, during Fiscal 2019 we obtained patents in several countries for the treatment of depression and we are pursuing patent applications related to treatment of LID, certain types of NP, tinnitus and obsessive-compulsive disorder. Additional patent applications to other aspects of prognostic testing and treatment using AV-101 are under consideration.

During Fiscal 2018 and Fiscal 2019, we have pursued patent applications in the U.S., Australia, China, Europe, Japan and other selected countries and regions with significant commercial potential. Several of these patent applications were allowed or have been granted in the U.S. and other major pharmaceutical markets during Fiscal 2019. Based on patent issuances or allowances to-date in several countries, we believe that pending counterpart patent applications related to AV-101 currently under review in other countries also are likely to be granted, although there can be no assurance that all pending applications will ultimately be granted.

As noted above, we have an exclusive license from Pherin to its portfolio of patent assets around PH94B. Patents have issued in several countries, including the U.S., Australia, Canada, China, Europe, Japan, Korea and Mexico. We also have an exclusive license from Pherin to its portfolio of patent assets around PH10. Patents in this portfolio have issued in Australia, China, Europe and Japan. Applications are pending in the U.S., Canada, Korea and Mexico.

As with AV-101, we plan to seek regulatory exclusivity in countries where this is available for the therapeutic use of PH94B, with initial emphasis on treating SAD as our lead indication in clinical development, and for the therapeutic use of PH10, with our lead indication being the treatment of MDD.

We have obtained and are pursuing patent rights to the production of several types of stem cells and cells differentiated from those stem cells, including cardiomyocytes, hematopoietic cells, chondrocytes, cartilage cells and hepatocytes, as well as the use of certain cell types that have been differentiated from pluripotent stem cells for therapeutic purposes, including cell-based therapy and regenerative medicine.

With respect to financing activities in Fiscal 2019, between June 2018 and October 2018, we completed a self-placed private placement with accredited investors pursuant to which we sold units, at a purchase price of $1.25 per unit, consisting of 4,605,000 unregistered shares of our common stock and warrants, exercisable through February 28, 2022, to purchase 4,605,000 unregistered shares of our common stock at an exercise price of $1.50 per share (the *Summer 2018 Private Placement*). We received aggregate cash proceeds of $5,756,200 from the Summer 2018 Private Placement. The Summer 2018 Private Placement was oversubscribed.

To accommodate additional investor interest, during October 2018, we accepted subscription agreements from accredited investors, pursuant to which we sold to such investors units, at a unit purchase price equal to $0.15 above the closing quoted market price of our common stock on the Nasdaq Capital Market on the effective date of the investor's subscription agreement, consisting of an aggregate of 420,939 unregistered shares of our common stock and four-year, immediately exercisable warrants to purchase 420,939 unregistered shares of our common stock at a per share exercise price equal to the closing quoted market price of our common stock on the Nasdaq Capital Market on the effective date of the investor's subscription agreement (the *Fall 2018 Private Placement*). We received aggregate cash proceeds of $812,500 in connection with the Fall 2018 Private Placement and settled an outstanding professional service payable by accepting a subscription agreement in the amount of $40,000 and issuing the corresponding number of shares and warrants.

In February and March 2019, we completed an underwritten public offering of 11,500,000 shares of our common stock, including full exercise of the underwriter's overallotment option, at a public offering price of $1.00 per share, resulting in gross proceeds of $11,500,000, pursuant to our shelf registration statement on Form S-3 (File No. 333-215671), previously filed with the SEC (the *Spring 2019 Public Offering*). We received net proceeds of approximately $10.4 million after deducting underwriting discounts and commissions and offering expenses.

During Fiscal 2019, we also received cash proceeds of $605,700 from the exercise of outstanding warrants to purchase an aggregate of 403,800 shares our common stock.

As a matter of course, we continue to minimize, to the greatest extent possible, cash commitments and expenditures for both internal and external research and development and general and administrative services. To further advance the clinical and nonclinical development of AV-101, PH94B, PH10 and our stem cell technology platform, as well as support our operating activities, we continue to carefully manage our routine operating costs, including our internal employee related expenses, as well as external costs relating to regulatory consulting, contract research and development, investor relations and corporate development, legal, acquisition and protection of intellectual property, public company compliance and other professional services and internal costs.

***Comparison of Fiscal Years Ended March 31, 2019 and 2018***

The following table summarizes the results of our operations (including cash and noncash items) for the fiscal years ended March 31, 2019 and 2018 (amounts in thousands).

| | Fiscal Year Ended March 31, | |
|---|---|---|
| | **2019** | **2018** |
| Operating expenses: | | |
| Research and development | $ 17,098 | $ 7,763 |
| General and administrative | 7,458 | 6,437 |
| Total operating expenses | 24,556 | 14,200 |
| Loss from operations | (24,556) | (14,200) |
| Interest expense (net) | (8) | (9) |
| Loss on extinguishment of accounts payable | (23) | (135) |
| Loss before income taxes | (24,587) | (14,344) |
| Income taxes | (2) | (2) |
| Net loss | (24,589) | (14,346) |
| Accrued dividend on Series B Preferred Stock | (1,140) | (1,030) |
| Deemed dividend from trigger of down round provision feature | - | (199) |
| Net loss attributable to common stockholders | $ (25,729) | $ (15,575) |

*Revenue*

We reported no revenue for either Fiscal 2019 or Fiscal 2018 and we presently have no recurring revenue generating arrangements, including arrangements with respect to AV-101, PH94B, PH10 or other potential product candidates. While we may potentially receive additional payments and royalties in the future under our December 2016 BlueRock Agreement in the event certain performance-based milestones and commercial sales are achieved, there can be no assurance that the BlueRock Agreement will provide additional revenue to us in the near term or at all.

*Research and Development Expense*

Research and development expense increased to approximately $17.1 million in Fiscal 2019 (including approximately $5.6 million of non-cash expense) compared to approximately $7.8 million in Fiscal 2018. This increase is primarily attributable to (i) the noncash acquisition of the PH94B license and the PH10 option and license through the issuance of unregistered shares of our common stock, which resulted in an aggregate of $4.25 million of expense, (ii) expenses related to conducting the ELEVATE Study throughout Fiscal 2019 and (iii) various nonclinical research and development, as well as manufacture of additional quantities of AV-101. Other noncash expenses included in research and development expense, including stock compensation, lab equipment depreciation and a portion of rent expense in both years and a portion of AV-101 project expenses in Fiscal 2019, aggregated approximately $1,382,000 and $1,595,000 for Fiscal 2019 and Fiscal 2018, respectively.

The following table indicates the primary components of research and development expense for each of the periods (amounts in thousands):

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | 2019 | 2018 |
| Salaries and benefits | $ 1,806 | $ 1,563 |
| Stock-based compensation | 1,259 | 969 |
| Consulting and other professional services | 264 | 32 |
| Technology licenses and royalties | 571 | 433 |
| Project-related research and supplies: | | |
| ELEVATE study and other AV-101 expenses | 8,126 | 4,154 |
| PH94B and PH10 licenses and other expenses | 4,496 | - |
| Stem cell and all other | 105 | 130 |
| | 12,727 | 4,284 |
| Rent | 419 | 412 |
| Depreciation | 49 | 66 |
| All other | 3 | 4 |
| Total Research and Development Expense | $ 17,098 | $ 7,763 |

The increase in salaries and benefits expense reflects the impact of salary increases effective in July 2018 and bonuses granted to our Chief Medical Officer (*CMO*), Chief Scientific Officer (*CSO*) and members of our scientific staff, offset by the impact of a staff termination in the first quarter of Fiscal 2018 and a staff leave of absence in the fourth quarter of Fiscal 2019.

Non-cash stock-based compensation expense increased significantly in Fiscal 2019 as a result of (i) the impact of new options granted to our CMO, CSO, and members of our scientific staff in August 2018, which options were 25% vested upon grant and vest ratably until becoming fully-vested within two years thereafter, and (ii) the modification in August 2018 of outstanding options held by our CMO, CSO and members of our scientific staff having exercise prices over $1.56 per share to reduce the exercise price to $1.50 per share in accordance with the terms of our 2016 Amended and Restated Stock Incentive Plan. Non-cash stock compensation expense attributable to grants made in Fiscal 2019 and including the $104,000 immediately recognized impact of the modification of exercise prices accounted for approximately $310,000 in Fiscal 2019. Fiscal 2019 expense is attributable to grants made in June 2016 and thereafter, all earlier grants having become fully vested and amortized prior to September 30, 2018.

Consulting and other professional services reflects fees paid or accrued for scientific, nonclinical and clinical development and regulatory advisory services rendered to us by third-parties, in both periods, in Fiscal 2018, primarily by members of our scientific and CNS clinical and regulatory advisory boards. The increase in Fiscal 2019 expense reflects consulting and support services in connection with our acquisition of the exclusive licenses to PH94B and PH10 and related consulting arrangements.

Technology license and royalties expense reflects both recurring annual license fees as well as legal counsel and other costs related to patent prosecution and protection pursuant to our stem cell technology license agreements or that we have elected to pursue for commercial purposes. We recognize these costs as they are invoiced to us by the licensors or counsel and they may vary noticeably between years. In both periods, this expense includes legal counsel and other costs we have incurred to advance pending patent applications in the U.S. and numerous foreign countries with respect to AV-101 and our stem cell technology platform. Acquisition of the PH94B and PH10 licenses contributed only nominally to the increased expense in Fiscal 2019.

AV-101 project expense for Fiscal 2019 primarily reflects the continuing costs of conducting the ELEVATE Study, including various CRO, investigator and clinical site costs, as well as expense incurred to manufacture additional quantities of AV-101 for use in future nonclinical and clinical trials of AV-101 for MDD and other potential CNS indications. In Fiscal 2018, AV-101 project expense primarily reflected costs incurred to develop our current proprietary manufacturing methods for AV-101, to produce quantities of AV-101 in preparation for the ELEVATE Study and Baylor Study and various expenses related to initiating the ELEVATE Study.

As indicated earlier, noncash expense related to the acquisition of the PH94B and PH10 licenses and PH10 option reflects the $4.25 million fair value of an aggregate of 2,556,361 unregistered shares of our common stock issued to Pherin in September 2018 and October 2018 under the terms of the applicable license and option agreements. Additional Fiscal 2019 expense primarily relates to initiatives advancing the further development of PH94B.

Stem cell and other project related expenses reflects costs associated with drug rescue applications of our stem cell technology in both years.

Rent expense is relatively flat between the periods and reflects commercial property rents prevalent in the South San Francisco real estate market at the time of our November 2016 lease amendment extending the lease of our headquarters facilities in South San Francisco by five years from July 31, 2017 to July 31, 2022 and the related accounting for the amendment.

*General and Administrative Expense*

General and administrative (*G&A*) expense increased by approximately $1.0 million to approximately $7.5 million in Fiscal 2019, as compared to approximately $6.4 million in Fiscal 2018, primarily as a result of increased noncash stock-based compensation expense. Other G&A expenses fluctuated moderately both up and down, but in aggregate were generally unchanged between years. Noncash G&A expense components accounted for approximately $2,622,000 and $2,884,000 in Fiscal 2019 and Fiscal 2018, respectively. Such non-cash expenses included, in both periods, stock compensation expense, a portion of professional services and investor relations expense, a portion of rent expense, and warrant modification expense. The following table indicates the primary components of general and administrative expense for each of the periods (amounts in thousands):

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | 2019 | 2018 |
| Salaries and benefits | $ 1,972 | $ 1,575 |
| Stock-based compensation | 2,184 | 1,375 |
| Board fees | 163 | 155 |
| Legal, accounting and other professional fees | 503 | 785 |
| Investor relations | 1,690 | 1,454 |
| Insurance | 281 | 242 |
| Travel expenses | 174 | 131 |
| Rent and utilities | 288 | 279 |
| Warrant modification expense | 26 | 293 |
| All other expenses | 177 | 148 |
| | $ 7,458 | $ 6,437 |

The increase in salaries and benefits primarily reflects the impact of salary increases effective in July 2018 and bonuses granted to our Chief Executive Officer (*CEO*), Chief Financial Officer (*CFO*), Vice President - Corporate Development (*VP Corporate Development*) and a non-officer member of our administrative staff.

Non-cash stock-based compensation expense increased significantly in Fiscal 2019 as a result of (i) the impact of new options granted to our CEO in January 2019 and to our CFO, VP Corporate Development, our administrative staff, and the independent members of our Board of Directors (*Board*) in August 2018, each of which were 25% vested upon grant and vest ratably until becoming fully-vested within two years thereafter, and (ii) the modification in August 2018 of outstanding options held by our CEO, CFO, VP Corporate Development, our administrative staff, and the independent members of our Board having exercise prices over $1.56 per share to reduce the exercise price to $1.50 per share as permitted by the terms of our 2016 Amended and Restated Stock Incentive Plan. Non-cash stock compensation expense attributable to grants made in Fiscal 2019, including the $154,000 immediately recognized impact of the modification of exercise prices, accounted for approximately $584,000 in Fiscal 2019. Additionally, the full year expense impact of grants made in February 2018 to our CEO, CFO, VP Corporate Development, our administrative staff, and the independent members of our Board contributed approximately an additional $183,000 to Fiscal 2019 expense. Fiscal 2019 expense is attributable to grants made in June 2016 and thereafter, all earlier grants having become fully vested and amortized prior to September 30, 2018.

Board fees represents fees paid as consideration for Board and Board Committee services to the independent members of our Board. The Fiscal 2019 increase is attributable to the addition of a new independent member to our Board in January 2019.

Legal, accounting and other professional fees for Fiscal 2019 and Fiscal 2018 includes expenses related to routine legal fees as well as the accounting expense related to the annual audit of the prior year's financial statements and the review of the financial statements for the first three quarters of the current fiscal year. Further, in Fiscal 2019, we incurred $94,000 attributable to services provided by an international business development consultant. In addition to routine legal and accounting cash fees incurred, in Fiscal 2018, we granted an aggregate of 20,000 unregistered shares of our common stock having an aggregate grant date fair value of $30,800 to legal services providers as partial compensation for services and an aggregate of 150,000 unregistered shares of our common stock having an aggregate grant date fair value of $234,000 to two investment banking firms pursuant to financial advisory agreements. We incurred no similar non-cash expense in Fiscal 2019.

Investor and public relations expense includes the fees of our various external service providers for a broad spectrum of investor relations and public relations services, as well as market awareness, strategic advisory and support functions and initiatives that included numerous meetings in multiple U.S. markets and other communication activities focused on expanding market awareness of the Company and its research and development programs, including among registered investment professionals and investment advisors, individual and institutional investors, securities analysts and media. During Fiscal 2019, in addition to cash fees and expenses, we granted: (i) in the first quarter, an aggregate of 100,000 unregistered shares of our common stock to certain financial advisory service providers as full or partial compensation for their services and recognized noncash expense of approximately $123,000 representing the fair value of the stock at the time of issuance; (ii) in the second quarter, an aggregate of 50,000 unregistered shares of our common stock and four-year warrants to purchase an aggregate of 288,000 unregistered shares of our common stock having an aggregate fair value of approximately $336,000 to various corporate development, investor relations, and market awareness service providers, pursuant to which we recognized aggregate non-cash expense of approximately $257,000; and (iii) in the fourth quarter, 25,000 registered shares of our common stock pursuant to our 2016 Amended and Restated Stock Incentive Plan having a fair value of $41,500 as partial compensation for investor relations services, pursuant to which we recognized noncash expense of approximately $14,000. The balance of the fair value of the securities granted in the second and fourth quarters of Fiscal 2019 remains recorded as a prepaid expense and is being amortized over the remaining service period of the respective contracts. In Fiscal 2018, in addition to cash fees and expenses we incurred, we granted an aggregate of 582,000 shares of our unregistered common stock to various corporate development, investor relations, market awareness and business advisory service providers as full or partial compensation for their services and recognized noncash expense totaling $886,300, representing the fair value of the stock at the time of issuance.

In both Fiscal 2019 and Fiscal 2018, travel expense reflects costs associated with management presentations and meetings held in multiple U.S. markets, and certain international markets in Fiscal 2019, with existing and potential individual and institutional investors, investment professionals and advisors, media, and securities analysts, as well as various investor relations, market awareness and corporate development and partnering initiatives and in monitoring the progress of our ELEVATE Study in Fiscal 2019.

Rent expense is essentially unchanged between the two periods and primarily reflects commercial property rents prevalent in the South San Francisco real estate market at the time of our November 2016 lease amendment extending the lease of our headquarters facilities in South San Francisco by five years from July 31, 2017 to July 31, 2022 and the related accounting for the amendment.

During the third quarter of Fiscal 2019, we modified certain warrants issued in the Summer 2018 Private Placement to comply with certain provisions of The Nasdaq Stock Market Rules applicable to the offering by increasing the exercise price of such warrants to purchase an aggregate of 304,000 shares of our common stock from $1.50 per share to $1.59 per share or $1.69 per share, depending on the effective date of the related subscription agreement. As additional consideration for the modification, we granted the investors additional warrants to purchase an aggregate of 23,800 unregistered shares of our common stock at an exercise price of $1.75 per share through February 28, 2022. We determined that the modification decreased the fair value of the modified warrants, which decrease is not recognized; however, the fair value of the new warrants was determined to be $25,800, which we recognized as noncash warrant modification expense. In the second quarter of Fiscal 2018, we reduced the exercise price of 247,500 warrants issued in our spring 2017 private placement offering from a weighted average exercise price of $3.99 per share to $2.00 per share. We also issued to each of the investors in the spring 2017 private placement additional warrants to purchase an aggregate total of 247,501 shares of common stock, with an exercise price of $2.00 per share. We recognized noncash expense of $279,700 in the second quarter of Fiscal 2018 representing the increase in fair value of the warrants granted initially plus the fair value of the additional warrants granted. During the third quarter of Fiscal 2018, we modified outstanding warrants issued in private placement transactions between August 2017 and November 2017 to purchase an aggregate of 178,572 shares of our common stock to reduce the exercise prices from a weighted average of $2.32 per share to a weighted average of $1.58 per share. We recognized the calculated increase in the fair value of the warrants, $13,000, as noncash warrant modification expense.

*Interest and Other Expenses, Net*

Interest expense totaled $8,000 for Fiscal 2019 compared to $8,900 for Fiscal 2018. Interest expense in both periods relates to interest paid on insurance premium financing and on a capital lease of office equipment.

During the third quarter of Fiscal 2019, in connection with the Fall 2018 Private Placement, we settled an outstanding professional service payable by accepting a subscription agreement in the amount of $40,000 and issuing the corresponding number of shares of common stock and warrants. The fair value of the common stock and warrant issued in settlement of the payable was determined to be $62,700 on the effective date of the agreement. Accordingly, we recognized a loss on extinguishment of accounts payable in the amount of $22,700 in Fiscal 2019. During the third quarter of Fiscal 2018, we issued 500,000 unregistered shares of our common stock having a grant date fair value of $585,000 and a cash payment of $76,500 to a contract manufacturing organization in settlement of $526,500 of open accounts payable. We recognized a corresponding loss on settlement of accounts payable in the amount of $135,000 in Fiscal 2018.

We recognized $1,139,900 and $1,030,300 in Fiscal 2019 and Fiscal 2018, respectively, representing the 10% cumulative noncash dividend payable on our Series B Preferred as an additional deduction in arriving at net loss attributable to common stockholders in the Consolidated Statement of Operations and Comprehensive Loss included in Item 8 of this Annual Report. The dividends are payable in unregistered shares of our common stock upon the conversion of Series B Preferred shares. There have been no conversions of outstanding shares of Series B Preferred into common shares since August 2016.

Our December 2017 public offering of units consisting of shares of our common stock and common stock purchase warrants at an offering price of $1.50 per unit (the *December 2017 Public Offering*) triggered the anti-dilution protection provisions of the Series A2 Warrants to purchase an aggregate of 503,641 shares of our common stock issued in the public offering we completed in September 2017. In accordance with the anti-dilution terms and formula contained in the Series A2 warrants, the exercise price of the Series A2 Warrants was reduced from the initial exercise price of $1.82 per share to $0.001 per share. We recognized the effect of triggering the down round feature, $199,200, as a further addition to net loss attributable to common stockholders and in our calculation of basic and fully diluted earnings per share in our Consolidated Statement of Operations and Comprehensive Loss and as a dividend in our Consolidated Statement of Stockholders' Equity for Fiscal 2018 included in Item 8 of this Annual Report. The holders of the Series A2 Warrants subsequently exercised them in the third and fourth quarters of Fiscal 2018 and we received minimal cash proceeds from the exercises. Following the exercise of the Series A2 Warrants, none of our outstanding warrants contain antidilution protection provisions other than is customary in the event of a change in our capital structure as a result of a stock split or dividend.

**Liquidity and Capital Resources**

Since our inception in May 1998 through March 31, 2019, we have financed our operations and technology acquisitions primarily through the issuance and sale of our equity and debt securities for cash proceeds of approximately $79.0 million, as well as from an aggregate of approximately $17.7 million of government research grant awards (excluding the fair market value of government sponsored and funded clinical trials such as the Baylor Study), strategic collaboration payments, intellectual property sublicensing and other revenues. Additionally, we have issued equity securities with an approximate value at issuance of $38.1 million in noncash acquisitions of product licenses and in settlements of certain liabilities, including liabilities for professional services rendered to us or as compensation for such services.

At March 31, 2019, we had cash and cash equivalents of approximately $13.1 million.

Our cash position at March 31, 2019 considered with our recurring and anticipated losses, negative cash flows from operations and limited stockholders' equity make it probable, in the absence of additional financing, that we will not have sufficient resources to fund our planned operations for the twelve months following the issuance of these financial statements, during which time we plan to complete our ELEVATE study, prepare for and launch a pivotal Phase 3 clinical trial of PH94B, prepare for additional Phase 2a clinical and certain nonclinical studies involving AV-101 and prepare for a Phase 2b clinical trial of PH10, and raises substantial doubt that we can continue as a going concern. Nevertheless, when necessary and advantageous, we plan to raise additional capital, primarily through the sale of our equity securities in one or more private placements to accredited investors or in public offerings. Subject to certain restrictions, our effective Registration Statement on Form S-3 (Registration No. 333-215671) (the *S-3 Registration Statement*) remains available for future sales of our equity securities in one or more public offerings from time to time. While we may make additional sales of our equity securities under the S-3 Registration Statement, we do not have an obligation to do so. As we have been in the past, we expect that, if and as necessary, we will be successful in raising additional capital from the sale of our equity securities either in one or more public offerings or in one or more private placement transactions with individual accredited investors or institutions.

In addition to the potential sale of our equity securities, we may also seek to enter research, development and/or commercialization collaborations that could generate revenue or provide funding, including non-dilutive funding, for development of AV-101, PH94B, PH10 and/or additional product candidates. We may also seek additional government grant awards or agreements similar, for example, to our recent CRADA with the NIMH, which provided for the NIMH to fully fund the NIMH Study, or similar to our relationships with Baylor and the VA in connection with the Baylor Study. Such strategic collaborations may provide non-dilutive resources to advance our strategic initiatives while reducing a portion of our future cash outlays and working capital requirements. We may also pursue intellectual property arrangements similar to the BlueRock Agreement with other parties. Although we may seek additional collaborations that could generate revenue and/or provide non-dilutive funding for development of AV-101, PH94B, PH10 or other product candidates, as well as new government grant awards and/or agreements, no assurance can be provided that any such collaborations, awards or agreements will occur in the future.

Our future working capital requirements will depend on many factors, including, without limitation, the scope and nature of opportunities related to our success and the success of certain other companies in clinical trials, including our development and commercialization of our current product candidates and various applications of our stem cell technology platform, the availability of, and our ability to obtain, government grant awards and agreements, and our ability to enter into collaborations on terms acceptable to us. To further advance the clinical development of AV-101, PH94B, PH10 and, to a lesser extent, our stem cell technology platform, as well as support our operating activities, we plan to continue to carefully manage our routine operating costs, including our employee headcount and related expenses, as well as costs relating to regulatory consulting, contract research and development, investor relations and corporate development, legal, acquisition and protection of intellectual property, public company compliance and other professional services and operating costs.

Notwithstanding the foregoing, there can be no assurance that future financings or government or other strategic collaborations will be available to us in sufficient amounts, in a timely manner, or on terms acceptable to us, if at all. If we are unable to obtain substantial additional financing on a timely basis when needed in 2019 and beyond, our business, financial condition, and results of operations may be harmed, the price of our stock may decline, we may be required to reduce, defer, or discontinue certain of our research and development activities and we may not be able to continue as a going concern. The Consolidated Financial Statements included in Part II, Item 8 of this Annual Report do not include any adjustments that might result from the negative outcome of this uncertainty.

*Cash and Cash Equivalents*

The following table summarizes changes in cash and cash equivalents for the periods stated (in thousands):

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | 2019 | 2018 |
| Net cash used in operating activities | $ (14,528) | $ (9,058) |
| Net cash used in investing activities | (174) | (2) |
| Net cash provided by financing activities | 17,424 | 16,517 |
| Net increase in cash and cash equivalents | 2,722 | 7,457 |
| Cash and cash equivalents at beginning of period | 10,378 | 2,921 |
| Cash and cash equivalents at end of period | $ 13,100 | $ 10,378 |

The increase in cash used in operations results primarily from conducting our ELEVATE Study, which commenced at the end of the fourth quarter of Fiscal 2018. Additional contributors to the increase in cash used in operations are modest increases in employee cash compensation and benefits and an expansion of various investor relations and corporate development and awareness initiatives. The increase in cash used in investing activities reflects the cost of tenant improvements at our office and laboratory facilities in South San Francisco, California, substantially all of which were reimbursed by our landlord under the terms of our November 2016 lease extension, which reimbursement is reflected in operating activities. Cash provided by financing activities in Fiscal 2019 primarily reflects the cash proceeds from our Spring 2019 Public Offering, our Summer 2018 and Fall 2018 Private Placements, and warrant and option exercises and, in Fiscal 2018, the proceeds of our September 2017 and December 2017 public offerings, net of routine note and capital lease payments in both years.

**Off-Balance Sheet Arrangements**

Other than contractual obligations incurred in the normal course of business, we do not have any off-balance sheet financing arrangements or liabilities, guarantee contracts, retained or contingent interests in transferred assets or any obligation arising out of a material variable interest in an unconsolidated entity. VistaStem has two inactive, wholly owned subsidiaries, Artemis Neuroscience, Inc., a Maryland corporation, and VistaStem Canada, Inc., an Ontario corporation.

**Item 7A. Quantitative and Qualitative Disclosures About Market Risk**

The disclosures in this section are not required because we qualify as a smaller reporting company under federal securities laws.

**Item 8. Financial Statements and Supplementary Data**

**INDEX TO CONSOLIDATED FINANCIAL STATEMENTS**

## REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Stockholders and Board of Directors
VistaGen Therapeutics, Inc.
South San Francisco, California

**Opinion on the Financial Statements**

We have audited the accompanying consolidated balance sheets of VistaGen Therapeutics, Inc. as of March 31, 2019 and 2018, the related consolidated statements of operations and comprehensive loss, cash flows, and stockholders' equity for each of the two fiscal years in the period ended March 31, 2019, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company at March 31, 2019 and 2018, and the results of its operations and its cash flows for each of the two years in the period ended March 31, 2019**,** in conformity with accounting principles generally accepted in the United States of America.

**Going Concern Uncertainty**

The accompanying consolidated financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 2 to the consolidated financial statements, the Company has not yet generated sustainable revenues, has suffered recurring losses and negative cash flows from operations and has minimal stockholders' equity, all of which raise substantial doubt about its ability to continue as a going concern. Management's plans in regard to these matters are also described in Note 2. The consolidated financial statements do not include any adjustments that might result from the outcome of this uncertainty.

**Basis for Opinion**

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's consolidated 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 consolidated financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the consolidated 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 consolidated 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 consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ OUM & CO. LLP

San Francisco, California
June 25, 2019
We have served as the Company's auditor since 2006.

**VISTAGEN THERAPEUTICS, INC.**

**CONSOLIDATED BALANCE SHEETS**
**(Amounts in dollars, except share amounts)**

| | March 31, 2019 | March 31, 2018 |
|---|---|---|
| **ASSETS** | | |
| Current assets: | | |
| Cash and cash equivalents | $ 13,100,300 | $ 10,378,300 |
| Receivable from supplier | 300,000 | - |
| Prepaid expenses and other current assets | 250,900 | 644,800 |
| Total current assets | 13,651,200 | 11,023,100 |
| Property and equipment, net | 312,700 | 207,400 |
| Security deposits and other assets | 47,800 | 47,800 |
| Total assets | $ 14,011,700 | $ 11,278,300 |
| **LIABILITIES AND STOCKHOLDERS' EQUITY** | | |
| Current liabilities: | | |
| Accounts payable | $ 1,055,000 | $ 1,195,700 |
| Accrued expenses | 1,685,600 | 206,300 |
| Current notes payable | 57,300 | 53,900 |
| Capital lease obligations | 3,000 | 2,600 |
| Total current liabilities | 2,800,900 | 1,458,500 |
| Non-current liabilities: | | |
| Accrued dividends on Series B Preferred Stock | 3,748,200 | 2,608,300 |
| Deferred rent liability | 381,100 | 285,600 |
| Capital lease obligations | 6,300 | 9,300 |
| Total non-current liabilities | 4,135,600 | 2,903,200 |
| Total liabilities | 6,936,500 | 4,361,700 |
| Commitments and contingencies | | |
| Stockholders' equity: | | |
| Preferred stock, $0.001 par value; 10,000,000 shares authorized at March 31, 2019 and 2018: | | |
| Series A Preferred, 500,000 shares authorized, issued and outstanding at March 31, 2019 and 2018 | 500 | 500 |
| Series B Preferred; 4,000,000 shares authorized at March 31, 2019 and 2018; 1,160,240 shares issued and outstanding at March 31, 2019 and 2018 | 1,200 | 1,200 |
| Series C Preferred; 3,000,000 shares authorized at March 31, 2019 and 2018; 2,318,012 shares issued and outstanding at March 31, 2019 and 2018 | 2,300 | 2,300 |
| Common stock, $0.001 par value; 100,000,000 shares authorized at March 31, 2019 and 2018; 42,758,630 and 23,068,280 shares issued and outstanding at March 31, 2019 and March 31, 2018, respectively | 42,800 | 23,100 |
| Additional paid-in capital | 192,129,900 | 167,401,400 |
| Treasury stock, at cost, 135,665 shares of common stock held at March 31, 2019 and 2018 | (3,968,100) | (3,968,100) |
| Accumulated deficit | (181,133,400) | (156,543,800) |
| Total stockholders' equity | 7,075,200 | 6,916,600 |
| Total liabilities and stockholders' equity | $ 14,011,700 | $ 11,278,300 |

See accompanying notes to consolidated financial statements.

**VISTAGEN THERAPEUTICS, INC.**

**CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS**
**(Amounts in dollars, except share amounts)**

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | **2019** | **2018** |
| Operating expenses: | | |
| Research and development | $ 17,098,500 | $ 7,762,500 |
| General and administrative | 7,457,800 | 6,437,100 |
| Total operating expenses | 24,556,300 | 14,199,600 |
| Loss from operations | (24,556,300) | (14,199,600) |
| Other expenses, net: | | |
| Interest expense, net | (8,000) | (8,900) |
| Loss on extinguishment of accounts payable | (22,700) | (135,000) |
| Loss before income taxes | (24,587,000) | (14,343,500) |
| Income taxes | (2,600) | (2,400) |
| Net loss and comprehensive loss | (24,589,600) | (14,345,900) |
| | | |
| Accrued dividend on Series B Preferred stock | (1,139,900) | (1,030,400) |
| Deemed dividend from trigger of down round provision feature | - | (199,200) |
| | | |
| Net loss attributable to common stockholders | $ (25,729,500) | $ (15,575,500) |
| | | |
| Basic and diluted net loss attributable to common stockholders per common share | $ (0.90) | $ (1.12) |
| | | |
| Weighted average shares used in computing basic and diluted net loss attributable to common stockholders per common share | 28,562,490 | 13,890,041 |

See accompanying notes to consolidated financial statements.

**VISTAGEN THERAPEUTICS, INC.**

**CONSOLIDATED STATEMENTS OF CASH FLOWS**
**(Amounts in dollars)**

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | **2019** | **2018** |
| Cash flows from operating activities: | | |
| Net loss | $ (24,589,600) | $ (14,345,900) |
| Adjustments to reconcile net loss to net cash used in operating activities: | | |
| Depreciation and amortization | 91,200 | 80,700 |
| Stock-based compensation | 3,443,400 | 2,344,200 |
| Expense related to modification of warrants | 25,800 | 292,700 |
| Fair value of common stock issued for services | 391,100 | 1,615,800 |
| Fair value of common stock issued for product licenses and option | 4,250,000 | - |
| Fair value of warrants issued for services | 119,700 | - |
| Loss on settlement of accounts payable | 22,700 | 135,000 |
| Changes in operating assets and liabilities: | | |
| Receivable from supplier | (300,000) | - |
| Prepaid expenses and other current assets | 589,000 | 131,200 |
| Accounts payable and accrued expenses | 1,338,700 | 541,700 |
| Deferred rent | 90,500 | 146,300 |
| Net cash used in operating activities | (14,527,500) | (9,058,300) |
| Cash flows from property and investing activities: | | |
| Purchases of equipment and acquisition of tenant improvements | (174,000) | (1,600) |
| Net cash used in investing activities | (174,000) | (1,600) |
| Cash flows from financing activities: | | |
| Net proceeds from issuance of common stock and warrants, including Units | 17,041,000 | 16,722,300 |
| Proceeds from exercise of warrants | 605,700 | - |
| Repayment of capital lease obligations | (2,700) | (2,400) |
| Repayment of notes payable | (220,500) | (203,000) |
| Net cash provided by financing activities | 17,423,500 | 16,516,900 |
| Net increase in cash and cash equivalents | 2,722,000 | 7,457,000 |
| Cash and cash equivalents at beginning of period | 10,378,300 | 2,921,300 |
| Cash and cash equivalents at end of period | $ 13,100,300 | $ 10,378,300 |
| Supplemental disclosure of cash flow activities: | | |
| Cash paid for interest | $ 8,000 | $ 8,900 |
| Cash paid for income taxes | $ 2,600 | $ 2,400 |
| Supplemental disclosure of noncash activities: | | |
| Insurance premiums settled by issuing note payable | $ 224,000 | $ 202,100 |
| Accrued dividends on Series B Preferred | $ 1,139,900 | $ 1,030,400 |
| Deemed dividend from trigger of down round provision feature | $ - | $ 199,200 |
| Accounts payable settled by issuing common stock | $ 40,000 | $ 450,000 |

See accompanying notes to consolidated financial statements.

**VISTAGEN THERAPEUTICS, INC.**

**CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY**

**Fiscal Years Ended March 31, 2018 and 2019**
**(Amounts in dollars, except share amounts)**

| | Series A Preferred Stock | | Series B Preferred Stock | | Series C Preferred Stock | | Common Stock | | Additional Paid-in | Treasury | Accumulated | Total Stockholders' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Shares | Amount | Shares | Amount | Shares | Amount | Shares | Amount | Capital | Stock | Deficit | Equity |
| **Balances at March 31, 2017** | **500,000** | **$ 500** | **1,160,240** | **$ 1,200** | **2,318,012** | **$ 2,300** | **8,974,386** | **$ 9,000** | **$146,569,600** | **$(3,968,100)** | **$(141,998,700)** | **$ 615,800** |
| Proceeds from sale of common stock and warrants for cash in September 2017 Public Offering, net of underwriting discount and expenses | - | - | - | - | - | - | 1,371,430 | 1,400 | 2,023,000 | - | - | 2,024,400 |
| Proceeds from sale of common stock and warrants for cash in December 2017 Public Offering, net of underwriting discount and expenses | - | - | - | - | - | - | 10,000,000 | 10,000 | 13,614,000 | - | - | 13,624,000 |
| Proceeds from sale of common stock and warrants for cash in private placement offerings | - | - | - | - | - | - | 616,323 | 600 | 1,072,600 | - | - | 1,073,200 |
| Proceeds from exercise of warrants | - | - | - | - | - | - | 503,641 | 500 | - | - | - | 500 |
| Accrued dividends on Series B Preferred stock | - | - | - | - | - | - | - | - | (1,030,400) | - | - | (1,030,400) |
| Stock-based compensation expense | - | - | - | - | - | - | - | - | 2,344,100 | - | - | 2,344,100 |
| Fair value of common stock granted for services | - | - | - | - | - | - | 1,102,500 | 1,100 | 1,732,100 | - | - | 1,733,200 |
| Fair value of common stock granted in settlement of accounts payable | - | - | - | - | - | - | 500,000 | 500 | 584,500 | - | - | 585,000 |
| Increase in fair value attributable to warrant modifications | - | - | - | - | - | - | - | - | 292,700 | - | - | 292,700 |
| Deemed dividend from trigger of down round provision feature | - | - | - | - | - | - | - | - | 199,200 | - | (199,200) | - |
| Net loss for the fiscal year ended March 31, 2018 | - | - | - | - | - | - | - | - | - | - | (14,345,900) | (14,345,900) |
| **Balances at March 31, 2018** | **500,000** | **$ 500** | **1,160,240** | **$ 1,200** | **2,318,012** | **$ 2,300** | **23,068,280** | **$ 23,100** | **$167,401,400** | **$(3,968,100)** | **$(156,543,800)** | **$ 6,916,600** |
| Proceeds from sale of common stock for cash in February 2019 Public Offering, net | - | - | - | - | - | - | 11,500,000 | 11,500 | 10,376,900 | - | - | 10,388,400 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| of underwriting discount and expenses | | | | | | | | | | | | |
| Proceeds from sale of common stock and warrants for cash and settlement of professional services payable in private placement offerings | - | - | - | - | - | - | 5,025,939 | 5,000 | 6,626,400 | - | - | 6,631,400 |
| Proceeds from exercise of warrants | - | - | - | - | - | - | 403,800 | 400 | 605,300 | - | - | 605,700 |
| Proceeds from exercise of stock options | - | - | - | - | - | - | 29,250 | - | 43,900 | - | - | 43,900 |
| Accrued dividends on Series B Preferred stock | - | - | - | - | - | - | - | - | (1,139,900) | - | - | (1,139,900) |
| Stock-based compensation expense | - | - | - | - | - | - | - | - | 3,443,400 | - | - | 3,443,400 |
| Fair value of common stock issued for PH94B license and PH10 option and license | - | - | - | - | - | - | 2,556,361 | 2,600 | 4,247,400 | - | - | 4,250,000 |
| Fair value of common stock and warrants issued for services | - | - | - | - | - | - | 175,000 | 200 | 499,300 | - | - | 499,500 |
| Increase in fair value attributable to warrant modifications | - | - | - | - | - | - | - | - | 25,800 | - | - | 25,800 |
| Net loss for the fiscal year ended March 31, 2019 | - | - | - | - | - | - | - | - | - | - | (24,589,600) | (24,589,600) |
| **Balances at March 31, 2019** | **500,000** | **$ 500** | **1,160,240** | **$ 1,200** | **2,318,012** | **$ 2,300** | **42,758,630** | **$ 42,800** | **$192,129,900** | **$(3,968,100)** | **$(181,133,400)** | **$ 7,075,200** |

See accompanying notes to consolidated financial statements.

## 1. Description of Business

### Overview

VistaGen Therapeutics, Inc., a Nevada corporation (which may be referred to as *VistaGen*, the *Company*, *we*, *our*, or *us*), is a clinical-stage biopharmaceutical company committed to developing and commercializing new generation medicines to treat diseases and disorders of the central nervous system (*CNS*) with high unmet need. Our portfolio of three clinical-stage product candidates is currently focused predominantly on major depressive disorder (*MDD*) and social anxiety disorder (*SAD*).

MDD is a serious neurobiologically-based mood disorder, affecting approximately 16 million adults in the United States, according to the U.S. National Institutes of Health (*NIH*). Individuals diagnosed with MDD exhibit depressive symptoms, such as a depressed mood or a loss of interest or pleasure in daily activities, for more than a two-week period, as well as impaired social, occupational, educational or other important functioning which has a negative impact on their quality of life. Globally, MDD affects nearly 300 million people of all ages and is the leading cause of disability worldwide.

SAD affects as many as 15 million Americans and is the third most common psychiatric condition after depression and substance abuse, according to the Anxiety and Depression Association of America.. SAD is characterized by a persistent and unreasonable fear of one or more social or performance situations, where the individual fears that he or she will act in a way or show symptoms that will be embarrassing or humiliating, leading to avoidance of the situations when possible and anxiety or distress when they occur. These fears have a significant impact on the person's employment, social activities and overall quality of life. Only three drugs, all antidepressants, are approved by the U.S Food and Drug Administration (*FDA*) for treatment of SAD. However, for treatment of both MDD and SAD, current oral antidepressants (*ADs*) have slow onset of effect (often several weeks to months) and significant side effects that may make them inadequate treatment alternatives for many individuals affected by MDD and SAD.

Our most advanced product candidate, PH94B neuroactive nasal spray, is fundamentally different from all current treatments for SAD. Developed from proprietary compounds called pherines and administered as a nasal spray, PH94B activates nasal chemosensory receptors that trigger neural circuits in the brain that suppress fear and anxiety. In a published double-blind, placebo-controlled Phase 2 clinical trial, PH94B neuroactive nasal spray was significantly more effective than placebo in reducing public-speaking and social interaction anxiety on laboratory challenges of individuals with SAD. Its novel mechanism of pharmacological action, rapid-onset of therapeutic effects and exceptional safety and tolerability profile in clinical trials to date make PH94B neuroactive nasal spray an excellent product candidate with potential to become the first FDA-approved on-demand, as-needed, or PRN, treatment for SAD.

AV-101 (4-Cl-KYN), one of our two product candidates for MDD, belongs to a new generation of investigational medicines in neuropsychiatry and neurology known as NMDA (N-methyl-D-aspartate) glutamate receptor modulators. The NMDA receptor is a pivotal receptor in the brain and abnormal NMDA function is associated with multiple CNS diseases and disorders, including MDD, chronic neuropathic pain, epilepsy, Parkinson's disease levodopa-induced dyskinesia and many others. AV-101 is an oral prodrug of 7-Cl-KYNA which binds uniquely at the glycine site of the NMDA receptor and has potential to be a new at-home treatment for MDD. AV-101 is currently in Phase 2 development in the U.S. for MDD. ELEVATE is our Phase 2 multicenter, multi-dose, double blind, placebo-controlled clinical study to evaluate the efficacy and safety of AV-101 as an add-on treatment for MDD in adult patients with an inadequate therapeutic response to current FDA-approved ADs (the *ELEVATE Study*). We currently anticipate top line results from the ELEVATE Study in the second half of 2019. The FDA has granted Fast Track designation for development of AV-101 both as a potential add-on treatment of MDD and as a non-opioid treatment for neuropathic pain.

Our other product candidate for MDD in Phase 2 development for MDD is PH10 neuroactive nasal spray. PH10 is a potential first-in-class, CNS neurosteroid nasal spray administered in microgram doses for MDD. PH10 nasal spray activates nasal chemosensory receptors that, in turn, engage GABA (gamma-aminobutyric acid) and CRH (corticotropin-releasing hormone) neurons in the limbic amygdala system. The activation of these neural circuits is believed to have the potential to lead to rapid antidepressant effects without psychological side effects, systemic exposure or safety concerns often associated with current antidepressants. Based on positive results of a small exploratory Phase 2a study in MDD in which rapid-onset antidepressant effects were observed without psychological side effects or systemic exposure, we are preparing for planned Phase 2b clinical development of PH10 as a first-line treatment for MDD.

Additional potential indications for PH94B include post-traumatic stress disorder (*PTSD*) and general anxiety disorder (*GAD*) and others neuropsychiatric indications. Additional potential indications for AV-101 include as a non-addictive, non-sedating treatment of chronic neuropathic pain (*CNP*), epilepsy, and to reduce dyskinesia induced by levodopa therapy for Parkinson’s disease (*PD LID*).

In addition to our CNS business, we have two pipeline-enabling programs through our wholly-owned subsidiary, VistaStem Therapeutics (*VistaStem*). VistaStem is focused on applying pluripotent stem cell (*hPSC*) technology to discover, rescue, develop and commercialize proprietary new chemical entities (*NCEs*) for CNS and other diseases and regenerative medicine (*RM*) involving hPSC-derived blood, cartilage, heart and liver cells. Our internal drug rescue programs are designed to utilize *CardioSafe 3D*, our customized cardiac bioassay system, to discover and develop small molecule NCEs for our CNS pipeline or for out-licensing. To advance potential RM applications of our cardiac stem cell technology, we have sublicensed to BlueRock Therapeutics LP, a next generation cell therapy and RM company established by Bayer AG and Versant Ventures (*BlueRock Therapeutics*), rights to certain proprietary technologies relating to the production of cardiac stem cells for the treatment of heart disease (the *BlueRock Agreement*). In a manner similar to the BlueRock Agreement, we may pursue additional collaborations or licensing transactions involving blood, cartilage, and/or liver cells derived from hPSCs for cell-based therapy, cell repair therapy, RM and/or tissue engineering.

**Subsidiaries**

As noted above, VistaStem is our wholly-owned subsidiary. Our Consolidated Financial Statements in this Annual Report on Form 10-K (*Report*) also include the accounts of VistaStem's two wholly-owned inactive subsidiaries, Artemis Neuroscience, Inc., a Maryland corporation, and VistaStem Canada, Inc., a corporation organized under the laws of Ontario, Canada.

**2. Basis of Presentation and Going Concern**

The accompanying Consolidated Financial Statements have been prepared assuming that we will continue as a going concern. As a clinical-stage biopharmaceutical company having not yet developed commercial products or achieved sustainable revenues, we have experienced negative cash flows from operations and recurring losses resulting in a deficit of $181.1 million accumulated from inception through March 31, 2019. We expect losses and negative cash flows from operations to continue for the foreseeable future as we engage in further development of AV-101, PH94B and PH10, execute our drug rescue programs and pursue potential drug development and regenerative medicine opportunities.

Since our inception in May 1998 through March 31, 2019, we have financed our operations and technology acquisitions primarily through the issuance and sale of our equity and debt securities for cash proceeds of approximately $79.0 million, as well as from an aggregate of approximately $17.7 million of government research grant awards (excluding the fair market value of government sponsored and funded clinical trials such as the Baylor Study), strategic collaboration payments, intellectual property sublicensing and other revenues. Additionally, we have issued equity securities with an approximate value at issuance of $38.1 million in noncash acquisitions of product licenses and in settlements of certain liabilities, including liabilities for professional services rendered to us or as compensation for such services.

At March 31, 2019, we had cash and cash equivalents of approximately $13.1 million.

Our cash position at March 31, 2019 considered with our recurring and anticipated losses, negative cash flows from operations and limited stockholders' equity make it probable, in the absence of additional financing, that we will not have sufficient resources to fund our planned operations for the twelve months following the issuance of these financial statements, during which time we plan to complete our ELEVATE study, prepare for and launch a pivotal Phase 3 clinical trial of PH94B, prepare for additional Phase 2 clinical studies and certain nonclinical studies involving AV-101 and prepare for a Phase 2b clinical trial of PH10, and raises substantial doubt that we can continue as a going concern. Nevertheless, when necessary and advantageous, we plan to raise additional capital, primarily through the sale of our equity securities in one or more private placements to accredited investors or in public offerings. Subject to certain restrictions, our effective Registration Statement on Form S-3 (Registration No. 333-215671) (the *S-3 Registration Statement*) remains available for future sales of our equity securities in one or more public offerings from time to time. While we may make additional sales of our equity securities under the S-3 Registration Statement, we do not have an obligation to do so. As we have been in the past, we expect that, if and as necessary, we will be successful in raising additional capital from the sale of our equity securities either in one or more public offerings or in one or more private placement transactions with individual accredited investors or institutions.

In addition to the potential sale of our equity securities, we may also seek to enter research, development and/or commercialization collaborations that could generate revenue or provide funding, including non-dilutive funding, for development of AV-101, PH94B, PH10 and/or additional product candidates. We may also seek additional government grant awards or agreements similar, for example, to our recent CRADA with the NIMH, which provided for the NIMH to fully fund the NIMH Study, or similar to our relationships with Baylor and the VA in connection with the Baylor Study. Such strategic collaborations may provide non-dilutive resources to advance our strategic initiatives while reducing a portion of our future cash outlays and working capital requirements. We may also pursue intellectual property arrangements similar to the BlueRock Agreement with other parties. Although we may seek additional collaborations that could generate revenue and/or provide non-dilutive funding for development of AV-101, PH94B, PH10 or other product candidates, as well as new government grant awards and/or agreements, no assurance can be provided that any such collaborations, awards or agreements will occur in the future.

Our future working capital requirements will depend on many factors, including, without limitation, the scope and nature of opportunities related to our success and the success of certain other companies in clinical trials, including our development and commercialization of our current product candidates and various applications of our stem cell technology platform, the availability of, and our ability to obtain, government grant awards and agreements, and our ability to enter into collaborations on terms acceptable to us. To further advance the clinical development of AV-101, PH94B, PH10 and, to a lesser extent, our stem cell technology platform, as well as support our operating activities, we plan to continue to carefully manage our routine operating costs, including our employee headcount and related expenses, as well as costs relating to regulatory consulting, contract research and development, investor relations and corporate development, legal, acquisition and protection of intellectual property, public company compliance and other professional services and operating costs.

Notwithstanding the foregoing, there can be no assurance that future financings or government or other strategic collaborations will be available to us in sufficient amounts, in a timely manner, or on terms acceptable to us, if at all. If we are unable to obtain substantial additional financing on a timely basis when needed in 2019 and beyond, our business, financial condition, and results of operations may be harmed, the price of our stock may decline, we may be required to reduce, defer, or discontinue certain of our research and development activities and we may not be able to continue as a going concern. As noted above, these Consolidated Financial Statements do not include any adjustments that might result from the negative outcome of this uncertainty.

**3. Summary of Significant Accounting Policies**

***Use of Estimates***

The preparation of financial statements in conformity with U.S. generally accepted accounting principles (*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 revenues and expenses during the reporting period. Actual results could differ from those estimates. Significant estimates include, but are not limited to, those relating to stock-based compensation, revenue recognition, research and development expenses and the assumptions used to value warrants, warrant modifications and warrant liabilities.

***Principles of Consolidation***

The accompanying consolidated financial statements include the Company's accounts, VistaStem's accounts and the accounts of VistaStem's two wholly-owned inactive subsidiaries, Artemis Neurosciences and VistaStem Canada. All material intercompany accounts and transactions have been eliminated in consolidation.

***Cash and Cash Equivalents***

Cash and cash equivalents are considered to be highly liquid investments with maturities of three months or less at the date of purchase.

***Property and Equipment***

Property and equipment is stated at cost. Repairs and maintenance costs are expensed in the period incurred. Depreciation is calculated using the straight-line method over the estimated useful lives of the assets. The estimated useful lives of property and equipment range from three to seven years.

***Impairment of Long-Lived Assets***

Our 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 we consider 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 our use of the assets. 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, we have not recorded any impairment losses on long-lived assets.

***Revenue Recognition***

We have historically generated revenue principally from collaborative research and development arrangements, licensing and technology transfer agreements, including strategic licenses or sublicenses, and government grants. We adopted Accounting Standards Update (*ASU*) No. 2014-09, *Revenue from Contracts with Customers (Topic 606)* and its related amendments, collectively referred to as ASC (*Accounting Standards Codification*) Topic 606, as of April 1, 2018, using the modified retrospective transition method. At adoption and currently, we have only the BlueRock Agreement as a potential revenue generating arrangement. Upon adoption of ASC Topic 606, there was no change to the units of accounting previously identified with respect to the BlueRock Agreement under legacy GAAP, which are now considered performance obligations under ASC Topic 606, and there was no change to the revenue recognition pattern for the performance obligation. Accordingly, there was no cumulative effect change to our opening accumulated deficit upon the adoption of ASC Topic 606.

Under ASC Topic 606, we recognize revenue when our customer obtains control of promised goods or services, in an amount that reflects the consideration that we expect to receive in exchange for those goods or services. To determine revenue recognition for arrangements that we determine are within the scope of Topic 606, we perform the following five steps: (i) identify the contract with a customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price, including variable consideration, if any; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) we satisfy a performance obligation. We only apply the five-step model to contracts when it is probable that we will collect the consideration to which we are entitled in exchange for the goods or services we transfer to a customer.

Once a contract is determined to be within the scope of Topic 606, we assesses the goods or services promised within each contract and determine those that are performance obligations. Arrangements that include rights to additional goods or services that are exercisable at a customer's discretion are generally considered options. We assess whether these options provide a material right to the customer and if so, they are considered performance obligations. The exercise of a material right may be accounted for as a contract modification or as a continuation of the contract for accounting purposes.

We assess whether each promised good or service is distinct for the purpose of identifying the performance obligations in the contract. This assessment involves subjective determinations and requires judgments about the individual promised goods or services and whether such are separable from the other aspects of the contractual relationship. Promised goods and services are considered distinct provided that: (i) the customer can benefit from the good or service either on its own or together with other resources that are readily available to the customer (that is, the good or service is capable of being distinct) and (ii) our promise to transfer the good or service to the customer is separately identifiable from other promises in the contract (that is, the promise to transfer the good or service is distinct within the context of the contract). In assessing whether a promised good or service is distinct in the evaluation of a collaboration arrangement subject to Topic 606, we consider factors such as the research, manufacturing and commercialization capabilities of the collaboration partner and the availability of the associated expertise in the general marketplace. We also consider the intended benefit of the contract in assessing whether a promised good or service is separately identifiable from other promises in the contract. If a promised good or service is not distinct, we are required to combine that good or service with other promised goods or services until we identify a bundle of goods or services that is distinct.

The transaction price is then determined and allocated to the identified performance obligations in proportion to their standalone selling prices (*SSP*) on a relative SSP basis. SSP is determined at contract inception and is not updated to reflect changes between contract inception and satisfaction of the performance obligations. Determining the SSP for performance obligations requires significant judgment. In developing the SSP for a performance obligation, we consider applicable market conditions and relevant Company-specific factors, including factors that were contemplated in negotiating the agreement with the customer and estimated costs. In certain circumstances, we may apply the residual method to determine the SSP of a good or service if the standalone selling price is considered highly variable or uncertain. We validate the SSP for performance obligations by evaluating whether changes in the key assumptions used to determine the SSP will have a significant effect on the allocation of arrangement consideration between multiple performance obligations.

If the consideration promised in a contract includes a variable amount, we estimate the amount of consideration to which we will be entitled in exchange for transferring the promised goods or services to a customer. We determine the amount of variable consideration by using the expected value method or the most likely amount method. We include the unconstrained amount of estimated variable consideration in the transaction price. The amount included in the transaction price is constrained to the amount for which it is probable that a significant reversal of cumulative revenue recognized will not occur. At the end of each subsequent reporting period, we re-evaluate the estimated variable consideration included in the transaction price and any related constraint, and if necessary, adjust our estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis in the period of adjustment.

If an arrangement includes development and regulatory milestone payments, we evaluate whether the milestones are considered probable of being reached and estimate the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within our control or the licensee's control, such as regulatory approvals, are generally not considered probable of being achieved until those approvals are received.

In determining the transaction price, we adjust consideration for the effects of the time value of money if the timing of payments provides us with a significant benefit of financing. We do not assess whether a contract has a significant financing component if the expectation at contract inception is such that the period between payment by the licensee and the transfer of the promised goods or services to the licensee will be one year or less. For arrangements with licenses of intellectual property that include sales-based royalties, including milestone payments based on the level of sales, and the license is deemed to be the predominant item to which the royalties relate, we recognize royalty revenue and sales-based milestones at the later of (i) when the related sales occur, or (ii) when the performance obligation to which the royalty has been allocated has been satisfied.

We then recognize as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) each performance obligation is satisfied at a point in time or over time, and if over time, based on the use of an output or input method.

***Research and Development Expenses***

Research and development expenses are composed of both internal and external costs. Internal costs include salaries and employment-related expenses, including stock-based compensation expense, of scientific personnel and direct project costs. External research and development expenses consist primarily of costs associated with clinical and nonclinical development of AV-101, PH94B and PH10, stem cell research and development costs, and costs related to the application and prosecution of patents related to AV-101 and our stem cell technology platform. All such costs are charged to expense as incurred.

We also record accruals for estimated ongoing clinical trial costs. Clinical trial costs represent costs incurred by contract research organizations (*CRO*s) and clinical trial sites. Progress payments are generally made to CROs, clinical sites, investigators and other professional service providers. We analyze the progress of the clinical trial, including levels of subject enrollment, invoices received and contracted costs when evaluating the adequacy of accrued liabilities. Significant judgments and estimates must be made in determining the clinical trial accrual in any reporting period. Actual results could differ from those estimates under different assumptions. Revisions are charged to research and development expense in the period in which the facts that give rise to the revision become known.

Costs incurred in obtaining product or technology licenses are charged immediately to research and development expense if the product or technology licensed has not achieved regulatory approval or reached technical feasibility and has no alternative future uses. In September 2018, we acquired an exclusive license to develop and commercialize PH94B and an option to acquire a license to develop and commercialize PH10 by issuing an aggregate of 1,630,435 unregistered shares of our common stock having a fair market value of $2,250,000. In October 2018, we exercised our option to acquire an exclusive license to develop and commercialize PH10 by issuing 925,926 shares of our unregistered common stock having a fair market value of $2,000,000. Since, at the date of each acquisition, neither product candidate had achieved regulatory approval and each will require significant additional development and expense, we recorded the costs related to acquiring the licenses and the option as research and development expense.

***Stock-Based Compensation***

We recognize compensation cost for all stock-based awards to employees and non-employee consultants based on the grant date fair value of the award. We record stock-based compensation expense over the period during which the employee is required to perform services in exchange for the award, which generally represents the scheduled vesting period. We have not granted restricted stock awards to employees nor do we have any awards with market or performance conditions. For option grants to non-employees, we have historically re-measured the fair value of the awards as they vest and any resulting increase in value has been recognized as an expense during the period over which the services are performed. Noncash expense attributable to compensatory grants of stock to non-employees is determined by the quoted market price of the stock on the date of grant and is either recognized as fully-earned at the time of the grant or expensed ratably over the term of the related service agreement, depending on the terms of the specific agreement.

***Income Taxes***

We account for income taxes using the asset and liability approach for financial reporting purposes. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date. Valuation allowances are established, when necessary, to reduce the deferred tax assets to an amount expected to be realized.

***Concentrations of Credit Risk***

Financial instruments, which potentially subject us to concentrations of credit risk, consist of cash and cash equivalents. Our investment policies limit any such investments to short-term, low-risk investments. We deposit cash and cash equivalents with quality financial institutions and are insured to the maximum of federal limitations. Balances in these accounts may exceed federally insured limits at times.

***Fair Value Measurements***

We do not use derivative instruments for hedging of market risks or for trading or speculative purposes. When applicable, we follow the principles of fair value accounting as they relate to our financial assets and financial liabilities. Fair value is defined as the estimated exit price received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date, rather than an entry price that represents the purchase price of an asset or liability. Where available, fair value is based on observable market prices or parameters, or derived from such prices or parameters. Where observable prices or inputs are not available, valuation models are applied. These valuation techniques involve some level of management estimation and judgment, the degree of which is dependent on several factors, including the instrument's complexity. The required fair value hierarchy that prioritizes observable and unobservable inputs used to measure fair value into three broad levels is described as follows:

- *Level 1* — Quoted prices (unadjusted) in active markets that are accessible at the measurement date for assets or liabilities. The fair value hierarchy gives the highest priority to Level 1 inputs.

- *Level 2* — Inputs other than Level 1 that are observable, either directly or indirectly, such as quoted prices for similar assets or liabilities; quoted prices in markets that are not active; or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities.

- *Level 3* — Unobservable inputs (*i.e.*, inputs that reflect the reporting entity's own assumptions about the assumptions that market participants would use in estimating the fair value of an asset or liability) are used when little or no market data is available. The fair value hierarchy gives the lowest priority to Level 3 inputs.

A financial instrument's categorization within the valuation hierarchy is based upon the lowest level of input that is significant to the fair value measurement. Where quoted prices are available in an active market, securities are classified as Level 1 of the valuation hierarchy. If quoted market prices are not available for the specific financial instrument, then we estimate fair value by using pricing models, quoted prices of financial instruments with similar characteristics or discounted cash flows. In certain cases where there is limited activity or less transparency around inputs to valuation, financial assets or liabilities are classified as Level 3 within the valuation hierarchy.

We carried no assets or liabilities that are measured on a recurring basis at fair value at March 31, 2019 or 2018.

***Warrants Issued in Connection with Equity Financing***

We generally account for warrants issued in connection with equity financings as a component of equity, unless there is a deemed possibility that we may have to settle the warrants in cash or the warrants contain other features requiring them to be treated as liabilities. For warrants issued with the possibility of cash settlement, or otherwise requiring liability treatment, we record the fair value of the issued warrants as a liability at each reporting period and record changes in the estimated fair value as noncash gain or loss in the Consolidated Statements of Operations and Comprehensive Loss.

***Comprehensive Loss***

We have no components of other comprehensive loss other than net loss, and accordingly our comprehensive loss is equivalent to our net loss for the periods presented.

***Loss per Common Share Attributable to Common Stockholders***

Basic net loss attributable to common stockholders per share of common stock excludes the effect of dilution and is computed by dividing net loss increased by the accrual for dividends on our Series B Preferred and, for the fiscal year ended March 31, 2018, the deemed dividend attributable to the trigger of a down-round provision feature (refer to Note 9, *Capital Stock*, for a description of this adjustment), by the weighted-average number of shares of common stock outstanding for the period. Diluted net loss attributable to common stockholders per share of common stock reflects the potential dilution that could occur if securities or other contracts to issue shares of common stock were exercised or converted into shares of common stock. In calculating diluted net loss attributable to common stockholders per share, we have generally not increased the denominator to include the number of potentially dilutive common shares assumed to be outstanding during the period using the treasury stock method because the result is antidilutive.

As a result of our net loss for both years presented, potentially dilutive securities were excluded from the computation of diluted loss per share, as their effect would be antidilutive.

Basic and diluted net loss attributable to common stockholders per share was computed as follows:

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | 2019 | 2018 |
| Numerator: | | |
| Net loss attributable to common stockholders for basic and diluted earnings per share | $ (25,729,500) | $ (15,575,500) |
| Denominator: | | |
| Weighted average basic and diluted common shares outstanding | 28,562,490 | 13,890,041 |
| Basic and diluted net loss attributable to common stockholders per common share | $ (0.90) | $ (1.12) |

Potentially dilutive securities excluded in determining diluted net loss per common share for the fiscal years ended March 31, 2019 and 2018 are as follows:

| | As of March 31, | |
|---|---|---|
| | 2019 | 2018 |
| Series A Preferred stock issued and outstanding [1] | 750,000 | 750,000 |
| Series B Preferred stock issued and outstanding [2] | 1,160,240 | 1,160,240 |
| Series C Preferred stock issued and outstanding [3] | 2,318,012 | 2,318,012 |
| Outstanding options under the Amended and Restated 2016 (formerly 2008) Stock Incentive Plan | 6,626,088 | 5,300,338 |
| Outstanding warrants to purchase common stock | 21,453,402 | 16,603,516 |
| Total | 32,307,742 | 26,132,106 |

[1] Assumes exchange under the terms of the October 11, 2012 Note Exchange and Purchase Agreement, as amended
[2] Assumes exchange under the terms of the Certificate of Designation of the Relative Rights and Preferences of the Series B 10% Convertible Preferred Stock, effective May 5, 2015; excludes common shares issuable in payment of dividends on Series B Preferred upon conversion
[3] Assumes exchange under the terms of the Certificate of Designation of the Relative Rights and Preferences of the Series C Convertible Preferred Stock, effective January 25, 2016

***Recent Accounting Pronouncements***

We believe the following recent accounting pronouncements or changes in accounting pronouncements are of significance or potential significance to the Company.

In February 2016, the Financial Accounting Standards Board (*FASB*) issued Accounting Standards Update (*ASU*) 2016-02, *Leases* (*ASC 842*), which will replace the existing guidance in ASC 840, *Leases*, and which sets out the principles for the recognition, measurement, presentation and disclosure of leases for both parties to a contract (i.e. lessees and lessors). The new standard requires lessees to apply a dual approach, classifying leases as either finance or operating leases based on the principle of whether or not the lease is effectively a financed purchase by the lessee. This classification will determine whether lease expense is recognized based on an effective interest method or on a straight-line basis over the term of the lease, respectively. A lessee is also required to record a right-of-use asset and a lease liability for all leases with a term of greater than 12 months regardless of their classification. Leases with a term of 12 months or less will be accounted for similar to the current guidance for operating leases. This standard becomes effective for our fiscal year beginning April 1, 2019. We estimate that we will record lease liabilities of approximately $4.5 million and right-of-use assets approximating $4.1 million upon implementation of ASC 842. We have evaluated our contracts with clinical research and manufacturing organizations and determined that such contracts do not contain embedded leases.

In June 2018, the FASB issued ASU 2018-07, *Compensation-Stock Compensation (Topic 718), Improvements to Nonemployee Share-Based Payment Accounting* (*ASU 2018-07*). ASU 2018-07 expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. ASU 2018-07 aligns the accounting for share-based payment awards issued to employees and non-employees. Under ASU 2018-07, the existing guidance regarding share-based transactions with employees will apply to share-based transactions with non-employees, as long as the transaction is not effectively a form of financing, with the exception of specific guidance related to the attribution of compensation cost. The cost of non-employee awards will continue to be recorded as if the grantor had paid cash for the goods or services. In addition, the contractual term may be used in lieu of an expected term in the option-pricing model for non-employee awards. ASU 2018-07 is effective for our fiscal year beginning April 1, 2019. We are evaluating the impact of this new guidance, but we do not believe that our adoption of ASU 2018-17 will have a material impact on our consolidated financial statements.

In July 2017, the Financial Accounting Standards Board (*FASB*) issued Accounting Standards Update (*ASU*) 2017-11, "*Earnings Per Share (Topic 260)*; *Distinguishing Liabilities from Equity (Topic 480)*; *Derivatives and Hedging (Topic 815): Part I: Accounting for Certain Financial Instruments with Down Round Features; Part II: Replacement of the Indefinite Deferral for Mandatorily Redeemable Financial Instruments of Certain Nonpublic Entities and Certain Mandatorily Redeemable Noncontrolling Interests with a Scope Exception" (ASU 2017-11)*. Part I of this ASU provides that an entity will no longer have to consider "down round" features (i.e., a provision in an equity-linked financial instrument, such as a free-standing warrant, or an embedded feature, such as a conversion option in a convertible instrument, that reduces the exercise price of such instrument if the entity subsequently sells stock for a lower price or issues an equity-linked instrument with a lower exercise price) when determining whether certain equity-linked financial instruments or embedded features are indexed to its own stock. The definition of a down round feature in ASU 2017-11 excludes standard antidilution provisions related to changes in an entity's capital structure. Accounting Standards Codification Topic 815-40, "Derivatives and Hedging–Contracts in Entity's Own Equity" (*ASC 815-40*) requires that a freestanding equity-linked financial instrument be indexed to the issuer's own stock to be classified as equity. An equity-linked embedded feature that meets the definition of a derivative may avoid bifurcation and derivative accounting if it is indexed to the issuer's own stock. Under the terms of prior guidance, a freestanding financial instrument or embedded feature was not considered indexed to the issuer's own stock if it had a down round provision. Consequently, the freestanding financial instrument was classified as a liability (or asset), and if it met the definition of a derivative, was measured at fair value with changes in fair value recorded through earnings. Similarly, an embedded feature was bifurcated and separately accounted for as a derivative if it met all other criteria for bifurcation under ASC 815-40. The bifurcated embedded feature was also measured at fair value through earnings. Under the provisions of ASU 2017-11, an entity that presents earnings per share (*EPS*) under Accounting Standards Codification Topic 260, "Earnings Per Share" will recognize the effect of a down round feature in a freestanding equity-classified financial instrument only when it is triggered. The effect of triggering such a feature will be recognized as a dividend and a reduction to income available to common shareholders in basic EPS. The new guidance requires new disclosures for financial instruments with down round features and other terms that change conversion or exercise prices. Part I of ASU 2017-11 became effective for fiscal years beginning after December 15, 2018, however early adoption was permitted. We early-adopted ASU 2017-11 effective for our fiscal quarter ended September 30, 2017 and applied its guidance to certain of the warrants issued in the September 2017 Public Offering, as described more completely in Note 9, *Capital Stock*. No retrospective adjustment to our consolidated financial statements was required as a result of our adoption of ASU 2017-11.

In May 2014, the FASB issued ASU No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*, to provide guidance on revenue recognition. In August 2015 and March, April, May and December 2016, the FASB issued additional amendments to the new revenue guidance relating to reporting revenue on a gross versus net basis, identifying performance obligations, licensing arrangements, collectability, noncash consideration, presentation of sales tax, transition, and clarifying examples. Collectively these are referred to as ASC Topic 606, which replaces all legacy GAAP guidance on revenue recognition and eliminates all industry-specific guidance. The new revenue recognition guidance provides a unified model to determine how revenue is recognized. The core principal of the guidance is that an entity should recognize revenue when it transfers promised goods or services to customers in an amount that reflects the consideration to which the company expects to be entitled in exchange for those goods or services. ASC Topic 606 defines a five-step process to achieve this core principal which may require entities to use more judgment and make more estimates than under legacy guidance. These estimates and judgments include identifying performance obligations in the contract, estimating the amount of variable consideration to include in the transaction price and allocating the transaction price to each distinct performance obligation. We adopted ASC Topic 606 as of April 1, 2018, using the modified retrospective transition method, applying the new guidance to the most current period presented. At adoption and currently, we have only the BlueRock Agreement as a potential revenue generating arrangement. We identified no change to the units of accounting previously identified with respect to that contract under legacy GAAP, which are now considered performance obligations under ASC Topic 606, nor did we identify any change to the revenue recognition pattern for the performance obligation. Accordingly, we did not recognize a cumulative effect change to our opening accumulated deficit upon our adoption of ASC Topic 606.

In May 2017, the FASB issued ASU 2017-09, *Compensation - Stock Compensation (Topic 718): Scope of Modification Accounting*, to clarify which changes to the terms or conditions of a share-based payment award require an entity to apply modification accounting under ASC 718. Under this guidance, an entity will not apply modification accounting to a share-based payment award if all of the following remain unchanged immediately before and after the change of terms and conditions:

- The award's fair value (or calculated value or intrinsic value, if those measurement methods are used),
- The award's vesting conditions, and
- The award's classification as an equity or liability instrument.

We adopted ASU 2017-09 effective for our fiscal year beginning April 1, 2018. Our adoption of ASU 2017-09 did not have a material impact on our financial statements.

Other accounting standards that have been issued or proposed by the FASB or other standards-setting bodies that do not require adoption until a future date are not expected to have a material impact on our consolidated financial statements upon adoption.

**4. Receivable from Supplier**

This amount reflects the balance of a prepayment made to a supplier that is to be refunded due to the termination of the underlying contract prior to March 31, 2019.

**5. Prepaid Expenses and Other Current Assets**

Prepaid expenses and other current assets consist of the following:

| | March 31, | |
|---|---|---|
| | **2019** | **2018** |
| AV-101 and PH94B materials and contract services | $ 5,900 | $ 505,900 |
| Fair value of securities issued for professional services | 105,900 | - |
| Insurance | 96,300 | 88,300 |
| Public offering filing fees and expenses | 22,300 | 25,900 |
| All other | 20,500 | 24,700 |
| | $ 250,900 | $ 644,800 |

**6. Property and Equipment**

Property and equipment consists of the following:

| | March 31, | |
|---|---|---|
| | **2019** | **2018** |
| Laboratory equipment | $ 892,500 | $ 888,300 |
| Tenant improvements | 214,400 | 26,900 |
| Computers and network equipment | 54,600 | 54,600 |
| Office furniture and equipment | 84,600 | 79,700 |
| | 1,246,100 | 1,049,500 |
| Accumulated depreciation and amortization | (933,400) | (842,100) |
| Property and equipment, net | $ 312,700 | $ 207,400 |

The increase in tenant improvements reflects recently completed construction at our South San Francisco, California offices. Under the terms of our November 2016 lease extension agreement, our landlord has provided a cash reimbursement of $158,600 of such tenant improvement costs. Such reimbursement is a component of the deferred rent liability shown on our Consolidated Balance Sheet at March 31, 2019.

The following table summarizes depreciation and amortization expense attributable to owned and leased property and equipment for the fiscal years ended March 31, 2019 and 2018:

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | 2019 | 2018 |
| Owned assets | $ 88,300 | $ 77,800 |
| Leased assets | 2,900 | 2,900 |
| Total depreciation and amortization | $ 91,200 | $ 80,700 |

Other than certain leased office equipment, none of our assets were subject to third party security interests at March 31, 2019 or 2018.

**7. Accrued Expenses**

Accrued expenses consist of:

| | March 31, | |
|---|---|---|
| | 2019 | 2018 |
| Accrued AV-101 clinical trial, development, and related expenses | $ 1,067,600 | $ 176,600 |
| Accrued compensation | 439,200 | - |
| Accrued professional services | 172,100 | 27,000 |
| All other | 6,700 | 2,700 |
| | $ 1,685,600 | $ 206,300 |

**8. Notes Payable**

The following table summarizes our notes payable:

| | March 31, 2019 | | | March 31, 2018 | | |
|---|---|---|---|---|---|---|
| | Principal Balance | Accrued Interest | Total | Principal Balance | Accrued Interest | Total |
| 7.75% (2019) and 7.15% (2018) Notes payable to insurance premium financing company (current) | $ 57,300 | $ - | $ 57,300 | $ 53,900 | $ - | $ 53,900 |

In February 2018, we executed a 7.15% promissory note in the principal amount of $59,700 in connection with certain insurance policy premiums. That note was payable in monthly installments of $6,200, including principal and interest, through December 2018, when it was paid in full. In May 2018, we executed a 6.50% promissory note in the principal amount of $160,500 in connection with other insurance policy premiums. That note was payable in monthly installments of $16,500, including principal and interest, through March 2019, when it was paid in full. In February 2019, we executed a 7.75% promissory note in the face amount of $63,500 in connection with other insurance policy premiums. The note is payable in monthly installments of $6,600, including principal and interest, through December 2019, and has an outstanding balance of $57,300 at March 31, 2019.

**9. Capital Stock**

***Common Stock***

At our Annual Meeting of Stockholders on September 15, 2017, as approved by and recommended to our stockholders by our Board of Directors (*Board*), our stockholders approved an amendment to our Restated Articles of Incorporation to increase the authorized number of shares of common stock that we may issue from 30.0 million shares to 100.0 million shares. The amendment became effective on September 15, 2017, upon our filing of a certificate of amendment with the Nevada Secretary of State. In connection with the underwritten public offering of our common stock and warrants in May 2016, our common stock was approved for listing on the Nasdaq Capital Market. Our common stock has been trading on the Nasdaq Capital Market under the symbol “VTGN” since May 11, 2016.

***Series A Preferred Stock***

In December 2011, our Board authorized the creation of a series of up to 500,000 shares of Series A Preferred, par value $0.001 (*Series A Preferred*). Each restricted share of Series A Preferred is currently convertible at the option of the holder into one and one-half restricted shares of our common stock. The Series A Preferred ranks prior to the common stock for purposes of liquidation preference.

The Series A Preferred has no separate dividend rights, however, whenever the Board declares a dividend on the common stock, each holder of record of a share of Series A Preferred shall be entitled to receive an amount equal to such dividend declared on one share of common stock multiplied by the number of shares of common stock into which such share of Series A Preferred could be converted on the applicable record date.

Except with respect to transactions upon which the Series A Preferred shall be entitled to vote separately as a class, the Series A Preferred has no voting rights. The restricted common stock into which the Series A Preferred is convertible shall, upon issuance, have all of the same voting rights as other issued and outstanding shares of our common stock.

In the event of the liquidation, dissolution or winding up of our affairs, after payment or provision for payment of our debts and other liabilities, the holders of Series A Preferred then outstanding shall be entitled to receive distributions out of our assets, if any, an amount per share of Series A Preferred calculated by taking the total amount available for distribution to holders of all of our outstanding common stock before deduction of any preference payments for the Series A Preferred, divided by the total of (x), all of the then outstanding shares of our common stock, plus (y) all of the shares of our common stock into which all of the outstanding shares of the Series A Preferred can be converted before any payment shall be made or any assets distributed to the holders of the common stock or any other junior stock.

At March 31, 2019 and 2018, there were 500,000 restricted shares of Series A Preferred outstanding, convertible into 750,000 shares of our common stock at the option of the two respective holders.

***Series B Preferred Stock***

In July 2014, our Board authorized the creation of a class of Series B Preferred Stock, par value $0.001 (*Series B Preferred*). In May 2015, we filed a Certificate of Designation of the Relative Rights and Preferences of the Series B 10% Preferred Stock of VistaGen Therapeutics, Inc. (*Certificate of Designation*) with the Nevada Secretary of State to designate 4.0 million shares of our authorized preferred stock as Series B Preferred.

Each share of Series B Preferred is convertible, at the option of the holder (*Voluntary Conversion*), into one (1) share of our common stock, subject to adjustment only for customary stock dividends, reclassifications, splits and similar transactions set forth in the Certificate of Designation. Outstanding shares of Series B Preferred are also convertible automatically on a one-to-one basis into shares of our common stock (*Automatic Conversion*) upon the closing or effective date of any of the following transactions or events: (i) a strategic transaction involving AV-101 with an initial up-front cash payment to us of at least $10.0 million; (ii) a registered public offering of our common stock with aggregate gross proceeds to us of at least $10.0 million; or (iii) for 20 consecutive trading days, our common stock trades at least 20,000 shares per day with a daily closing price of at least $12.00 per share; provided, however, that Automatic Conversion and Voluntary Conversion (collectively, *Conversion*) are subject to certain beneficial ownership blockers as set forth in the Certificate of Designation and/or securities purchase agreements. Following the completion of our underwritten public offering in May 2016, which occurred concurrently with and facilitated the listing of our common stock on the NASDAQ Capital Market, approximately 2.4 million shares of Series B Preferred were converted automatically into approximately 2.4 million shares of our common stock pursuant to the Automatic Conversion provision. There have been no conversions of Series B Preferred since August 2016.

Prior to Conversion, shares of Series B Preferred accrue in-kind dividends (payable only in unregistered shares of our common stock) at a rate of 10% per annum (*Accrued Dividends*). The Accrued Dividends are payable on the date of either a Voluntary Conversion or Automatic Conversion in that number of shares of common stock equal to the Accrued Dividends. At March 31, 2019, we have recognized a liability in the amount of $3,748,200 for Accrued Dividends in the accompanying Consolidated Balance Sheet at March 31, 2019, based on the Series B Preferred issued and outstanding through that date. We have recognized a deduction from net loss of $1,139,900 and $1,030,400 related to dividends on Series B Preferred in arriving at net loss attributable to common stockholders in the accompanying Consolidated Statement of Operations and Comprehensive Loss for the fiscal years ended March 31, 2019 and 2018, respectively.

In the event of the liquidation, dissolution or winding-up of our affairs, after payment or provision for payment of our debts and other liabilities, the Holders of the Series B Preferred then outstanding shall be entitled to receive distributions out of our assets, if any, an amount equal to the Stated Value of the Series B Preferred ($7.00 per share), plus any accrued and unpaid dividends thereon, before any distribution or payment shall be made to the holders of any junior securities, including holders of our common stock. If our assets are insufficient to pay, in full, such amounts, then the entire assets to be distributed to the holders of the Series B Preferred shall be ratably distributed among the holders in accordance with the respective amounts that would be payable on such shares if all amounts payable thereon were paid in full. Upon liquidation, each share of Series B Preferred ranks pari-passu with our Series A Preferred and our Series C Preferred (defined below).The liquidation value of the Series B Preferred at March 31, 2019 is approximately $11,869,800.

At March 31, 2019 and 2018, there were 1,160,240 shares of Series B Preferred outstanding, which shares are subject to beneficial ownership blockers and are exchangeable at the option of the two respective holders by Voluntary Conversion, or pursuant to Automatic Conversion to the extent not otherwise subject to beneficial ownership blockers, into an aggregate of 1,160,240 shares of our common stock, excluding shares of our common stock which may be issued in payment of Accrued Dividends upon conversion.

***Series C Preferred Stock***

In January 2016, our Board authorized the creation of and, accordingly, we filed a Certificate of Designation of the Relative Rights and Preferences of the Series C Convertible Preferred Stock of VistaGen Therapeutics, Inc. (the *Series C Preferred Certificate of Designation*) with the Nevada Secretary of State to designate 3.0 million shares of our preferred stock, par value $0.001 per share, as Series C Convertible Preferred Stock (*Series C Preferred*).

In the event of the liquidation, dissolution or winding up of our affairs, after payment or provision for payment of our debts and other liabilities, the holders of Series C Preferred then outstanding shall be entitled to receive, out of our assets, if any, an amount per share of Series C Preferred calculated by taking the total amount available for distribution to holders of all of our outstanding common stock before deduction of any preference payments for the Series C Preferred, divided by the total of (x), all of the then outstanding shares of our common stock, plus (y) all of the shares of our common stock into which all of the outstanding shares of the Series C Preferred can be exchanged before any payment shall be made or any assets distributed to the holders of the common stock or any other junior stock. Upon liquidation, each share of Series C Preferred ranks pari-passu with our Series B Preferred and our Series A Preferred.

Each share of Series C Preferred is convertible, at the option of the holder into one share of our common stock, subject to certain beneficial ownership limitations as set forth in the Series C Preferred Certificate of Designation. Shares of the Series C Preferred do not accrue dividends, and holders of the Series C Preferred have no voting rights. At March 31, 2019 and 2018, one holder and its affiliates held all 2,318,012 outstanding shares of Series C Preferred.

***Common Stock and Warrants Issued in September 2017 Public Offering***

On September 6, 2017, we completed a public offering of units consisting of shares of common stock and Series A1 and A2 common stock purchase warrants to two of our existing institutional investors (the *September 2017 Public Offering*), resulting in gross proceeds of approximately $2.4 million. We issued an aggregate of 1,371,430 shares of our common stock, Series A1 Warrants to purchase up to 1,388,931 shares of common stock and Series A2 Warrants to purchase up to 503,641 of common stock (collectively, the *Warrants*), each exercisable for $1.82 per share. The Series A1 Warrants became exercisable by the investors for a five-year period commencing on March 7, 2018, and the Series A2 Warrants were immediately exercisable at any time through September 6, 2022. The common stock and the shares of common stock underlying the Warrants issued in the September 2017 Public Offering were offered, issued and sold pursuant to our S-3 Registration Statement (Registration No. 333-215671) that had previously been declared effective by the Securities and Exchange Commission (the *Commission*) to cover this and potential future sales of our equity securities in one or more public offerings from time to time. We received net proceeds of approximately $2.0 million from the September 2017 Public Offering, after deducting underwriter’s commission and other expenses related to the offering.

The Series A1 Warrants to purchase an aggregate of 1,388,931 shares of our common stock issued in the September 2017 Public Offering have no anti-dilution or other exercise price or share reset features, except as is customary with respect to a change in our capital structure in the event of a stock split or dividend, and, accordingly, we accounted for them as equity warrants. The Series A2 Warrants to purchase an aggregate of 503,641 shares of our common stock contained anti-dilution protection provisions that would take effect upon the issuance of any common stock, securities convertible into common stock or certain other issuances at a price below the then-current ($1.82 per share) exercise price of the Series A2 Warrants, with certain exceptions; provided, however, that such anti-dilution protection would terminate automatically on the trading day following the date on which we raised at least $20.0 million in aggregate gross proceeds through one or more issuances of common stock or equity-linked securities. The anti-dilution protection provisions in the Series A2 Warrants constituted a down round feature subject to the guidance in ASU 2017-11. Since the Series A2 Warrants contained no other provisions which required their treatment as liability warrants rather than equity warrants, including exercise price or share reset features, except as is customary with respect to a change in our capital structure in the event of a stock split or dividend and which are also present in the Series A1 Warrants, we also accounted for the Series A2 Warrants as equity warrants. The anti-dilution protection provisions of the Series A2 Warrants were triggered upon our issuance of common stock and warrants in the December 2017 Public Offering (defined below) at a price below the Series A2 Warrants' then-current $1.82 per share exercise price.

***Common Stock and Warrants Issued in December 2017 Public Offering and Trigger of Anti-Dilution Protection Provisions of Series A2 Warrants Issued in September 2017 Public Offering***

On December 13, 2017, we completed a public offering of units consisting of shares of common stock and common stock purchase warrants at a combined public offering price of $1.50 per share and related warrant (the *December 2017 Public Offering*), resulting in gross proceeds of $15.0 million. We issued an aggregate of 10,000,000 shares of our common stock and warrants to purchase up to 10,000,000 shares of our common stock at an exercise price of $1.50 per share (the *December 2017 Offering Warrants*). The common stock and the shares of common stock underlying the December 2017 Offering Warrants issued in the December 2017 Public Offering were offered, issued and sold pursuant to our Registration Statement on Form S-1 (Registration No. 333-221009) that was declared effective by the Commission on December 11, 2017. The December 2017 Offering Warrants are exercisable at any time through December 13, 2022, have no anti-dilution or other exercise price or share reset features, except as is customary with respect to a change in our capital structure in the event of a stock split or dividend, and do not contain any cashless exercise features as long as our Registration Statement on Form S-1 (Registration No. 333-221009) is effective. Accordingly, we accounted for the December 2017 Offering Warrants as equity warrants. We received net proceeds of approximately $13.6 million from the December 2017 Public Offering, after deducting underwriter's commission and other expenses related to the offering.

Our sale of units consisting of common stock and warrants in the December 2017 Public Offering at an offering price of $1.50 per unit triggered the anti-dilution provisions of the Series A2 Warrants. In accordance with the anti-dilution terms and formula contained in the Series A2 warrants, the exercise price of the Series A2 Warrants was reduced to $0.001 per share. In December 2017 and January 2018, the holders exercised the reset Series A2 warrants to purchase an aggregate of 503,641 shares of our common stock from which we received nominal cash proceeds. In accordance with the guidance in ASU 2017-11, we recognized the effect of triggering the down round feature as a deemed dividend in our Consolidated Statements of Stockholders' Equity for the fiscal year ended March 31, 2018 and as an increase in net loss attributable to common stockholders and in our calculation of basic and fully diluted earnings per share in our Consolidated Statements of Operations and Comprehensive Loss for the fiscal year ended March 31, 2018.

We calculated the deemed dividend from the trigger of the down round provision feature, $199,200, using the Black-Scholes Option Pricing Model and the assumptions indicated in the table below:

| **Assumption:** | **Pre-reset** | **Post-reset** |
|---|---|---|
| Market price per share | $ 1.17 | $ 1.17 |
| Exercise price per share | $ 1.82 | $ 0.001 |
| Risk-free interest rate | 2.09% | 2.09% |
| Remaining contractual term in years | 4.73 | 4.73 |
| Volatility | 97.8% | 97.8% |
| Dividend rate | 0.0% | 0.0% |
| | | |
| Number of warrant shares | 503,641 | 503,641 |
| **Fair value per share** | **$ 0.77** | **$ 1.17** |

***Common Stock Issued in Spring 2019 Public Offering***

During the quarter ended March 31, 2019, we completed an underwritten public offering of 11,500,000 shares of our common stock, including the overallotment option, at a public offering price of $1.00 per share, resulting in gross proceeds to us of $11,500,000, pursuant to our shelf registration statement on Form S-3 (File No. 333-215671), previously filed with the Commission (the *Spring 2019 Public Offering*). We received net proceeds of approximately $10.4 million after deducting underwriter's commission and offering expenses.

***Common Stock and Warrants Issued in Private Placements in our Fiscal Year Ended March 31, 2018***

During the quarter ended June 30, 2017, in self-placed private placement transactions, we accepted subscription agreements from individual accredited investors, pursuant to which we sold to such investors units, at a weighted average purchase price of $2.00 per unit, consisting of an aggregate of 437,751 unregistered shares of our common stock and warrants, exercisable through April 30, 2021, to purchase an aggregate of 218,875 unregistered shares of our common stock at a weighted average exercise price of $3.99 per share. The purchasers of the units have no registration rights with respect to the shares of common stock, warrants or the shares of common stock issuable upon exercise of the warrants comprising the units sold. The warrants are not exercisable until six months and one day following the date of issuance. We received aggregate cash proceeds of $873,300 in connection with these self-placed private placement transactions, and the entire amount of the proceeds was credited to stockholders' equity.

During the quarter ended September 30, 2017, in a self-placed private placement transaction, we sold to an accredited investor units consisting of 28,572 shares of our unregistered common stock and warrants exercisable through April 30, 2021 to purchase 28,572 unregistered shares of our common stock at an exercise price of $4.00 per share. The purchaser of the units has no registration rights with respect to the shares of common stock, warrants or the shares of common stock issuable upon exercise of the warrants comprising the units sold. The warrants are not exercisable until six months and one day following the date of issuance. We received cash proceeds of $50,000 from this sale of our securities, and the entire amount of the proceeds was credited to stockholders' equity.

During the quarter ended December 31, 2017, in a self-placed private placement transaction, we sold to an accredited investor units consisting of 150,000 shares of our unregistered common stock and warrants exercisable through November 30, 2021 to purchase 150,000 unregistered shares of our common stock at an exercise price of $2.00 per share. The purchaser of the units has no registration rights with respect to the shares of common stock, warrants or the shares of common stock issuable upon exercise of the warrants comprising the units sold. The warrants are not exercisable until six months and one day following the date of issuance. We received cash proceeds of $150,000 from this sale of our securities, and the entire amount of the proceeds was credited to stockholders' equity.

***Common Stock and Warrants Issued in Summer 2018 Private Placement***

Between June 2018 and October 2018, we completed a self-placed private placement with accredited investors, pursuant to which we sold units, at a purchase price of $1.25 per unit, consisting of 4,605,000 unregistered shares of our common stock and warrants, exercisable through February 28, 2022, to purchase 4,605,000 unregistered shares of our common stock at an exercise price of $1.50 per share (the *Summer 2018 Private Placement*). The purchasers of the units have no registration rights with respect to the shares of common stock, warrants or the shares of common stock issuable upon exercise of the warrants comprising the units sold. The warrants are not exercisable until at least six months and one day following the date of issuance. We received aggregate cash proceeds of $5,756,200 in connection with the Summer 2018 Private Placement and the entire amount of the proceeds was credited to stockholders' equity.

***Common Stock and Warrants Issued in Fall 2018 Private Placement***

The Summer 2018 Private Placement was oversubscribed. To accommodate additional investor interest, during October 2018, we accepted subscription agreements from accredited investors, pursuant to which we sold to such investors units, at a unit purchase price equal to $0.15 above the closing quoted market price of our common stock on the Nasdaq Capital Market on the effective date of the investor's subscription agreement, consisting of an aggregate of 420,939 unregistered shares of our common stock and four-year, immediately exercisable warrants to purchase 420,939 unregistered shares of our common stock at a per share exercise price equal to the closing quoted market price of our common stock on the Nasdaq Capital Market on the effective date of the investor's subscription agreement (the *Fall 2018 Private Placement*). The purchasers of the units have no registration rights with respect to the shares of common stock, warrants or the shares of common stock issuable upon exercise of the warrants comprising the units sold. We received aggregate cash proceeds of $812,500 in connection with the Fall 2018 Private Placement and settled an outstanding professional service payable by accepting a subscription agreement in the amount of $40,000 and issuing the corresponding number of shares of common stock and warrants. The entire amount of the proceeds of the Fall 2018 Private Placement was credited to stockholders' equity. The fair value of the common stock and warrant issued in the Fall 2018 Private Placement in settlement of the professional services payable was determined to be $62,700 on the effective date of the agreement. Accordingly, we recognized a loss on extinguishment of accounts payable in the amount of $22,700 in our Consolidated Statement of Operations and Comprehensive Loss for the fiscal year ended March 31, 2019.

***Modification of Warrants issued in Summer 2018 Private Placement***

Subsequent to the completion of the Summer 2018 Private Placement, we amended warrants to purchase an aggregate of 304,000 shares of our common stock issued to investors who submitted Summer 2018 Private Placement subscription agreements between October 3, 2018 and October 5, 2018 to increase the exercise price of their warrants from $1.50 per share to $1.59 per share or $1.69 per share, depending on the effective date of the related subscription agreement, to comply with certain provisions of The Nasdaq Stock Market Rules applicable to the private placement. As additional consideration for agreeing to the increase in the warrant exercise price, we granted the investors additional warrants to purchase an aggregate of 23,800 unregistered shares of our common stock at an exercise price of $1.75 per share through February 28, 2022. We calculated the fair value of the modified warrants immediately before and after the modification using the Black Scholes Option Pricing Model and determined that the increase in the exercise price resulted in a decrease in the fair value of the warrants, which decrease is not recognized. We calculated the fair value of the new warrants using the Black-Scholes Option Pricing Model and the weighted average assumptions indicated in the table below, recognizing $25,800 as the fair value of the new warrants and as warrant modification expense, included as a component of general and administrative expenses, in our Consolidated Statement of Operations and Comprehensive Loss for the fiscal year ended March 31, 2019.

| **Assumption:** | **New Warrants** |
|---|---|
| Market price per share | $ 1.80 |
| Exercise price per share | $ 1.75 |
| Risk-free interest rate | 2.83% |
| Remaining contractual term in years | 3.25 |
| Volatility | 88.80% |
| Dividend rate | 0.0% |
| | |
| Number of warrant shares | 23,800 |
| **Weighted average fair value per share** | **$ 1.08** |

***Issuance of Common Stock for Product Licenses and Option***

As indicated in Note 1, *Description of Business*, and Note 3, *Summary of Significant Accounting Policies*, in September 2018 we issued an aggregate of 1,630,435 shares of our unregistered common stock having a fair market value of $2,250,000, based on the $1.38 per share quoted closing market price of our common stock on the Nasdaq Capital Market, to Pherin to acquire an exclusive worldwide license to develop and commercialize PH94B and an option to acquire a similar license for PH10. In October 2018, we exercised our option to acquire an exclusive worldwide license to develop and commercialize PH10 by issuing 925,926 shares of our unregistered common stock having a fair market value of $2,000,000, based on the $2.16 per share closing quoted market price of our common stock on the Nasdaq Capital Market, to Pherin under the terms of the PH10 license agreement. Under the terms of the PH94B and PH10 license agreements, we are obligated to make additional cash payments and pay royalties to Pherin in the event that certain regulatory and performance-based milestones and commercial sales are achieved. Additionally, in connection with the license agreements, we are obligated to pay to Pherin monthly support payments of $10,000 for a term of the earlier of 18 months or the termination of the license agreement, however no monthly support payment is required under the 18-month period identified in the PH10 license agreement if support payments are being made under the terms of the PH94B license agreement.

***Issuance of Common Stock and Warrants to Professional Services Providers and in Settlement of Accounts Payable***

During our fiscal years ended March 31, 2018 and 2019, we issued the following securities in private placement transactions as compensation for various professional services. Unless otherwise noted, we recorded the related noncash expense as a component of general and administrative expense in the Consolidated Statement of Operations and Comprehensive Loss for the fiscal years ended March 31, 2018 and 2019, as appropriate.

- During the quarter ended September 30, 2017, we issued an aggregate of 927,500 unregistered shares of our common stock, of which 477,500 shares were issued from our 2016 Plan, for various professional services, including contract research, legal, investor relations and financial advisory services. The common stock issued had an aggregate fair value of $1,503,600 on the dates issued, of which all but $117,300 has been recognized as noncash expense through March 31, 2018. The un-expensed portion at March 31, 2018, which is included in prepaid expenses in our accompanying Consolidated Balance Sheet, is being recognized in expense ratably through July 2019 in accordance with the terms of work orders for certain contract research services to be provided through that period.

- During the quarter ended December 31, 2017, we issued an aggregate of 70,000 unregistered shares of our common stock, all of which were issued from our Amended and Restated 2016 Stock Incentive Plan for additional investor relations and financial advisory services. The common stock issued had an aggregate fair value of $140,800 on the dates issued.

- During the quarter ended December 31, 2017, we also issued 500,000 unregistered shares of our common stock having a fair value at the time of issuance of $585,000 and a cash payment of $76,500 to our contract manufacturing organization (*CMO*) in exchange for and settlement of $526,500 of open accounts payable for services provided by the CMO relating to production of AV-101 drug substance. We recognized a corresponding loss on settlement of accounts payable in the amount of $135,000 in the Consolidated Statement of Operations and Comprehensive Loss for the fiscal year ended March 31, 2018.

- During the quarter ended March 31, 2018, we issued 30,000 unregistered shares of our common stock to a provider of investor relations and financial advisory services. The common stock issued had an aggregate fair value of $39,000 on the date issued.

- During the quarter ended June 30, 2018, we issued an aggregate of 100,000 unregistered shares of our common stock having a fair value on the dates of issuance of $123,000 as full or partial compensation to an investor relations service provider and under a financial advisory agreement.

- During the quarter ended September 30, 2018, we issued 50,000 shares of our unregistered common stock having a fair value on the date of issuance of $68,000 as partial compensation to a corporate awareness service provider.

- During the quarter ended September 30, 2018, we also issued four-year warrants to three service providers to purchase an aggregate of 288,000 unregistered shares of our common stock at an exercise price of $1.50 per share as full or partial compensation for investor relations and corporate awareness services. We valued the warrants at an aggregate fair value of $266,900 using the Black-Scholes Option Pricing Model and the following grant date weighted average assumptions: exercise price per share: $1.50; market price per share: $1.40; risk-free interest rate: 2.71%; contractual term: 4 years; volatility: 94.17%; dividend rate: 0%; deriving a value per warrant share of $0.93. The fair value of the common stock and warrants is being recognized in expense ratably over the term of the underlying contracts.

- During the quarter ended March 31, 2019, we issued 25,000 registered shares of our common stock having a fair value of $41,500 on the date of issuance from our Amended and Restated 2016 Stock Incentive Plan to an investor relations and social media service provider. The fair value of the common stock is being recognized in expense ratably over the term of the underlying contract.

***Stock Option Exercises***

During the quarter ended March 31, 2019, our Chief Executive Officer and Chief Scientific Officer and a member of our Board exercised outstanding stock options to purchase an aggregate of 29,250 shares of our common stock and we received cash proceeds of $43,900.

***Warrant Modifications***

In addition to the Summer 2018 Private Placement warrants modified during our fiscal year ended March 31, 2019, we modified other outstanding warrants during our fiscal year ended March 31, 2018.

During the quarter ended September 30, 2017, the Board authorized the modification of outstanding warrants issued in private placement transactions between March 2017 and June 2017 to reduce the exercise prices and increase the number of shares issuable thereunder. We calculated the fair value of the warrant immediately before and after the modification using the Black-Scholes Option Pricing Model and the weighted average assumptions indicated in the table below. We recognized the incremental fair value, $279,700, as warrant modification expense, included as a component of general and administrative expenses, in our Consolidated Statement of Operations and Comprehensive Loss for the fiscal year ended March 31, 2018.

| **Assumption:** | **Pre-modification** | **Post-modification** |
|---|---|---|
| Market price per share | $ 1.54 | $ 1.54 |
| Exercise price per share | $ 3.99 | $ 2.00 |
| Risk-free interest rate | 1.62% | 1.62% |
| Remaining contractual term in years | 3.62 | 3.62 |
| Volatility | 95.5% | 95.5% |
| Dividend rate | 0.0% | 0.0% |
| | | |
| Number of warrant shares | 247,500 | 495,001 |
| **Weighted average fair value per share** | **$ 0.71** | **$ 0.92** |

During the quarter ended December 31, 2017, the Board authorized the modification of outstanding warrants issued in private placement transactions between August 2017 and November 2017 to reduce the exercise prices of the warrants. We calculated the fair value of the warrants immediately before and after the modification using the Black Scholes Option Pricing Model and the weighted average assumptions indicated in the table below. We recognized the incremental fair value, $13,000, as warrant modification expense, included as a component of general and administrative expenses, in our Consolidated Statement of Operations and Comprehensive Loss for the fiscal year ended March 31, 2018.

| **Assumption:** | **Pre-modification** | **Post-modification** |
|---|---|---|
| Market price per share | $ 1.14 | $ 1.14 |
| Exercise price per share | $ 2.32 | $ 1.58 |
| Risk-free interest rate | 2.12% | 2.12% |
| Remaining contractual term in years | 3.85 | 3.85 |
| Volatility | 98.7% | 98.7% |
| Dividend rate | 0.0% | 0.0% |
| | | |
| Number of warrant shares | 178,572 | 178,572 |
| **Weighted average fair value per share** | **$ 0.64** | **$ 0.71** |

**Warrants Outstanding**

The following table summarizes outstanding and exercisable warrants to purchase shares of our common stock as of March 31, 2019. The weighted average exercise price of outstanding and exercisable warrants at March 31, 2019 was $2.53 per share and $2.57 per share, respectively.

| Exercise Price per Share | Expiration Date | Warrants Outstanding at March 31, 2019 | Warrants Exercisable at March 31, 2019 |
|---|---|---|---|
| $ 1.50 | 11/30/2021 to 12/13/2022 | 14,335,200 | 13,857,200 |
| $ 1.59 | 2/28/2022 | 292,000 | - |
| $ 1.69 | 2/28/2022 | 12,000 | - |
| $ 1.70 | 10/5/2022 | 182,434 | 182,434 |
| $ 1.75 | 2/28/2022 | 23,800 | - |
| $ 1.80 | 10/10/2022 | 115,385 | 115,385 |
| $ 1.82 | 3/7/2023 | 1,388,931 | 1,388,931 |
| $ 2.00 | 4/30/2021 | 523,573 | 523,573 |
| $ 2.20 | 10/19/2022 | 106,383 | 106,383 |
| $ 2.24 | 10/16/2022 | 16,737 | 16,737 |
| $ 3.51 | 12/31/2021 | 50,000 | 50,000 |
| $ 4.50 | 9/26/2019 | 25,000 | 25,000 |
| $ 5.30 | 5/16/2021 | 2,705,883 | 2,705,883 |
| $ 6.00 | 9/26/2019 to 11/30/2019 | 97,750 | 97,750 |
| $ 7.00 | 1/11/2020 to 3/3/2023 | 1,262,878 | 1,262,878 |
| $ 8.00 | 3/25/2021 | 185,000 | 185,000 |
| $ 10.00 | 1/11/2020 | 20,000 | 20,000 |
| $ 20.00 | 9/15/2019 | 110,448 | 110,448 |
| | | 21,453,402 | 20,647,602 |

**Reserved Shares**

At March 31, 2019, we have reserved shares of our common stock for future issuance as follows:

| | |
|---|---|
| Upon exchange of all shares of Series A Preferred currently issued and outstanding [1] | 750,000 |
| Upon exchange of all shares of Series B Preferred currently issued and outstanding [2] | 5,096,738 |
| Upon exchange of all shares of Series C Preferred currently issued and outstanding [3] | 2,318,012 |
| Pursuant to warrants to purchase common stock: | |
| Subject to outstanding warrants | 21,453,402 |
| Pursuant to stock incentive plan: | |
| Subject to outstanding options under the Amended and Restated 2016 Stock Incentive Plan | 6,626,088 |
| Available for future grants under the Amended and Restated 2016 Stock Incentive Plan | 2,607,162 |
| | 9,233,250 |
| Total | 38,851,402 |

[1] Assumes exchange under the terms of the October 11, 2012 Note Exchange and Purchase Agreement
[2] Assumes exchange under the terms of the Certificate of Designation of the Relative Rights and Preferences of the Series B 10% Convertible Preferred Stock, effective May 5, 2015; includes 3,936,498 shares of common stock issuable in payment of dividends on Series B Preferred upon conversion
[3] Assumes exchange under the terms of the Certificate of Designation of the Relative Rights and Preferences of the Series C Convertible Preferred Stock, effective January 25, 2016

At March 31, 2019, we have 18,525,633 authorized shares of our common stock not subject to reserves and available for future issuance.

**10. Research and Development Expenses**

We recorded research and development expenses of approximately $17.1 million (including approximately $5.6 million of non-cash expense) and $7.8 million in the fiscal years ended March 31, 2019 and 2018, respectively. Research and development expense is composed of employee compensation expenses, including stock–based compensation, direct project expenses, notably including costs attributable to our AV-101 ELEVATE clinical trial and other preclinical and nonclinical projects, and costs to maintain and prosecute our intellectual property suite, including new patent applications for AV-101 for various indications. As indicated in Note 9, *Capital Stock*, research and development expense for the fiscal year ended March 31, 2019 also includes non-cash expense of $4.25 million attributable to the acquisition of the PH94B and PH10 licenses and the PH10 option.

**11. Income Taxes**

The provision for income taxes for the periods presented in the Consolidated Statements of Operations and Comprehensive Loss represents minimum California franchise tax and North Carolina income tax.

On December 22, 2017, the Tax Cuts and Jobs Act (the *Tax Act*) was enacted into law, significantly changing the fundamentals of U.S. corporate income taxation by, among many other things, reducing the U.S. federal corporate income tax rate to 21%, converting to a territorial tax system, and creating various income inclusion and expense limitation provisions. The reduction of the U.S. federal statutory tax rate from 34% to 21% became effective January 1, 2018. Income tax expense for the fiscal year ended March 31, 2018 was computed by applying the U.S. federal income tax rate of 34% for April 1, 2017 to December 31, 2017 and 21% for January 1, 2018 to March 31, 2018 (prorated basis 30.75%) to pretax losses. Income tax expense differed from the amounts computed by applying the U.S. federal income tax rate of 21% and the prorated rate of 30.75% for the fiscal years ended March 31, 2019 and 2018, respectively, to pretax losses as a result of the following:

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | **2019** | **2018** |
| Computed expected tax benefit | (21.00)% | (30.75)% |
| Tax effect of warrant modifications and other non-deductible items | 0.74% | 0.40% |
| Tax effect of research and development credits | (1.92)% | (1.44)% |
| Effect of U.S. tax law change (federal and state) | -% | 88.09% |
| Other losses not benefitted | 22.19% | (56.28)% |
| Other | -% | -% |
| Income tax expense | 0.01% | 0.02% |

Deferred income taxes reflect the net tax effect of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Significant components of our deferred tax assets are as follows:

| | March 31, | |
|---|---|---|
| | **2019** | **2018** |
| Deferred tax assets: | | |
| Net operating loss carryovers | $ 27,190,900 | $ 21,402,600 |
| Basis differences in fixed assets | (2,700) | (7,600) |
| Stock based compensation | 3,516,600 | 2,504,500 |
| Accruals and reserves | 2,047,500 | 1,352,900 |
| Total deferred tax assets | 32,752,300 | 25,252,400 |
| Valuation allowance | (32,752,300) | (25,252,400) |
| Net deferred tax assets | $ - | $ - |

Realization of deferred tax assets is dependent upon future earnings, if any, the timing and amount of which are uncertain. Accordingly, the deferred tax assets have been fully offset by a valuation allowance. The valuation allowance increased by $7,499,900 and decreased by $9,529,300 during the fiscal years ended March 31, 2019 and 2018, respectively.

At March 31, 2019 we had U.S. federal net operating loss carryforwards of approximately $109,032,500, which will expire in fiscal years 2020 through 2038. At March 31, 2019, we had state net operating loss carryforwards of approximately $63,574,300, which will expire in fiscal years 2029 through 2039. Federal net operating losses incurred in our fiscal year ended March 31, 2019 and thereafter will not expire. We also have federal and state research and development tax credit carryforwards of approximately $1,624,700 and $1,049,500, respectively. The federal tax credits will expire at various dates beginning in the year 2029, unless previously utilized. The state tax credits do not expire and will carry forward indefinitely until utilized.

On December 22, 2017, the SEC staff issued Staff Accounting Bulletin No. 118 (*SAB 118*) to provide guidance for companies that are not able to complete their accounting for the income tax effects of the Tax Act in the period of enactment. SAB 118 provides for a measurement period of up to one year from the date of enactment. During the measurement period, companies need to reflect adjustments to any provisional amounts if it obtains, prepares or analyzes additional information about facts and circumstances that existed as of the enactment date that, if known, would have affected the income tax effects initially reported as provisional amounts.

At March 31, 2019 we have completed our analysis of the Tax Act. The Act required us to re-measure our net U.S. deferred tax assets reducing the U.S. federal corporate rate to 21%, which was offset by our valuation allowance. During our fiscal year ended March 31, 2019, this amount was finalized and no additional adjustment was required to be made due to the change in corporate tax rate.

Also effective for our fiscal year ended March 31, 2019 is a new Global Intangible Low-Taxed Income inclusion (*GILTI*). The GILTI income inclusion did not impact our current loss and valuation allowance as our Canadian subsidiary is an inactive entity. The Company has elected to account for GILTI as a period cost in the year the income or tax is incurred.

U.S. federal and state tax laws include substantial restrictions on the utilization of net operating loss carryforwards in the event of an ownership change of a corporation. We have not performed a change in ownership analysis since our inception in 1998 and accordingly some or all of our net operating loss carryforwards may not be available to offset future taxable income, if any.

We file income tax returns in the U.S. federal, Canada and various U.S. state jurisdictions. We are subject to U.S. federal and state income tax examinations by tax authorities for tax years 1998 through 2018 due to net operating losses that are being carried forward for tax purposes, but we are not currently under examination by tax authorities in any jurisdiction.

*Uncertain Tax Positions*

Our unrecognized tax benefits at March 31, 2019 and 2018 relate entirely to research and development tax credits. The total amount of unrecognized tax benefits at March 31, 2019 and 2018 is $668,700 and $451,600, respectively. If recognized, none of the unrecognized tax benefits would impact our effective tax rate. The following table summarizes the activity related to our unrecognized tax benefits.

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | **2019** | **2018** |
| Unrecognized benefit - beginning of period | $ 451,600 | $ 290,500 |
| Current period tax position increases | 210,100 | 102,300 |
| Prior period tax position increases | 7,000 | 58,800 |
| Unrecognized benefit - end of period | $ 668,700 | $ 451,600 |

Our policy is to recognize interest and penalties related to income taxes as components of interest expense and other expense, respectively. We incurred no interest or penalties related to unrecognized tax benefits in the years ended March 31, 2019 or 2018. We do not anticipate any significant changes of our uncertain tax positions within twelve months of this reporting date.

**12. Licensing, Sublicensing and Collaborative Agreements**

***License Agreements with Pherin Pharmaceuticals, Inc. (Pherin)***

In September 2018 we issued an aggregate of 1,630,435 shares of our unregistered common stock having a fair market value of $2,250,000 to Pherin to acquire an exclusive worldwide license to develop and commercialize PH94B for social anxiety disorder and an option to acquire a similar license for PH10 for MDD. In October 2018, we exercised our option to acquire an exclusive worldwide license to develop and commercialize PH10 by issuing 925,926 shares of our unregistered common stock having a fair market value of $2,000,000 to Pherin under the terms of the PH10 license agreement. Under the terms of the PH94B and PH10 license agreements, we are obligated to make additional cash payments and pay royalties to Pherin in the event that certain regulatory and performance-based milestones and commercial sales are achieved. Additionally, in connection with the license agreements, we are obligated to pay to Pherin monthly support payments of $10,000 for a term of the earlier of 18 months or the termination of the license agreement, however no monthly support payment is required under the 18-month period identified in the PH10 license agreement if support payments are being made under the terms of the PH94B license agreement.

***BlueRock Therapeutics Sublicense Agreement***

In December 2016, we entered into an Exclusive License and Sublicense Agreement (*BlueRock Agreement*) with BlueRock Therapeutics, LP, a next generation regenerative medicine company established in December 2016 by Bayer AG and Versant Ventures (*BlueRock Therapeutics*), pursuant to which BlueRock Therapeutics received exclusive rights to utilize certain technologies exclusively licensed by us from University Health Network (*UHN*) for the production of cardiac stem cells for the treatment of heart disease. We retained rights to cardiac stem cell technology licensed from UHN related to small molecule, protein and antibody drug discovery, drug rescue and drug development, including small molecules with cardiac regenerative potential, as well as small molecule, protein and antibody testing involving cardiac cells. To date, we have recognized $1.25 million in sublicense revenue, in our fiscal year ended March 31, 2017, under the BlueRock Agreement.

***Cato Research Ltd.***

We have built a long-term strategic development relationship with Cato Research Ltd. (*CRL*), a global contract research and development organization, or CRO, and an affiliate of one of our largest institutional stockholders. CRL has provided us with access to essential CRO services and regulatory expertise supporting our AV-101 preclinical and clinical development programs, including our ELEVATE Study, and other projects, including projects related to PH94B and PH10. We recorded research and development expenses for CRO services provided by CRL in the amounts of $3,969,100 and $1,390,700 for the fiscal years ended March 31, 2019 and 2018, respectively.

**13. Stock Option Plans and 401(k) Plan**

At March 31, 2019, we have the following share-based compensation plan.

***Amended and Restated 2016 Stock Incentive Plan***

Our Board unanimously approved the Company's Amended and Restated 2016 Stock Incentive Plan, formerly titled the 2008 Stock Incentive Plan (the *2016 Plan*), on July 26, 2016, and the 2016 Plan was approved by our stockholders at our 2016 Annual Meeting of Stockholders on September 26, 2016, and further amended at our 2017 Annual Meeting of Stockholders on September 15, 2017. The 2016 Plan provides for the grant of stock options, restricted shares of common stock, stock appreciation rights and dividend equivalent rights, collectively referred to as "Awards". Stock options granted under the 2016 Plan may be either incentive stock options under the provisions of Section 422 of the Internal Revenue Code of 1986, as amended (the *Code*), or non-qualified stock options. We may grant incentive stock options only to employees of the Company or any parent or subsidiary of the Company. Awards other than incentive stock options may be granted to employees, directors and consultants. A total of 10.0 million shares of our common stock were initially authorized for issuance under the 2016 Plan, of which approximately 9.2 million shares remain authorized and approximately 2.6 million registered shares remain available for future equity grants under the plan at March 31, 2019.

***Description of the 2016 Plan***

The 2016 Plan provides for the grant of stock options, restricted shares of common stock, stock appreciation rights and dividend equivalent rights, collectively referred to as "Awards". Stock options granted under the 2016 Plan may be either incentive stock options under the provisions of Section 422 of the Code, or non-qualified stock options. We may grant incentive stock options only to employees of the Company or any parent or subsidiary of the Company. Awards other than incentive stock options may be granted to employees, directors and consultants.

The Compensation Committee of the Board of Directors (the *Committee*), administers the 2016 Plan, including selecting the Award recipients, determining the number of shares to be subject to each Award, the exercise or purchase price of each Award and the vesting and exercise periods of each Award.

The exercise price of all incentive stock options granted under the 2016 Plan must be at least equal to 100% of the fair market value of the shares on the date of grant. The maximum term of an incentive stock option granted to any other participant may not exceed 10 years. The Committee determines the term and exercise or purchase price of all other Awards granted under the 2016 Plan.

Under the 2016 Plan, incentive stock options may not be sold, pledged, assigned, hypothecated, transferred or disposed of in any manner other than by will or by the laws of descent or distribution and may be exercised, during the lifetime of the participant, only by the participant. Other Awards shall be transferable:

- by will and by the laws of descent and distribution; and
- during the lifetime of the participant, to the extent and in the manner authorized by the Committee by gift or pursuant to a domestic relations order to members of the participant's Immediate Family (as defined in the 2016 Plan).

The maximum number of shares with respect to which options and stock appreciation rights may be granted to any participant in any calendar year is 300,000 shares of common stock. In connection with a participant's commencement of service with the Company, a participant may be granted options and/or stock appreciation rights for up to an additional 50,000 shares that will not count against the foregoing limitation. In addition, for Awards of restricted stock and restricted shares of common stock that are intended to be "performance-based compensation" (within the meaning of Section 162(m) of the Code), the maximum number of shares with respect to which such Awards may be granted to any participant in any calendar year is 300,000 shares of common stock. The limits described in this paragraph are subject to adjustment in the event of any change in our capital structure as described below.

The terms and conditions of Awards are determined by the Committee, including the vesting schedule and any forfeiture provisions. Awards under the 2016 Plan may vest upon the passage of time or upon the attainment of certain performance criteria. Although we do not currently have any Awards outstanding that vest upon the attainment of performance criteria, the Committee may establish criteria based on any one of, or a combination of, a number of financial measurements.

Effective upon the consummation of a Corporate Transaction (as defined below), all outstanding Awards under the 2016 Plan will terminate unless the acquirer assumes or replaces such Awards. The Committee has the authority, exercisable either in advance of any actual or anticipated Corporate Transaction or Change in Control (as defined below) or at the time of an actual Corporate Transaction or Change in Control and exercisable at the time of the grant of an Award under the 2016 Plan or any time while an Award remains outstanding, to provide for the full or partial automatic vesting and exercisability of one or more outstanding unvested Awards under the 2016 Plan and the release from restrictions on transfer and repurchase or forfeiture rights of such Awards in connection with a Corporate Transaction or Change in Control, on such terms and conditions as the Committee may specify. The Committee also has the authority to condition any such Award vesting and exercisability or release from such limitations upon the subsequent termination of the service of the grantee within a specified period following the effective date of the Corporate Transaction or Change in Control. The Committee may provide that any Awards so vested or released from such limitations in connection with a Change in Control, shall remain fully exercisable until the expiration or earlier termination of the Award.

Under the 2016 Plan, a Corporate Transaction is generally defined as:

- an acquisition of securities possessing more than fifty percent (50%) of the total combined voting power of our outstanding securities but excluding any such transaction or series of related transactions that the Committee determines shall not be a Corporate Transaction;
- a reverse merger in which we remain the surviving entity but: (i) the shares of common stock outstanding immediately prior to such merger are converted or exchanged by virtue of the merger into other property, whether in the form of securities, cash or otherwise; or (ii) in which securities possessing more than fifty percent (50%) of the total combined voting power of our outstanding securities are transferred to a person or persons different from those who held such securities immediately prior to such merger;
- a sale, transfer or other disposition of all or substantially all of the assets of the Company;
- a merger or consolidation in which the Company is not the surviving entity; or
- a complete liquidation or dissolution.

Under the 2016 Plan, a Change in Control is generally defined as: (i) the acquisition of more than 50% of the total combined voting power of our stock by any individual or entity which a majority of our Board (who have served on our board for at least 12 months) do not recommend our stockholders accept; (ii) or a change in the composition of our Board over a period of 12 months or less.

Unless terminated sooner, the 2016 Plan will automatically terminate in 2026. Our Board may at any time amend, suspend or terminate the 2016 Plan. To the extent necessary to comply with applicable provisions of U.S. federal securities laws, state corporate and securities laws, the Code, the rules of any applicable stock exchange or national market system, and the rules of any non-U.S. jurisdiction applicable to Awards granted to residents therein, we will obtain stockholder approval of any such amendment to the 2016 Plan in such a manner and to such a degree as required.

During our fiscal year ended March 31, 2019, we granted from the 2016 Plan:

- options to purchase an aggregate of 860,000 shares of our common stock at an exercise price of $1.27 per share to the independent members of our Board, to all of our officers except our Chief Executive Officer, and to all non-officer employees in August 2018;
- options to purchase an aggregate of 250,000 shares of our common stock at exercise prices ranging from $1.52 per share to $2.20 per share to various scientific, legal, investor relations, and financial and strategic advisory consultants in October 2018;
- an option to purchase 25,000 shares of our common stock at an exercise price of $1.74 per share to a new independent member of our Board in January 2019;
- an option to purchase 220,000 shares of our common stock at an exercise price of $1.70 per share to our Chief Executive Officer in January 2019; and
- 25,000 shares of registered common stock having a fair value of $41,500 on the date of grant to an investor relations and social media consultant. Noncash expense related to this grant is being amortized ratably over the contractual period as a component of general and administrative expense not included in stock compensation expense.

During our fiscal year ended March 31, 2018, we granted from the 2016 Plan:

- options to purchase an aggregate of 880,000 shares of our common stock at an exercise price of $1.96 per share to the independent members of our Board and to our officers and all non-officer employees in April 2017;
- options to purchase an aggregate of 770,000 shares of our common stock at an exercise price of $1.56 per share to the independent members of our Board, officers, non-officer employees and two consultants in September 2017;
- options to purchase an aggregate of 2,000,000 shares of our common stock at an exercise price of $1.16 per share to the independent members of our Board, officers, non-officer employees and ten consultants in February 2018;
- options to purchase 25,000 shares of our common stock at an exercise price of $1.21 per share to a legal services consultant in February 2018; and
- an aggregate of 547,500 shares of unregistered common stock to various legal, investor relations, and financial and strategic advisory consultants in September and October 2017 pursuant to which we recognized an aggregate of $827,900 as a noncash component of general and administrative expense not included in stock compensation expense for the fiscal year.

The following table summarizes stock-based compensation expense related to option grants to our officers, independent directors, consultants and service providers, included in the accompanying Consolidated Statement of Operations and Comprehensive Loss for the years ended March 31, 2019 and 2018.

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | **2019** | **2018** |
| Research and development expense: | | |
| Stock option grants | $ 1,259,400 | $ 969,200 |
| General and administrative expense: | 1,259,400 | 969,200 |
| Stock option grants | 2,184,000 | 1,375,000 |
| | 2,184,000 | 1,375,000 |
| Total stock-based compensation expense | $ 3,443,400 | $ 2,344,200 |

We used the Black-Scholes Option Pricing model with the following weighted average assumptions to determine share-based compensation expense related to option grants during the fiscal years ended March 31, 2019 and 2018:

| | Fiscal Years Ended March 31, | |
|---|---|---|
| | **2019** | **2018** |
| | (weighted average) | (weighted average) |
| Exercise price | $ 1.45 | $ 1.44 |
| Market price on date of grant | $ 1.45 | $ 1.44 |
| Risk-free interest rate | 2.84% | 2.39% |
| Expected term (years) | 6.32 | 6.87 |
| Volatility | 96.58% | 90.40% |
| Expected dividend yield | 0.00% | 0.00% |
| | | |
| Fair value per share at grant date | $ 1.15 | $ 1.10 |

The expected term of options represents the period that our share-based compensation awards are expected to be outstanding. We have calculated the weighted-average expected term of the options using the simplified method as prescribed by Securities and Exchange Commission Staff Accounting Bulletins No. 107 and No. 110 (*SAB No. 107 and 110*). The utilization of SAB No. 107 and 110 is based on the lack of relevant historical option exercises and relevant historical data due to our limited experience as a publicly traded company and the historical lack of liquidity in freely-tradable shares of our common stock. Those factors also resulted in our decision to utilize the historical volatilities of a peer group of public companies' stock over the expected term of the option in determining our expected volatility assumptions. The risk-free interest rate for periods related to the expected life of the options is based on the U.S. Treasury yield curve in effect at the time of grant. The expected dividend yield is zero, as we have not paid any dividends and do not anticipate paying dividends in the near future. We recognize the effect of forfeitures as they occur.

The following table summarizes activity for the fiscal years ended March 31, 2019 and 2018 under the 2016 Plan:

| | Fiscal Years Ended March 31, | | | |
|---|---|---|---|---|
| | 2019 | | 2018 | |
| | Number of Shares | Weighted Average Exercise Price | Number of Shares | Weighted Average Exercise Price |
| Options outstanding at beginning of period | 5,300,338 | $ 2.43 | 1,659,324 | $ 4.76 |
| Options granted | 1,355,000 | $ 1.45 | 3,675,000 | $ 1.44 |
| Options exercised | (29,250) | $ 1.50 | - | $ - |
| Options forfeited | - | $ - | (12,154) | $ 5.39 |
| Options expired | - | $ - | (21,832) | $ 9.42 |
| Options outstanding at end of period | 6,626,088 | $ 1.48 | 5,300,338 | $ 2.43 |
| Options exercisable at end of period | 4,303,972 | $ 1.53 | 1,818,962 | $ 3.31 |
| Weighted average grant-date fair value of options granted during the period | | $ 1.15 | | $ 1.10 |

In August 2018, in accordance with the terms of the 2016 Plan, the Board approved the modification of outstanding options held by independent members of our Board, our officers and our employees that had exercise prices higher than $1.56 per share to reduce the exercise prices thereof to $1.50 per share. We calculated the fair value of such options immediately before and after the modification using the Black-Scholes Option Pricing Model and the weighted average assumptions indicated in the table below. We immediately recognized the additional fair value attributable to vested options, $258,100, as stock compensation expense, which is included in the expense reported above. The additional fair value resulting from the modification, approximately $142,200, is being expensed over the remaining vesting period of the modified options.

| **Assumption:** | **Pre-modification** | **Post-modification** |
|---|---|---|
| Market price per share | $ 1.49 | $ 1.49 |
| Exercise price per share | $ 3.57 | $ 1.50 |
| Risk-free interest rate | 2.77% | 2.77% |
| Remaining expected term in years | 5.08 | 5.08 |
| Volatility | 94.9% | 94.9% |
| Dividend rate | 0.0% | 0.0% |
| | | |
| Number of option shares | 2,419,503 | 2,419,503 |
| **Weighted average fair value per share** | **$ 0.91** | **$ 1.08** |

**VISTAGEN THERAPEUTICS, INC.**
**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**

The following table summarizes information on stock options outstanding and exercisable under the 2016 Plan as of March 31, 2019, including the results of the exercise price modification noted above:

| | Options Outstanding | | | Options Exercisable | |
|---|---|---|---|---|---|
| Exercise Price | Number Outstanding | Weighted Average Remaining Years until Expiration | Weighted Average Exercise Price | Number Exercisable | Weighted Average Exercise Price |
| $ 1.16 | 2,000,000 | 8.84 | $ 1.16 | 1,312,493 | $ 1.16 |
| $ 1.21 to $1.27 | 885,000 | 9.34 | $ 1.27 | 419,529 | $ 1.27 |
| $ 1.50 | 2,390,253 | 7.34 | $ 1.50 | 1,699,753 | $ 1.50 |
| $ 1.52 to $1.99 | 1,215,000 | 8.91 | $ 1.62 | 777,058 | $ 1.59 |
| $ 2.20 to $3.80 | 55,000 | 9.38 | $ 2.35 | 14,304 | $ 3.67 |
| $ 8.00 to $15.00 | 80,835 | 5.86 | $ 8.54 | 80,835 | $ 8.54 |
| | 6,626,088 | 8.35 | $ 1.48 | 4,303,972 | $ 1.53 |

At March 31, 2019, there were 2,607,162 registered shares of our common stock remaining available for grant under the 2016 Plan. Two officers and a member of our Board exercised outstanding stock options to purchase an aggregate of 29,250 shares of our common stock during the fiscal year ended March 31, 2019. There were no option exercises during the fiscal year ended March 31, 2018.

Aggregate intrinsic value is the sum of the amount by which the fair value of the underlying common stock exceeds the aggregate exercise price of the outstanding options (*in-the-money-options*). Based on the $1.29 per share quoted closing market price of our common stock on March 31, 2019, outstanding options to purchase an aggregate of 2,885,000 shares had aggregate intrinsic value of approximately $250,300 and exercisable options to purchase an aggregate of 1,732,022 shares had aggregate intrinsic value of approximately $162,700 at that date.

As of March 31, 2019, there was approximately $3,089,300 of unrecognized compensation cost related to non-vested share-based compensation awards from the 2016 Plan, which is expected to be recognized through January 2021.

***401(k) Plan***

Through a third-party agent, we maintain a retirement and deferred savings plan for our employees. This plan is intended to qualify as a tax-qualified plan under Section 401(k) of the Internal Revenue Code. The retirement and deferred savings plan provides that each participant may contribute a portion of his or her pre-tax compensation, subject to statutory limits. Under the plan, each employee is fully vested in his or her deferred salary contributions. Employee contributions are held and invested by the plan's trustee. The retirement and deferred savings plan also permits us to make discretionary contributions, subject to established limits and a vesting schedule. To date, we have not made any discretionary contributions to the retirement and deferred savings plan on behalf of participating employees.

**14. Related Party Transactions**

Cato Holding Company (*CHC*), doing business as Cato BioVentures (*CBV*), is the parent of Cato Research Ltd. (*CRL*). CRL is a contract research, development and regulatory services organization (*CRO*) that we have engaged for a wide range of material aspects related to the nonclinical and clinical development and regulatory affairs associated with our efforts to develop and commercialize AV-101 for MDD, including our ELEVATE Study, and other potential CNS indications, PH94B, PH10, and other potential product candidates. At March 31, 2019, CBV held approximately 2% of our outstanding common stock.

In July 2017, we entered into a Master Services Agreement (*MSA*) with CRL, which replaced a substantially similar May 2007 master services agreement, pursuant to which CRL may assist us in the evaluation, development, commercialization and marketing of our potential product candidates, and provide regulatory and strategic consulting services as requested from time to time. Specific projects or services are and will be delineated in individual work orders negotiated from time-to-time under the MSA. Under the terms of work orders issued pursuant to the July 2017 MSA and our prior May 2007 master services agreement, we incurred expenses of $3,969,100 and $1,390,700 for the fiscal years ended March 31, 2019 and 2018, respectively. We anticipate periodic expenses for CRO services from CRL related to nonclinical and clinical development of, and regulatory affairs related to, AV-101, PH94B, PH10 and other potential product candidates will increase in future periods.

As disclosed in Note 9, *Capital Stock*, in September 2018, we issued an aggregate of 1,630,435 shares of our unregistered common stock having a fair market value of $2,250,000 to acquire an exclusive worldwide license to develop and commercialize PH94B and an option to acquire a similar license for PH10. In October 2018, we issued an additional 925,926 shares of our unregistered common stock having a fair market value of $2,000,000 to exercise the option to acquire an exclusive worldwide license to develop and commercialize PH10. The acquisition of the licenses and option was recorded as research and development expense. Additionally, between the acquisition of the PH94B license in September 2018 and March 31, 2019, we expensed $70,000 of monthly cash support payments to Pherin under the terms of the PH94B license agreement as research and development expense. At March 31, 2019, Pherin held approximately 6% of our outstanding Common Stock.

**15. Commitments, Contingencies, Guarantees and Indemnifications**

From time to time, we may become involved in claims and other legal matters arising in the ordinary course of business. Management is not currently aware of any claims made or other legal matters that will have a material adverse effect on our consolidated financial position, results of operations or its cash flows.

We indemnify our officers and directors for certain events or occurrences while the officer or director is or was serving at our request in such capacity. The term of the indemnification period is for the officer’s or director’s lifetime. We will indemnify the officers or directors against any and all expenses incurred by the officers or directors because of their status as one of our directors or executive officers to the fullest extent permitted by Nevada law. We have never incurred costs to defend lawsuits or settle claims related to these indemnification agreements. We have a director and officer insurance policy which limits our exposure and may enable us to recover a portion of any future amounts paid. We believe the fair value of these indemnification agreements is minimal. Accordingly, there are no liabilities recorded for these agreements at March 31, 2019 or 2018.

In the normal course of business, we provide indemnifications of varying scopes under agreements with other companies, typically clinical research organizations, investigators, clinical sites, suppliers and others. Pursuant to these agreements, we generally indemnify, hold harmless, and agree to reimburse the indemnified parties for losses suffered or incurred by the indemnified parties in connection with the use or testing of our product candidates or with any U.S. patents or any copyright or other intellectual property infringement claims by any third party with respect to our product candidates. The terms of these indemnification agreements are generally perpetual. The potential future payments we could be required to make under these indemnification agreements is unlimited. We maintain liability insurance coverage that limits our exposure. We believe the fair value of these indemnification agreements is minimal. Accordingly, we have not recorded any liabilities for these agreements as of March 31, 2019 or 2018.

***Leases***

At March 31, 2019 and or 2018, the following assets are subject to capital lease obligations and included in property and equipment:

| | March 31, 2019 | March 31, 2018 |
|---|---|---|
| Office equipment | $ 14,700 | $ 14,700 |
| Accumulated depreciation | (6,500) | (3,600) |
| Net book value | $ 8,200 | $ 11,100 |

Amortization expense for assets recorded under capital leases is included in depreciation expense. Future minimum payments, by year and in the aggregate, required under capital leases are as follows:

| Fiscal Years Ending March 31, | Capital Leases |
|---|---|
| 2020 | $ 3,800 |
| 2021 | 3,800 |
| 2022 | 3,300 |
| Future minimum lease payments | 10,900 |
| Less imputed interest included in minimum lease payments | (1,600) |
| Present value of minimum lease payments | 9,300 |
| Less current portion | (3,000) |
| Non-current capital lease obligation | $ 6,300 |

At March 31, 2019, future minimum payments under operating leases relate to our facility lease in South San Francisco, California through July 31, 2022 and are as follows:

| Fiscal Years Ending March 31, | Amount |
|---|---|
| 2020 | $ 623,900 |
| 2021 | 645,800 |
| 2022 | 668,400 |
| 2023 | 225,300 |
| | $ 2,163,400 |

We incurred total facility rent expense for the fiscal years ended March 31, 2019 and 2018 of $657,900 and $645,800, respectively.

***Debt Repayment***

At March 31, 2019, future minimum principal payments on outstanding notes related to an insurance premium financing arrangement in the remaining principal amount of $57,300, which will be repaid in monthly principal and interest installments of $6,600 through December 2019.

**16. Subsequent Events**

We have evaluated subsequent events through the date of this Annual Report and have identified the following material events and transactions that occurred after March 31, 2019:

***Grants of Stock Options and Adoption of 2019 Stock Incentive Plan***

On May 23, 2019, when the quoted market price of our common stock was $0.80 per share, the Compensation Committee of the Board granted options from our 2016 Plan to our independent directors, officers and employees and to certain consultants to purchase an aggregate of 1,210,000 shares of our common stock at an exercise price of $1.00 per share. The options were vested 25% upon grant with the remaining shares vesting over three years for independent directors, officers and employees, and over two years for consultants. On May 30, 2019, when the quoted market price of our common stock was $0.91 per share, we granted options to purchase 10,000 shares of our common stock to another consultant. The options were vested 25% upon grant with the remaining shares vesting over two years.

On May 27, 2019, the Board approved, subject to subsequent stockholder approval at our 2019 Annual Meeting of Stockholders expected to be held in September 2019, the 2019 Omnibus Equity Incentive Plan (the *2019 Plan*) and designated 7.5 million shares of our authorized common stock to be reserved thereunder. On May 28, 2019, when the quoted market price of our common stock was $0.82 per share, the Compensation Committee granted options from the 2019 Plan to one of our officers to purchase 170,000 shares of our common stock at an exercise price of $1.00 per share, which grant is contingent upon the approval of the 2019 Plan by our stockholders. The option will vest 25% upon approval of the 2019 Plan with the remaining shares vesting over three years.

**17. Supplemental Financial Information (Unaudited)**

The following table presents the unaudited statements of operations data for each of the eight quarters in the period ended March 31, 2019. The information has been presented on the same basis as the audited financial statements and all necessary adjustments, consisting only of normal recurring adjustments, have been included in the amounts below to present fairly the unaudited quarterly results when read in conjunction with the audited financial statements and related notes. The operating results for any quarter should not be relied upon as necessarily indicative of results for any future period.

**Quarterly Results of Operations (Unaudited)**
**(in thousands, except share and per share amounts)**

| | Three Months Ended | | | | Total |
|---|---|---|---|---|---|
| | June 30, 2018 | September 30, 2018 | December 31, 2018 | March 31, 2019 | Fiscal Year 2019 |
| Operating expenses: | | | | | |
| Research and development | $ 2,744 | $ 5,261 | $ 5,335 | $ 3,758 | $ 17,098 |
| General and administrative | 1,466 | 2,171 | 1,857 | 1,964 | 7,458 |
| Total operating expenses | 4,210 | 7,432 | 7,192 | 5,722 | 24,556 |
| Loss from operations | (4,210) | (7,432) | (7,192) | (5,722) | (24,556) |
| Other expenses, net: | | | | | |
| Interest expense, net | (2) | (3) | (2) | (1) | (8) |
| Loss on extinguishment of accounts payable | - | - | (23) | - | (23) |
| Loss before income taxes | (4,212) | (7,435) | (7,217) | (5,723) | (24,587) |
| Income taxes | (2) | - | - | - | (2) |
| Net loss and comprehensive loss | (4,214) | (7,435) | (7,217) | (5,723) | (24,589) |
| Accrued dividend on Series B Preferred stock | (274) | (284) | (291) | (291) | (1,140) |
| Net loss attributable to common stockholders | $ (4,488) | $ (7,719) | $ (7,508) | $ (6,014) | $ (25,729) |
| Basic and diluted net loss per common share attributable to common stockholders | $ (0.20) | $ (0.30) | $ (0.24) | $ (0.17) | $ (0.90) |
| Weighted average shares used in computing: Basic and diluted net loss per common share attributable to common stockholders | 22,987,066 | 25,815,245 | 30,696,312 | 35,113,753 | 28,562,490 |

| | Three Months Ended | | | | Total |
|---|---|---|---|---|---|
| | June 30, 2017 | September 30, 2017 | December 31, 2017 | March 31, 2018 | Fiscal Year 2018 |
| Operating expenses: | | | | | |
| Research and development | $ 1,096 | $ 2,427 | $ 1,602 | $ 2,638 | $ 7,763 |
| General and administrative | 1,164 | 2,567 | 1,266 | 1,440 | 6,437 |
| Total operating expenses | 2,260 | 4,994 | 2,868 | 4,078 | 14,200 |
| Loss from operations | (2,260) | (4,994) | (2,868) | (4,078) | (14,200) |
| Other expenses, net: | | | | | |
| Interest expense, net | (3) | (3) | (2) | (1) | (9) |
| Loss on extinguishment of accounts payable | - | - | (135) | - | (135) |
| Loss before income taxes | (2,263) | (4,997) | (3,005) | (4,079) | (14,344) |
| Income taxes | (2) | - | - | - | (2) |
| Net loss and comprehensive loss | (2,265) | (4,997) | (3,005) | (4,079) | (14,346) |
| Accrued dividend on Series B Preferred stock | (247) | (257) | (263) | (263) | (1,030) |
| Deemed dividend from trigger of down round provision feature | - | - | (199) | - | (199) |
| Net loss attributable to common stockholders | $ (2,512) | $ (5,254) | $ (3,467) | $ (4,342) | $ (15,575) |
| Basic and diluted net loss per common share attributable to common stockholders | $ (0.28) | $ (0.53) | $ (0.25) | $ (0.19) | $ (1.12) |
| Weighted average shares used in computing: Basic and diluted net loss per common share attributable to common stockholders | 9,034,213 | 9,892,016 | 13,895,642 | 22,880,968 | 13,890,041 |

**Item 9. Changes in and Disagreements With Accountants on Accounting and Financial Disclosure**

None.

**Item 9A. Controls and Procedures**

**Disclosure Controls and Procedures.**

As required by Rule 13a-15(b) under the Securities Exchange Act of 1934, as amended, (the *Exchange Act*) our Chief Executive Officer (*CEO*) and our Chief Financial Officer (*CFO*) conducted an evaluation as of the end of the period covered by this Annual Report on Form 10-K, of the effectiveness of our disclosure controls and procedures as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act. Based on that evaluation, our CEO and our CFO each concluded that our disclosure controls and procedures are effective to provide reasonable assurance that information required to be disclosed in the reports that we file or submit under the Exchange Act, (i) is recorded, processed, summarized and reported within the time periods specified in the Securities and Exchange Commission's rules and forms and (ii) is accumulated and communicated to our management, including our CEO and our CFO, as appropriate to allow timely decisions regarding required disclosure.

**Management's Report on Internal Control Over Financial Reporting.**

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rules 13a-15(f) and 15d-15(f). Our internal control system is designed to provide reasonable assurance to our management and Board of Directors regarding the reliability of financial reporting and the preparation and fair presentation of financial statements for external purposes in accordance with U.S. generally accepted accounting principles.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Therefore, even those systems determined to be effective can provide only reasonable assurance of achieving their control objectives. Smaller reporting companies may face additional limitations in achieving control objectives. Smaller reporting companies typically employ fewer individuals who are often tasked with a wide range of responsibilities, making it difficult to segregate duties. Often, one or two individuals control many, or all, aspects of the smaller reporting company’s general and financial operations, placing such individual(s) in a position to override any system of internal control. Additionally, projections of an evaluation of current effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the controls may deteriorate.

Management has assessed the effectiveness of our internal control over financial reporting for our fiscal year ended March 31, 2019. Management's assessment was based on criteria set forth in *Internal Control - Integrated Framework (2013)*, issued by the Committee of Sponsoring Organizations of the Treadway Commission (*COSO*). Based upon this assessment, management concluded that, as of March 31, 2019, our internal control over financial reporting was not effective, based upon those criteria, as a result of the material weaknesses identified below.

A material weakness is a deficiency or combination of deficiencies in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the annual or interim financial statements will not be prevented or detected on a timely basis.

Specifically, management identified the following control weaknesses: (i) the size of the Company’s staff does not permit appropriate segregation of duties to (a) permit appropriate review of accounting transactions and/or accounting treatment by multiple qualified individuals, and (b) prevent one individual from overriding the internal control system by initiating, authorizing and completing all transactions; and (ii) the Company utilizes accounting software that does not prevent erroneous or unauthorized changes to previous reporting periods and/or can be adjusted so as to not provide an adequate audit trail of entries made in the accounting software. The Company does not believe that these control weaknesses have resulted in any deficient financial reporting because each of our CEO and CFO is aware of his responsibilities under the SEC's reporting requirements and personally certifies our financial reports. Further, the Company has implemented a series of manual checks and balances to verify that no previous reporting period has been improperly modified and that no unauthorized entries have been made in the current reporting period.

Accordingly, while the Company has identified certain material weaknesses in its system of internal control over financial reporting, it believes that it has taken reasonable and sufficient steps to ascertain that the financial information contained in this Annual Report is in accordance with U.S. generally accepted accounting principles. Management has determined that current resources would be more appropriately applied elsewhere and when resources permit, they will alleviate the material weaknesses through various steps, which may include the addition of qualified financial personnel and/or the acquisition and implementation of alternative accounting software.

As a result of the enactment of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, and the resulting amendment of Section 404 of the Sarbanes-Oxley Act of 2002, as a smaller reporting company, we are not required to provide an attestation report by our independent registered public accounting firm regarding internal control over financial reporting for the fiscal year ended March 31, 2019 or thereafter, until such time as we are no longer eligible for the exemption for smaller issuers set forth within the Sarbanes-Oxley Act.

**Item 9B. Other Information**

None.

## PART III

### Item 10. Directors, Executive Officers and Corporate Governance

The information required by this Item is incorporated herein by reference to the information that will be contained in our proxy statement related to the 2019 Annual Meeting of Stockholders, which we intend to file with the Securities and Exchange Commission on or before July 29, 2019 pursuant to General Instruction G(3) of Form 10-K.

### Item 11. Executive Compensation

The information required by this Item is incorporated herein by reference to the information that will be contained in our proxy statement related to the 2019 Annual Meeting of Stockholders, which we intend to file with the Securities and Exchange Commission on or before July 29, 2019 pursuant to General Instruction G(3) of Form 10-K.

### Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information required by this Item is incorporated herein by reference to the information that will be contained in our proxy statement related to the 2019 Annual Meeting of Stockholders, which we intend to file with the Securities and Exchange Commission on or before July 29, 2019 pursuant to General Instruction G(3) of Form 10-K.

### Item 13. Certain Relationships and Related Transactions, and Director Independence

The information required by this Item is incorporated herein by reference to the information that will be contained in our proxy statement related to the 2019 Annual Meeting of Stockholders, which we intend to file with the Securities and Exchange Commission on or before July 29, 2019 pursuant to General Instruction G(3) of Form 10-K.

### Item 14. Principal Accounting Fees and Services

The information required by this Item is incorporated herein by reference to the information that will be contained in our proxy statement related to the 2019 Annual Meeting of Stockholders, which we intend to file with the Securities and Exchange Commission on or before July 29, 2019 pursuant to General Instruction G(3) of Form 10-K.

## PART IV

### Item 15. Exhibits, Financial Statement Schedules

**(a)(1) Financial Statements**

See Index to Financial Statements under Item 8 on page 64.

**(a)(2) Consolidated Financial Statement Schedules**

Consolidated financial statement schedules are omitted because they are not applicable or are not required or the information required to be set forth therein is included in the Consolidated Financial Statements or notes thereto.

**(a)(3) Exhibits**

The exhibits listed in the Exhibit Index below are filed or incorporated by reference as part of this report.

**Exhibit Index**

| Exhibit No. | Description |
|---|---|
| 2.1* | Agreement and Plan of Merger by and among Excaliber Enterprises, Ltd., VistaGen Therapeutics, Inc. and Excaliber Merger Subsidiary, Inc. |
| 3.4 | Articles of Merger filed with the Nevada Secretary of State on May 24, 2011, incorporated by reference from Exhibit 3.1 to the Company's Current Report on Form 8-K filed on May 31, 2011. |
| 3.5 | Certificate of Designations Series A Preferred, incorporated by reference from Exhibit 3.1 to the Company's Current Report on Form 8-K filed on December 23, 2011. |
| 3.6 | Certificate of Change filed with the Nevada Secretary of State on August 11, 2014 incorporated by reference from Exhibit 3.1 to the Company's Current Report on Form 8-K filed on August 14, 2014. |
| 3.7 | Certificate of Designation of the Relative Rights and Preferences of the Series B 10% Convertible Preferred Stock of VistaGen Therapeutics, Inc., filed with the Nevada Secretary of State on May 7, 2015, incorporated by reference from Exhibit 3.1 to the Company's Current Report on Form 8-K filed on May 13, 2015. |
| 3.9 | Certificate of Designation of the Relative Rights and Preferences of the Series C Convertible Preferred Stock of VistaGen Therapeutics, Inc., dated January 25, 2016, incorporated by reference from Exhibit 3.1 to the Company's Current Report on Form 8-K filed on January 29, 2016. |
| 3.10 | Restated Articles of Incorporation of VistaGen Therapeutics, Inc., dated August 16, 2016, incorporated by reference from Exhibit 3.1 to the Company's Current Report on Form 8-K, filed on August 17, 2016. |
| 3.11 | Second Amended and Restated Bylaws of VistaGen Therapeutics, Inc., dated August 16, 2016, incorporated by reference from Exhibit 3.2 to the Company's Current Report on Form 8-K, filed on August 16, 2016. |
| 3.12 | Certificate of Amendment to the Restated and Amended Articles of Incorporation of VistaGen Therapeutics, Inc., dated September 15, 2017; incorporated by reference from Exhibit 3.1 to the Company's Current Report on Form 8-K, filed on September 20, 2017. |
| 10.22* | License Agreement by and between Mount Sinai School of Medicine of New York University and the Company, dated October 1, 2004. |
| 10.23* | Non-Exclusive License Agreement, dated December 5, 2008, by and between VistaGen and Wisconsin Alumni Research Foundation, as amended by that certain Wisconsin Materials Addendum, dated February 2, 2009. |
| 10.24* | Sponsored Research Collaboration Agreement, dated September 18, 2007, between VistaGen and University Health Network, as amended by that certain Amendment No. 1 and Amendment No. 2, dated April 19, 2010 and December 15, 2010, respectively. |
| 10.26* | License Agreement, dated October 24, 2001, by and between the University of Maryland, Baltimore, Cornell Research Foundation and Artemis Neuroscience, Inc. |
| 10.40* | Employment Agreement, by and between, VistaGen and Shawn K. Singh, dated April 28, 2010, as amended May 9, 2011. |
| 10.41* | Employment Agreement, by and between, VistaGen and H. Ralph Snodgrass, PhD, dated April 28, 2010, as amended May 9, 2011. |
| 10.49 | License Agreement No. 1, dated as of October 24, 2011 between University Health Network and VistaGen Therapeutics, Inc., incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K filed on November 30, 2011. |
| 10.57 | License Agreement No. 2, dated as of March 19, 2012 between University Health Network and VistaGen Therapeutics, Inc., incorporated by reference from Exhibit 10.57 to the Company's Annual Report on Form 10-K filed on July 2, 2012. |
| 10.67 | Note Exchange and Purchase Agreement dated as of October 11, 2012 by and between VistaGen Therapeutics, Inc. and Platinum Long Term Growth VII, LLP, incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K filed on October 16, 2012. |
| 10.73 | Amendment to Note Exchange and Purchase Agreement as of November 14, 2012 between VistaGen Therapeutics Inc. and Platinum Long Term Growth VII, LLP, incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K filed on November 20, 2012. |
| 10.75 | Amendment No. 2 to Note Exchange and Purchase Agreement as of January 31, 2013 between VistaGen Therapeutics Inc. and Platinum Long Term Growth VII, LLP, incorporated by reference from Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q filed on February 14, 2013. |
| 10.76 | Amendment No. 3 to Note Exchange and Purchase Agreement as of February 22, 2013 between VistaGen Therapeutics Inc. and Platinum Long Term Growth VII, LLP, incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K filed on February 28, 2013. |

| | |
|---|---|
| 10.77 | Form of Warrant to Purchase Common Stock issued to independent members of the Company's Board of Directors and its executive officers on March 3, 2013, incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K filed on March 6, 2013. |
| 10.83 | Lease between Bayside Area Development, LLC and VistaGen Therapeutics, Inc. (California) dated April 24, 2013, incorporated by reference from Exhibit 10.83 to the Company's Annual Report on Form 10-K filed July 18, 2013. |
| 10.84 | Indemnification Agreement effective May 20, 2013 between the Company and Jon S. Saxe, incorporated by reference from Exhibit 10.84 to the Company's Annual Report on Form 10-K filed on July 18, 2013. |
| 10.85 | Indemnification Agreement effective May 20, 2013 between the Company and Shawn K. Singh, incorporated by reference from Exhibit 10.85 to the Company's Annual Report on Form 10-K filed on July 18, 2013. |
| 10.86 | Indemnification Agreement effective May 20, 2013 between the Company and H. Ralph Snodgrass, incorporated by reference from Exhibit 10.86 to the Company's Annual Report on Form 10-K filed on July 18, 2013. |
| 10.87 | Indemnification Agreement effective May 20, 2013 between the Company and Brian J. Underdown, incorporated by reference from Exhibit 10.87 to the Company's Annual Report on Form 10-K filed on July 18, 2013. |
| 10.88 | Indemnification Agreement effective May 20, 2013 between the Company and Jerrold D. Dotson, incorporated by reference from Exhibit 10.88 to the Company's Annual Report on Form 10-K filed on July 18, 2013. |
| 10.111 | Exchange Agreement, by and between VistaGen Therapeutics, Inc., and Platinum Long Term Growth VII, LLC and Montsant Partners, LLC, dated January 25, 2016, incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K filed on January 29, 2016. |
| 10.112 | Indemnification Agreement effective April 8, 2016 between the Company and Jerry B. Gin, incorporated by reference from Exhibit 10.112 to the Company's Annual Report on Form 10-K filed on June 24, 2016. |
| 10.113 | Underwriting Agreement, by and between Chardan Capital Markets, LLC and WallachBeth Capital, LLC, as representatives of the several underwriters, and VistaGen Therapeutics, Inc., dated May 10, 2016, incorporated by reference from Exhibit 1.1 to the Company's Current Report on Form 8-K filed on May 16, 2016. |
| 10.114 | Warrant Agency Agreement, by and between Computershare, Inc. and VistaGen Therapeutics, Inc., dated May 16, 2016, incorporated by reference from Exhibit 4.1 to the Company's Current Report on Form 8-K filed on May 16, 2016. |
| 10.115 | Form of Warrant; incorporated by reference from Exhibit 4.2 to the Company's Current Report on Form 8-K filed on May 16, 2016. |
| 10.116 | Second Amendment to Employment Agreement by and between VistaGen Therapeutics, Inc. and Shawn K. Singh, dated June 22, 2016, incorporated by reference from Exhibit 10.116 to the Company's Annual Report on Form 10-K filed on June 24, 2016. |
| 10.117 | Second Amendment to Employment Agreement by and between VistaGen Therapeutics, Inc. and H. Ralph Snodgrass, Ph.D., dated June 22, 2016, incorporated by reference from Exhibit 10.117 to the Company's Annual Report on Form 10-K filed on June 24, 2016. |
| 10.118 | Second Amendment to Lease between Bayside Area Development and the Company, effective November 10, 2016, incorporated by reference from Exhibit 10.1 to the Company's Quarterly report on Form 10-Q filed on November 15, 2016. |
| 10.119 | Indemnification Agreement effective November 10, 2016 between the Company and Mark A. Smith, incorporated by reference from Exhibit 10.2 to the Company's Quarterly report on Form 10-Q filed on November 15, 2016. |
| 10.120+ | Exclusive License and Sublicense Agreement by and between VistaGen Therapeutics, Inc. and Apollo Biologics LP, effective December 9, 2016, incorporated by reference from Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q filed on May 11, 2017. |
| 10.121+ | Patent License Amendment Agreement between VistaGen Therapeutics Inc. and University Health Network effective December 9, 2016, incorporated by reference from Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q/A filed on May 1, 2017. |
| 10.122 | Amended and Restated 2016 Stock Incentive Plan (formerly the VistaGen Therapeutics, Inc. 2008 Stock Incentive Plan), incorporated by reference from Exhibit 10.122 to the Company's Annual Report on Form 10-K filed on June 29, 2017. |

| | |
|---|---|
| 10.123 | Underwriting Agreement, dated as of August 31, 2017, by and between VistaGen Therapeutics, Inc. and Oppenheimer & Co. Inc., incorporated by reference from Exhibit 1.1 to the Company's Current Report on Form 8-K filed on August 31, 2017. |
| 10.124 | Form of Series A1 Warrant, incorporated by reference from Exhibit 4.1 to the Company's Current Report on Form 8-K filed on August 31, 2017. |
| 10.125 | Form of Series A2 Warrant, incorporated by reference from Exhibit 4.2 to the Company's Current Report on Form 8-K filed on August 31, 2017. |
| 10.126 | Underwriting Agreement, dated as of December 11, 2017, by and between VistaGen Therapeutics, Inc. and Oppenheimer & Co. Inc., incorporated by reference from Exhibit 1.1 to the Company's Current Report on Form 8-K filed on December 13, 2017. |
| 10.127 | Form of Warrant, incorporated by reference from Exhibit 4.1 to the Company's Current Report on Form 8-K filed on December 13, 2017. |
| 10.128 | Form of Summer 2018 Private Placement Subscription Agreement, incorporated by reference from the Company's Current Report on Form 8-K filed on August 9, 2018. |
| 10.129 | Form of Summer 2018 Private Placement Warrant, incorporated by reference from the Company's Current Report on Form 8-K filed on August 9, 2018. |
| 10.130+ | License Agreement (PH94B), by and between VistaGen Therapeutics, Inc. and Pherin Pharmaceuticals, Inc., dated September 11, 2018, incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K filed on September 13, 2018 |
| 10.131+ | Option Agreement, by and between VistaGen Therapeutics, Inc. and Pherin Pharmaceuticals, Inc., dated September 11, 2018, incorporated by reference from Exhibit 10.2 to the Company's Current Report on Form 8-K filed on September 13, 2018. |
| 10.132+ | License Agreement (PH10), by and between VistaGen Therapeutics, Inc. and Pherin Pharmaceuticals, Inc., dated October 24, 2018, incorporated by reference from Exhibit 10.3 to the Company's Quarterly Report on Form 10-Q/A filed on October 30, 2018. |
| 10.133 | Form of Fall 2018 Private Placement Subscription Agreement, incorporated by reference from Exhibit 10.4 to the Company's Quarterly Report on Form 10-Q filed on October 29, 2018. |
| 10.134 | Form of Fall 2018 Private Placement Warrant, incorporated by reference from Exhibit 10.5 to the Company's Quarterly Report on Form 10-Q filed on October 29, 2018. |
| 10.135 | Indemnification Agreement, dated January 10, 2019, by and between VistaGen Therapeutics, Inc. and Ann Cunningham, incorporated by reference from Exhibit 10.1 to the Company's Current Report on Form 8-K filed on January 15, 2019. |
| 10.136 | Indemnification Agreement, dated November 10, 2016, by and between VistaGen Therapeutics, Inc. and Mark A. McPartland, filed herewith. |
| 10.137 | Underwriting Agreement, dated as of February 26, 2019, by and between VistaGen Therapeutics, Inc. and William Blair & Company, LLC, incorporated by reference from Exhibit 1.1 to the Company's Current Report on Form 8-K filed on March 4, 2019. |
| 10.138 | Master Services Agreement, dated July 11, 2017, by and between VistaGen Therapeutics, Inc. and Cato Research Ltd., filed herewith. |
| 23.1 | Consent of Independent Registered Public Accounting Firm, filed herewith. |
| 31.1 | Certification of the Company's Chief Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002, filed herewith. |
| 31.2 | Certification of the Company's Chief Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002, filed herewith. |
| 32.1 | Certification of the Company's Chief Executive Officer and Chief Financial Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, filed herewith. |
| 101.INS | XBRL Instance Document, filed herewith |
| 101.SCH | XBRL Taxonomy Extension Schema, filed herewith |
| 101.CAL | XBRL Taxonomy Extension Calculation Linkbase, filed herewith |
| 101.DEF | XBRL Taxonomy Extension Definition Linkbase, filed herewith |
| 101.LAB | XBRL Taxonomy Extension Label Linkbase, filed herewith |
| 101.PRE | XBRL Taxonomy Extension Presentation Linkbase, filed herewith |

---

* Incorporated by reference from the like-numbered exhibit filed with our Current Report on Form 8-K on May 16, 2011.
+ Confidential treatment has been granted for certain confidential portions of this agreement.

**SIGNATURES**

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of South San Francisco, State of California, on the 25th day of June, 2019.

**VistaGen Therapeutics, Inc.**

Date: June 25, 2019

By: /s/ *Shawn K. Singh*
**Shawn K. Singh, J.D.**
***Chief Executive Officer***

In accordance with the Exchange Act, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

| Signature | Title | Date |
|---|---|---|
| /s/ Shawn K. Singh<br>**Shawn K. Singh, JD** | Chief Executive Officer, and Director<br>*(Principal Executive Officer)* | June 25, 2019 |
| /s/ Jerrold D. Dotson<br>**Jerrold D. Dotson** | Vice President and Chief Financial Officer<br>*(Principal Financial and Accounting Officer)* | June 25, 2019 |
| /s/ H. Ralph Snodgrass<br>**H. Ralph Snodgrass, Ph.D** | President, Chief Scientific Officer and Director | June 25, 2019 |
| /s/ Jon S. Saxe<br>**Jon S. Saxe** | Chairman of the Board of Directors | June 25, 2019 |
| /s/ Brian J. Underdown<br>**Brian J. Underdown, Ph. D** | Director | June 25, 2019 |
| /s/ Jerry B. Gin, Ph.D<br>**Jerry B. Gin, Ph.D.** | Director | June 25, 2019 |
| /s/ Ann M. Cunningham<br>**Ann M. Cunningham** | Director | June 25, 2019 |

**VISTAGEN THERAPEUTICS, INC. INDEMNIFICATION AGREEMENT**

THIS AGREEMENT is entered into, effective as of November 10, 2016 between VistaGen Therapeutics, Inc., a Nevada corporation (the "Company"), and Mark A. McPartland (“Indemnitee”).

WHEREAS, it is essential to the Company to retain and attract as directors and officers the most capable persons available;

WHEREAS, Indemnitee is an officer of the Company;

WHEREAS, both the Company and Indemnitee recognize the increased risk of litigation and other claims currently being asserted against directors and officers of corporations; and

WHEREAS, in recognition of Indemnitee's need for substantial protection against personal liability in order to enhance Indemnitee's continued and effective service to the Company, and in order to induce Indemnitee to provide services to the Company as an officer, the Company wishes to provide in this Agreement for the indemnification of and the advancing of expenses to Indemnitee to the fullest extent (whether partial or complete) permitted by law and as set forth in this Agreement, and, to the extent insurance is maintained, for the coverage of Indemnitee under the Company's directors' and officers' liability insurance policies.

NOW, THEREFORE, in consideration of the above premises and of Indemnitee's continuing to serve the Company directly or, at its request, with another enterprise, and intending to be legally bound hereby, the parties agree as follows:

1. Certain Definitions:

(a) Board: the Board of Directors of the Company.

(b) Change in Control: shall be deemed to have occurred if (i) any "person" (as such term is used in Sections 13(d) and 14(d) of the Securities Exchange Act of 1934, as amended), other than a trustee or other fiduciary holding securities under an employee benefit plan of the Company or a corporation owned directly or indirectly by the shareholders of the Company in substantially the same proportions as their ownership of stock of the Company, is or becomes the "Beneficial Owner" (as defined in Rule 13d-3 under said Act), directly or indirectly, of securities of the Company representing 20% or more of the total voting power represented by the Company's then outstanding Voting Securities, or (ii) during any period of two consecutive years, individuals who at the beginning of such period constitute the Board and any new director whose election by the Board or nomination for election by the Company's shareholders was approved by a vote of at least two-thirds (2/3) of the directors then still in office who either were directors at the beginning of the period or whose election or nomination for election was previously so approved, cease for any reason to constitute a majority thereof, or (iii) the shareholders of the Company approve a merger or consolidation of the Company with any other corporation, other than a merger or consolidation that would result in the Voting Securities of the Company outstanding immediately prior thereto continuing to represent (either by remaining outstanding or by being converted into Voting Securities of the surviving entity) at least 80% of the total voting power represented by the Voting Securities of the Company or such surviving entity outstanding immediately after such merger or consolidation, or the shareholders of the Company approve a plan of complete liquidation of the Company or an agreement for the sale or disposition by the Company (in one transaction or a series of transactions) of all or substantially all of the Company's assets.

(c) Expenses: any expense, liability, or loss, including attorneys' fees, judgments, fines, ERISA excise taxes and penalties, amounts paid or to be paid in settlement, any interest, assessments, or other charges imposed thereon, and any federal, state, local, or foreign taxes imposed as a result of the actual or deemed receipt of any payments under this Agreement, paid or incurred in connection with investigating, defending, being a witness in, or participating in (including on appeal), or preparing for any of the foregoing in, any Proceeding relating to any Indemnifiable Event.

(d) Indemnifiable Event: any event or occurrence that takes place either prior to or after the execution of this Agreement, related to the fact that Indemnitee is or was an officer of the Company, or while an officer is or was serving at the request of the Company as a director, officer, employee, trustee, agent, or fiduciary of another foreign or domestic corporation, partnership, joint venture, employee benefit plan, trust, or other enterprise, or was a director, officer, employee, or agent of a foreign or domestic corporation that was a predecessor corporation of the Company or of another enterprise at the request of such predecessor corporation, or related to anything done or not done by Indemnitee in any such capacity, whether or not the basis of the Proceeding is alleged action in an official capacity as a director, officer, employee, or agent or in any other capacity while serving as a director, officer, employee, or agent of the Company, as described above.

(e) Independent Counsel: the person or body appointed in connection with Section 3.

(f) Proceeding: any threatened, pending, or completed action, suit, or proceeding (including an action by or in the right of the Company), or any inquiry, hearing, or investigation, whether conducted by the Company or any other party, that Indemnitee in good faith believes might lead to the institution of any such action, suit, or proceeding, whether civil, criminal, administrative, investigative, or other.

(g) Reviewing Party: the person or body appointed in accordance with Section 3.

(h) Voting Securities: any securities of the Company that vote generally in the election of directors.

2. Agreement to Indemnify.

(a) General Agreement. In the event Indemnitee was, is, or becomes a party to or witness or other participant in, or is threatened to be made a party to or witness or other participant in, a Proceeding by reason of (or arising in part out of) an Indemnifiable Event, the Company shall indemnify Indemnitee from and against any and all Expenses to the fullest extent permitted by law, as the same exists or may hereafter be amended or interpreted (but in the case of any such amendment or interpretation, only to the extent that such amendment or interpretation permits the Company to provide broader indemnification rights than were permitted prior thereto). The parties hereto intend that this Agreement shall provide for indemnification in excess of that expressly permitted by statute, including, without limitation, any indemnification provided by the Company's Articles of Incorporation, its Bylaws, vote of its shareholders or disinterested directors, or applicable law.

(b) Initiation of Proceeding. Notwithstanding anything in this Agreement to the contrary, Indemnitee shall not be entitled to indemnification pursuant to this Agreement in connection with any Proceeding initiated by Indemnitee against the Company or any director of the Company unless (i) the Company has joined in or the Board has consented to the initiation of such Proceeding; (ii) the Proceeding is one to enforce indemnification rights under Section 5; or (iii) the Proceeding is instituted after a Change in Control (other than a Change in Control approved by a majority of the directors on the Board who were directors immediately prior to such Change in Control) and Independent Counsel has approved its initiation.

(c) Expense Advances. If so requested by Indemnitee, the Company shall advance (within ten business days of such request) any and all Expenses to Indemnitee (an "Expense Advance"); provided that, if and to the extent that the Reviewing Party determines that Indemnitee would not be permitted to be so indemnified under applicable law, the Company shall be entitled to be reimbursed by Indemnitee (who hereby agrees to reimburse the Company) for all such amounts theretofore paid. If Indemnitee has commenced or commences legal proceedings in a court of competent jurisdiction to secure a determination that Indemnitee should be indemnified under applicable law, as provided in Section 4, any determination made by the Reviewing Party that Indemnitee would not be permitted to be indemnified under applicable law shall not be binding and Indemnitee shall not be required to reimburse the Company for any Expense Advance until a final judicial determination is made with respect thereto (as to which all rights of appeal therefrom have been exhausted or have lapsed). Indemnitee's obligation to reimburse the Company for Expense Advances shall be unsecured and no interest shall be charged thereon.

(d) Mandatory Indemnification. Notwithstanding any other provision of this Agreement, to the extent that Indemnitee has been successful on the merits in defense of any Proceeding relating in whole or in part to an Indemnifiable Event or in defense of any issue or matter therein, Indemnitee shall be indemnified against all Expenses incurred in connection therewith.

(e) Partial Indemnification. If indemnitee is entitled under any provision of this Agreement to indemnification by the Company for some or a portion of Expenses, but not, however, for the total amount thereof, the Company shall nevertheless indemnify Indemnitee for the portion thereof to which Indemnitee is entitled.

(f) Prohibited Indemnification. No indemnification pursuant to this Agreement shall be paid by the Company on account of any Proceeding in which final unappealed judgment beyond the right of appeal is rendered against Indemnitee for an accounting of profits made from the purchase or sale by Indemnitee of securities of the Company pursuant to the provisions of Section 16(b) of the Securities Exchange Act of 1934, as amended, or similar provisions of any federal, state, or local laws.

3. Reviewing Party. Prior to any Change in Control, the Reviewing Party shall be any appropriate person or body consisting of a member or members of the Board or any other person or body appointed by the Board who is not a party to the particular Proceeding with respect to which Indemnitee is seeking indemnification; after a Change in Control, the Reviewing Party shall be the Independent Counsel referred to below. With respect to all matters arising after a Change in Control (other than a Change in Control approved by a majority of the directors on the Board who were directors immediately prior to such Change in Control) concerning the rights of Indemnitee to indemnity payments and Expense Advances under this Agreement or any other agreement or under applicable law or the Company's Articles of Incorporation or Bylaws now or hereafter in effect relating to indemnification for Indemnifiable Events, the Company shall seek legal advice only from Independent Counsel selected by Indemnitee and approved by the Company (which approval shall not be unreasonably withheld), and who has not otherwise performed services for the Company or the Indemnitee (other than in connection with indemnification matters) within the last five years. The Independent Counsel shall not include any person who, under the applicable standards of professional conduct then prevailing, would have a conflict of interest in representing either the Company or Indemnitee in an action to determine Indemnitee's rights under this Agreement. Such counsel, among other things, shall render its written opinion to the Company and Indemnitee as to whether and to what extent the Indemnitee should be permitted to be indemnified under applicable law. The Company agrees to pay the reasonable fees of the Independent Counsel and to indemnify fully such counsel against any and all expenses (including attorneys' fees), claims, liabilities, loss, and damages arising out of or relating to this Agreement or the engagement of Independent Counsel pursuant hereto.

4. Indemnification Process and Appeal.

(a) Indemnification Payment. Indemnitee shall be entitled to indemnification of Expenses, and shall receive payment thereof, from the Company in accordance with this Agreement as soon as practicable after Indemnitee has made written demand on the Company for indemnification, unless the Reviewing Party has given a written opinion to the Company that Indemnitee is not entitled to indemnification under applicable law.

(b) Suit to Enforce Rights. Regardless of any action by the Reviewing Party, if Indemnitee has not received full indemnification within thirty days after making a demand in accordance with Section 4(a), Indemnitee shall have the right to enforce its indemnification rights under this Agreement by commencing litigation in any court in the State of Nevada having subject matter jurisdiction thereof and in which venue is proper seeking an initial determination by the court or challenging any determination by the Reviewing Party or any aspect thereof. The Company hereby consents to service of process and to appear in any such proceeding. Any determination by the Reviewing Party not challenged by the Indemnitee shall be binding on the Company and Indemnitee. The remedy provided for in this Section 4 shall be in addition to any other remedies available to Indemnitee in law or equity.

(c) Defense to Indemnification, Burden of Proof, and Presumptions. It shall be a defense to any action brought by Indemnitee against the Company to enforce this Agreement (other than an action brought to enforce a claim for Expenses incurred in defending a Proceeding in advance of its final disposition where the required undertaking has been tendered to the Company) that it is not permissible under applicable law for the Company to indemnify Indemnitee for the amount claimed. In connection with any such action or any determination by the Reviewing Party or otherwise as to whether Indemnitee is entitled to be indemnified hereunder, the burden of proving such a defense or determination shall be on the Company. Neither the failure of the Reviewing Party or the Company (including its Board, independent legal counsel, or its shareholders) to have made a determination prior to the commencement of such action by Indemnitee that indemnification of the claimant is proper under the circumstances because he has met the standard of conduct set forth in applicable law, nor an actual determination by the Reviewing Party or Company (including its Board, independent legal counsel, or its shareholders) that the Indemnitee had not met such applicable standard of conduct, shall be a defense to the action or create a presumption that the Indemnitee has not met the applicable standard of conduct. For purposes of this Agreement, the termination of any claim, action, suit, or proceeding, by judgment, order, settlement (whether with or without court approval), conviction, or upon a plea of nolo contendere, or its equivalent, shall not create a presumption that Indemnitee did not meet any particular standard of conduct or have any particular belief or that a court has determined that indemnification is not permitted by applicable law.

5. Indemnification for Expenses Incurred in Enforcing Rights. The Company shall indemnify Indemnitee against any and all Expenses that are incurred by Indemnitee in connection with any action brought by Indemnitee for

(i) indemnification of Expenses by the Company under this Agreement or any other agreement or under applicable law or the Company's Articles of Incorporation or Bylaws now or hereafter in effect relating to indemnification for Indemnifiable Events; and/or

(ii) recovery under directors' and officers' liability insurance policies maintained by the Company, but only in the event that Indemnitee ultimately is determined to be entitled to such indemnification or insurance recovery, as the case may be. In addition, the Company shall, if so requested by Indemnitee, advance the foregoing Expenses to Indemnitee, subject to and in accordance with Section 2(c).

6. Notification and Defense of Proceeding.

(a) Notice. Promptly after receipt by Indemnitee of notice of the commencement of any Proceeding, Indemnitee will, if a claim in respect thereof is to be made against the Company under this Agreement, notify the Company of the commencement thereof; but the omission so to notify the Company will not relieve it from any liability that it may have to Indemnitee, except as provided in Section 6(c).

(b) Defense. With respect to any Proceeding as to which Indemnitee notifies the Company of the commencement thereof, the Company will be entitled to participate in the Proceeding at its own expense and except as otherwise provided below, to the extent the Company so wishes, it may assume the defense thereof with counsel reasonably satisfactory to Indemnitee. After notice from the Company to Indemnitee of its election to assume the defense of any Proceeding, the Company will not be liable to Indemnitee under this Agreement or otherwise for any Expenses subsequently incurred by Indemnitee in connection with the defense of such Proceeding other than reasonable costs of investigation or as otherwise provided below. Indemnitee shall have the right to employ his own counsel in such Proceeding, but all Expenses related thereto incurred after notice from the Company of its assumption of the defense shall be at Indemnitee's expense unless: (i) the employment of counsel by Indemnitee has been authorized by the Company; (ii) Indemnitee has reasonably determined that there may be a conflict of interest between Indemnitee and the Company in the defense of the Proceeding, after a Change in Control (other than a Change in Control approved by a majority of the directors on the Board who were directors immediately prior to such Change in Control); (iii) the employment of counsel by Indemnitee has been approved by the Independent Counsel; or (iv) the Company shall not in fact have employed counsel to assume the defense of such Proceeding, in each of which case all Expenses of the Proceeding shall be borne by the Company. The Company shall not be entitled to assume the defense of any Proceeding brought by or on behalf of the Company or as to which Indemnitee shall have made the determination provided for in (ii) above.

(c) Settlement of Claims. The Company shall not be liable to indemnify Indemnitee under this Agreement or otherwise for any amounts paid in settlement of any Proceeding effected without the Company's written consent, provided, however, that if a Change in Control has occurred (other than a Change in Control approved by a majority of the directors on the Board who were directors immediately prior to such Change in Control), the Company shall be liable for indemnification of Indemnitee for amounts paid in settlement if the Independent Counsel has approved the settlement. The Company shall not settle any Proceeding in any manner that would impose any penalty or limitation on Indemnitee without Indemnitee's written consent. Neither the Company nor the Indemnitee will unreasonably withhold their consent to any proposed settlement. The Company shall not be liable to indemnify the Indemnitee under this Agreement with regard to any judicial award if the Company was not given a reasonable and timely opportunity, at its expense, to participate in the defense of such action; the Company's liability hereunder shall not be excused if participation in the Proceeding by the Company was barred by this Agreement.

7. Establishment of Trust. In the event of a Change in Control (other than a Change in Control approved by a majority of the directors on the Board who were directors immediately prior to such Change in Control) the Company shall, upon written request by Indemnitee, create a Trust for the benefit of the Indemnitee and from time to time upon written request of Indemnitee shall fund the Trust in an amount sufficient to satisfy any and all Expenses reasonably anticipated at the time of each such request to be incurred in connection with investigating, preparing for, participating in, and/or defending any Proceeding relating to an Indemnifiable Event. The amount or amounts to be deposited in the Trust pursuant to the foregoing funding obligation shall be determined by the Reviewing Party. The terms of the Trust shall provide that: (i) the Trust shall not be revoked or the principal thereof invaded, without the written consent of the Indemnitee; (ii) the Trustee shall advance, within ten business days of a request by the Indemnitee, any and all Expenses to the Indemnitee (and the Indemnitee hereby agrees to reimburse the Trust under the same circumstances for which the Indemnitee would be required to reimburse the Company under Section 2(c) of this Agreement); (iii) the Trust shall continue to be funded by the Company in accordance with the funding obligation set forth above; (iv) the Trustee shall promptly pay to the Indemnitee all amounts for which the Indemnitee shall be entitled to indemnification pursuant to this Agreement or otherwise; and (v) all unexpended funds in the Trust shall revert to the Company upon a final determination by the Reviewing Party or a court of competent jurisdiction, as the case may be, that the Indemnitee has been fully indemnified under the terms of this Agreement. The Trustee shall be chosen by the Indemnitee. Nothing in this Section 7 shall relieve the Company of any of its obligations under this Agreement. All income earned on the assets held in the Trust shall be reported as income by the Company for federal, state, local, and foreign tax purposes. The Company shall pay all costs of establishing and maintaining the Trust and shall indemnify the Trustee against any and all expenses (including attorneys' fees), claims, liabilities, loss, and damages arising out of or relating to this Agreement or the establishment and maintenance of the Trust.

8. Non-Exclusivity. The rights of Indemnitee hereunder shall be in addition to any other rights Indemnitee may have under the Company's Articles of Incorporation, Bylaws, applicable law, or otherwise. To the extent that a change in applicable law (whether by statute or judicial decision) permits greater indemnification by agreement than would be afforded currently under the Company's Articles of Incorporation, Bylaws, applicable law, or this Agreement, it is the intent of the parties that Indemnitee enjoy by this Agreement the greater benefits so afforded by such change.

9. Liability Insurance. To the extent the Company maintains an insurance policy or policies providing directors' and officers' liability insurance, Indemnitee shall be covered by such policy or policies, in accordance with its or their terms, to the maximum extent of the coverage available for any Company director or officer.

10. Period of Limitations. No legal action shall be brought and no cause of action shall be asserted by or on behalf of the Company or any affiliate of the Company against Indemnitee, Indemnitee's spouse, heirs, executors, or personal or legal representatives after the expiration of two (2) years from the date of accrual of such cause of action, or such longer period as may be required by state law under the circumstances. Any claim or cause of action of the Company or its affiliate shall be extinguished and deemed released unless asserted by the timely filing of a legal action within such period; provided, however, that if any shorter period of limitations is otherwise applicable to any such cause of action the shorter period shall govern.

11. Amendment of this Agreement. No supplement, modification, or amendment of this Agreement shall be binding unless executed in writing by both of the parties hereto. No waiver of any of the provisions of this Agreement shall be binding unless in the form of a writing signed by the party against whom enforcement of the waiver is sought, and no such waiver shall operate as a waiver of any other provisions hereof (whether or not similar), nor shall such waiver constitute a continuing waiver. Except as specifically provided herein, no failure to exercise or any delay in exercising any right or remedy hereunder shall constitute a waiver thereof.

12. Subrogation. In the event of payment under this Agreement, the Company shall be subrogated to the extent of such payment to all of the rights of recovery of Indemnitee, who shall execute all papers required and shall do everything that may be necessary to secure such rights, including the execution of such documents necessary to enable the Company effectively to bring suit to enforce such rights.

13. No Duplication of Payments. The Company shall not be liable under this Agreement to make any payment in connection with any claim made against Indemnitee to the extent Indemnitee has otherwise received payment (under any insurance policy, Bylaw, or otherwise) of the amounts otherwise Indemnifiable hereunder.

14. Binding Effect. This Agreement shall be binding upon and inure to the benefit of and be enforceable by the parties hereto and their respective successors (including any direct or indirect successor by purchase, merger, consolidation, or otherwise to all or substantially all of the business and/or assets of the Company), assigns, spouses, heirs, and personal and legal representatives. The Company shall require and cause any successor (whether direct or indirect by purchase, merger, consolidation, or otherwise) to all, substantially all, or a substantial part, of the business and/or assets of the Company, by written agreement in form and substance satisfactory to Indemnitee, expressly to assume and agree to perform this Agreement in the same manner and to the same extent that the Company would be required to perform if no such succession had taken place. The indemnification provided under this Agreement shall continue as to Indemnitee for any action taken or not taken while serving in an indemnified capacity pertaining to an Indemnifiable Event even though he may have ceased to serve in such capacity at the time of any Proceeding.

15. Severability. If any provision (or portion thereof) of this Agreement shall be held by a court of competent jurisdiction to be invalid, void, or otherwise unenforceable, the remaining provisions shall remain enforceable to the fullest extent permitted by law. Furthermore, to the fullest extent possible, the provisions of this Agreement (including, without limitation, each portion of this Agreement containing any provision held to be invalid, void, or otherwise unenforceable, that is not itself invalid, void, or unenforceable) shall be construed so as to give effect to the intent manifested by the provision held invalid, void, or unenforceable.

16. Governing Law. This Agreement shall be governed by and construed and enforced in accordance with the laws of the State of California applicable to contracts made and to be performed in such State without giving effect to the principles of conflicts of laws.

17. Notices. All notices, demands, and other communications required or permitted hereunder shall be made in writing and shall be deemed to have been duly given if delivered by hand, against receipt, or mailed, postage prepaid, certified or registered mail, return receipt requested, and addressed to the Company at:

VistaGen Therapeutics, Inc.
343 Allerton Avenue
South San Francisco, CA 94080 Attention: CEO

and to Indemnitee at:

Mark A. McPartland
405 Marsh Oaks Drive
Wilmington, NC 28411

Notice of change of address shall be effective only when done in accordance with this Section. All notices complying with this Section shall be deemed to have been received on the date of delivery or on the third business day after mailing.

IN WITNESS WHEREOF, the parties hereto have duly executed and delivered this Agreement as of the day specified above.

VISTAGEN THERAPEUTICS, INC.

By: /s/ Shawn Singh
Name: Shawn Singh
Title: Chief Executive Officer

MARK A. MCPARTLAND

/s/ Mark A. McPartland
Indemnitee

# MASTER SERVICES AGREEMENT

**(For All CRO Services)**

This Master Services Agreement (this "Agreement") is made as of the 11th day of July, 2017 (the "Effective Date") by and between Cato Research Ltd., a North Carolina corporation headquartered at 4364 South Alston Avenue, Durham, North Carolina, USA 27713 ("CRL"), and VistaGen Therapeutics, Inc., a Nevada corporation headquartered at 343 Allerton Avenue, South San Francisco, California 94080, USA ("VistaGen"). Each of CRL and VistaGen may be referred to herein separately as a "Party" and collectively as the "Parties." As used in this Agreement, "Affiliate(s)" means any corporation, firm, partnership, or other entity which controls, is controlled by or is under common control with a Party. For the purpose of this definition, "control" shall mean the power to direct, or cause the direction of, the management and policies of an entity through the ownership, directly or indirectly, of at least fifty percent (50%) of the voting share capital of such entity or any other comparable equity, by contract, or by ownership interest.

**WHEREAS,** VistaGen is engaged in the evaluation, development, commercialization and/or marketing of biologics, pharmaceutical agents, medical devices and/or other life sciences technologies (collectively, "Products"); and

**WHEREAS,** CRL is an independent contract research and development organization ("CRO") providing a broad range of services relating to the evaluation, development, commercialization and marketing of new biologics, pharmaceutical agents, medical devices and/or other life sciences technologies; and

**WHEREAS,** VistaGen wishes to retain CRL, and CRL wishes to be retained by VistaGen, to assist VistaGen with certain aspects of the evaluation, development, commercialization or marketing of VistaGen Products or otherwise to provide certain regulatory or other strategic consulting services as specified by VistaGen from time to time; and

**NOW, THEREFORE,** in consideration of the foregoing premises and the promises, benefits, rights, and obligations set forth below, the Parties agree as follows:

1. **Work Orders for CRO Services**.

1.1 CRL shall provide CRO services to VistaGen, as requested by VistaGen from time to time in accordance with the terms of this Agreement (the "CRO Services"). Requested CRO Services may include any area of services customarily undertaken by CRL, including without limitation the areas of nonclinical development, clinical development, regulatory affairs, medical monitoring and pharmacovigilance or safety services.

1.2 Whenever VistaGen requests CRL to perform CRO Services, and CRL wishes to perform CRO Services requested by VistaGen, CRL shall prepare a Work Order, in a form acceptable to both Parties and containing, at a minimum, the CRO Services to be performed and the compensation to be paid by VistaGen for the CRO Services covered by the Work Order. It may also include any other requirements or obligations agreed upon by the Parties and not set forth herein. Each such Work Order, to be binding an effective on the Parties, shall be executed and delivered by the Parties **before** any CRO Services are rendered thereunder. If CRL submits a project proposal for CRO Services to VistaGen, and such project proposal is executed and delivered by both Parties with the expressed intent reflected in writing therein that it be performed as a Work Order, then it shall be deemed a Work Order for purposes of this Agreement. Each Work Order shall be deemed a part of this Agreement and incorporated into it, but no Work Order shall be deemed part of another Work Order, unless specifically so stated in the applicable Work Order executed and delivered by both Parties.

1.3 CRL shall not be obligated to perform, and VistaGen shall not be obligated to pay for, the CRO Services described in any proposal, draft work order or similar document unless and until such time as the Work Order related to such CRO Services has been signed and delivered by both Parties.

1.4 If the terms of a Work Order conflict with those of this Agreement, then the terms of this Agreement shall control unless otherwise specifically stated in the Work Order. If either Party sends a purchase order, confirmation, or similar form, then the terms of this Agreement and not those in such additional document shall control; the Parties agree that any additional or different terms in such form, now or in the future, are void even if the form indicates that it shall control.

1.5 Unless a Work Order specifies to the contrary, CRL may subcontract some or all of its obligations under such Work Order to an Affiliate provided that such Affiliate is bound by confidentiality obligations at least as protective of VistaGen's confidential information as those in this Agreement. CRL shall be equally responsible for the performance of such Affiliate as CRL would be if it performed such obligations itself. CRL may use individuals engaged as independent contractors to perform CRO Services hereunder provided that CRL remains equally liable for their conduct as if they were employees. Except for such individuals and Affiliates, CRL shall not subcontract any of its obligations under a Work Order to a third party without Vistagen's consent.

1.6 If a Work Order is unclear, ambiguous, or permits different understandings of the CRO Services to be performed, the Parties shall use good faith efforts to resolve such ambiguity in writing, it being understood that such resolution may result in an adjustment to the budgeted costs.

1.7 If the scope or definition of the CRO Services in a Work Order changes, including without limitation a change in the number of units of any CRO Services as specified in the budget for the applicable Work Order, and the additional cost of such additional CRO Services does not exceed the lesser of (x) ten percent (10%) of the budget for the CRO Services as set forth in the applicable Work Order or (y) $50,000, CRL will notify VistaGen of the changes and, upon VistaGen's written authorization (which may be by email), will commence performance of the additional CRO Services without a formal Work Order amendment. CRL will thereafter formalize the changes by providing to VistaGen a formal amendment to the Work Order reflecting the authorized changes. The Parties shall then timely sign such amendment, but Vistagen shall nevertheless be obligated to pay for the changed CRO Services based on the previously- given authorization to proceed even if Vistagen does not sign the relevant amendment. With respect to changes requested in excess of the lesser of (x) ten percent (10%) of the applicable budget or (y) $50,000, neither party shall be obligated unless and until a prior written Work Order amendment is signed and delivered by the Parties.

1.8 The parties acknowledge that any change in regulations to which the CRO Services are subject may require an amendment to the relevant Work Order, and that some changes to regulations may render the underlying project economically or practically infeasible and, in such instances, the parties will work together to negotiate an appropriate amendment to the Work Order to wind-down the CRO Services efficiently.

1.9 Unless specifically included in an applicable Work Order, CRL will not collect or report to VistaGen any payments made which may be reportable under the Physicians Payment Sunshine Act. If collection and reporting obligations are specified in an applicable Work Order, CRL shall report the required information based no payments made by CRL, and CRL shall have no obligations with respect to any payments made by VistaGen; VistaGen shall aggregate its own information from all sources and make its report to the Centers for Medicare and Medicaid Services.

1.10 Subject to the terms of Section 1.7 or 1.8, a Work Order may only be amended in writing with the signature of both Parties.

2. **Performance of CRO Services**.

2.1 CRL shall use commercially reasonable efforts to perform the CRO Services in accordance with the specifications, instructions, and guidelines in each Work Order and this Agreement in all material respects. CRL shall use its own protocols in the performance of CRO Services unless specified to the contrary in the applicable Work Order.

2.2 All CRO Services performed by CRL shall be performed in conformity with all applicable international, federal, state and local laws and regulations, including without limitation, as applicable, current Good Laboratory Practices, Good Manufacturing Practices, Good Clinical Practices, ICH Guidelines, and all applicable FDA regulations.

3. **VistaGen Obligations**. VistaGen shall undertake the following obligations with respect to the performance of this Agreement, in addition to any other obligations outlined herein or in the applicable Work Order.

3.1 VistaGen shall use commercially reasonable efforts to deliver all information and materials reasonably required for CRL's performance of CRO Services in accordance with mutually agreed upon timelines.

3.2 VistaGen shall immediately inform CRL of any safety concerns or serious adverse events related to a Product that is the subject of the CRO Services.

3.3 VistaGen shall use commercially reasonable efforts to not take any actions or participate in any activities that are intended to, or can be reasonably expected to, disrupt or interfere with CRL's obligations under this Agreement.

3.4 CRL believes all data, information and analysis provided and all reports generated as Deliverables (as defined below) will be accurate and reliable, but VistaGen is ultimately and solely responsible for its use of the Deliverables or other matter or information produced or provided under this Agreement.

4. **Compensation**.

4.1 VistaGen shall pay CRL for the CRO Services as specified in the Work Order governing such CRO Services. If travel time is not included in the applicable unit price on the Work Order, then it shall be billed as out of scope work time, with the understanding that, to the extent practical, travel time shall be used to perform CRO Services for VistaGen.

4.2 Unless otherwise specified in the applicable Work Order, VistaGen shall reimburse CRL for out-of-pocket expenses reasonably incurred in performance of the CRO Services under this Agreement including, but not limited to, third-party fees and expenses, passthrough expenses, telephone, facsimile, messenger, postage and other communication costs, document copying and retrieval, on-site and off-site storage fees, computer research fees and filing fees, reasonable transportation, lodging, and meal expenses for travel to sites away from CRL's office, and travel between CRL offices (collectively, "Expenses"); provided however, that advanced written approval is required from VistaGen for any Expense which exceeds five hundred dollars ($500).

4.3 Invoices for CRO Services and Expenses shall be in United States dollars unless the Work Order related to such CRO Services or Expenses specifies a different currency shall be sent monthly, and shall itemize the CRO Services performed and Expenses incurred. VistaGen shall pay all invoices in the currency of the invoice within thirty (30) days of the date of the invoice via wire transfer, per wire instructions which shall be provided by CRL. In addition to paying the amount due with respect to CRO Services and Expenses, VistaGen shall also make additional payments for any federal, state, county, local or governmental taxes, duties, excise taxes, now or hereafter applied including sales tax, value added tax, or any similar tax. No deduction shall be made from the amount due or paid as a result of any taxes or withholding that may occur by governments with respect to payments made to CRL from outside the United States or as a result of any taxes paid by VistaGen. Except as specified in Section 4.4, payment shall be in the full amount specified on the invoice.

4.4 If VistaGen disputes the amount due on any invoice, then VistaGen must notify CRL of such dispute before the payment due date and pay such amount as is undisputed by the payment due date. Both Parties shall act in good faith to promptly resolve such dispute, and upon resolution of the dispute, any amount remaining due shall be paid within fifteen (15) days after the resolution.

4.5 If all or any undisputed portion of an invoice remains unpaid when due, then such unpaid portion shall accrue a finance charge of 1.25% per month from the date of the invoice until paid. For the avoidance of confusion, in calculating finance charges related to disputed invoices, an invoice (or portions thereof, as applicable) shall be deemed to have been due such that finance charges begin to accrue: (a) thirty (30) days after the date of the original invoice if the invoice is determined to have been correct; or (b) if the dispute relates to incomplete or incorrect work then fifteen (15) days after the date on which it is determined all obligations for payment of each disputed amount were met under the Work Order such that payment of such amount should have been made. VistaGen shall reimburse CRL on demand for all reasonable out-of-pocket costs and expenses CRL incurs in enforcing payment of an overdue invoice, including, without limitation, attorneys' fees and expenses. Payments received from VistaGen by CRL on an overdue invoice shall be first applied to costs of collection, then to accrued interest, and then to the unpaid balance of the invoice. CRL may, in its discretion, allocate collection costs among any overdue invoices and apply any payments received against any overdue invoices.

4.6 Except as otherwise set forth herein, any and all payments made hereunder are nonrefundable.

5. **Term and Termination**.

5.1 The term of this Agreement shall be five (5) years from the Effective Date and it shall automatically renew for additional one (1) year terms unless, at least sixty (60) days before the expiration of any term, a Party gives written notice to the other Party that it does not want to renew this Agreement; provided however, that if the term of a Work Order extends beyond the term of this Agreement, then this Agreement will continue in effect as to that Work Order (only) until the completion or termination of such Work Order and all wind-down CRO Services related to such Work Order.

5.2 Either Party may terminate a Work Order upon the other Party's material default under this Agreement with respect to such Work Order, provided that the terminating Party has given the defaulting Party not less than thirty (30) days' prior written notice of such default and the defaulting Party has not cured such default by the end of the notice period. Termination of a Work Order based on an uncured default does not give rise to the right to terminate any other Work Order or this Agreement.

5.3 Except with respect to Work Orders for clinical trials, either Party may terminate a Work Order at any time upon no less than thirty (30) days' prior written notice to the other Party. With respect to Work Orders for clinical trials, only VistaGen may terminate at any time upon no less than sixty (60) days' prior written notice to CRL.

5.4 Upon early termination of a Work Order, CRL shall invoice VistaGen and VistaGen shall pay CRL for all CRO Services rendered and Expenses incurred through the date of termination in accordance with Section 4 above. CRL's compensation under any Work Order being paid on a fixed-fee basis or on any payment schedule which is other than either time-and materials or a unit-based budget, the Work Order shall be converted to a time-and-materials basis in accordance with CRL's current rates, and CRL shall be paid for all CRO Services performed and Expenses incurred through the date of termination.

5.5 If VistaGen terminates a Work Order under Section 5.3 or CRL terminates a Work Order under Section 5.2, then, in addition to payments made under Section 5.4, then (a) VistaGen shall reimburse CRL for any and all non-cancelable obligations of CRL to third parties related to the terminated Work Order and (b) if the terminated Work Order relates to a clinical trial, then VistaGen shall pay CRL the Termination Fee (if any) for such Work Order, as described in Section 5.6.

5.6 The Termination Fee for a work order shall be computed as follows:

The Termination Fee shall be twenty-five percent (25%) of the estimated remaining unbilled amounts for CRO Services (but excluding any pass-through costs or or Expenses) under the Work Order if either:

(a) the clinical trial to which the Work Order relates is terminated either in anticipation of or following a Change of Control (as defined below), or

(b) Vistagen does not undertake a new clinical trial within three (3) months of the date of termination where, in connection with such trial, Vistagen enters into a new Work Order with CRL providing for similar services (in description, price and quantity) as specified in the original terminated Work Order.

As used above, a “Change of Control” means any event or series of events by which (a) any person or group of related persons acquires shares representing fifty percent (50%) of the outstanding voting power of VistaGen (b) any merger, share exchange or simiar transaction of VistaGen with another entity in which the holders of VistaGen shares representing the majority of the voting power of VistaGen (as measured before the relevant events) do not hold shares representing the majority of the voting power of the resulting entity (as measured after the resulting events); or (c) a sale of the assets of VistaGen to which the Work Order relates.

The Termination Fee shall be $0 if neither (a) nor (b), above, apply.

5.7 Upon early termination of a Work Order, CRL shall inform VistaGen of the extent to which it expects work in progress to be completed as of the termination date and CRL shall (unless otherwise instructed by VistaGen) take steps to wind-down work in progress in an orderly fashion. In addition to all other amounts payable to CRL, VistaGen shall pay CRL for such winddown CRO Services on a time-and-materials basis at CRL’s current rates for all reasonable and customary wind-down CRO Services performed and Expenses incurred by CRL. If VistaGen instructs CRL not to complete such wind-down CRO Services, CRL shall, upon notification of the termination of the Work Order, promptly cease providing CRO Services and incurring costs to the extent practicable. In any such event, VistaGen shall be deemed to have released CRL from all legal liability and to have covenanted not to sue CRL on any claims related to failure to perform and the failure to complete reasonable and customary wind-down CRO Services.

5.8 In addition to termination of this Agreement under Sections 5.1-5.3, at any time CRO Services under all Work Orders have been completed or terminated such that there is no request for CRO Services pending, either Party may terminate this Agreement by giving written notice of termination to the other Party.

5.9 The remedies set forth in this Section 5 are not meant to limit any additional remedies available to a Party for breach of this Agreement by the other Party.

6. **Suspension of CRO Services.**

6.1 If VistaGen should, for any reason, suspend the CRO Services to be provided under any Work Order for a period of thirty (30) days, then at the end of such thirty (30) day period CRL may invoice VistaGen and VistaGen shall pay for all CRO Services which have been performed through the date of suspension which have not been invoiced previously. For any Work Order being paid on a unit-based budget basis, payment shall be made for each partially completed unit on a time-and-materials basis related to the CRO Services undertaken for each such unit. For any Work Order being paid on a fixed-fee basis or on any payment schedule which is other than either time-and-materials or a unit-based budget, all CRO Services performed shall be converted to a time-and-materials basis in accordance with CRL’s current rates and CRL shall be paid for all CRO Services performed and Expenses incurred through the date of suspension.

6.2 CRL may in its sole discretion suspend its performance of CRO Services if an undisputed invoice is sixty (60) days or more overdue, and CRL may refrain from resuming performance of CRO Services until all overdue undisputed invoices have been paid in full. If CRL should suspend the CRO Services pursuant to this Section 6.2, and in the further event that the suspension shall remain in place for a period of at least thirty (30) days, then at the end of such 30-day period, CRL may invoice VistaGen and VistaGen shall pay for all CRO Services which have been performed through the date of suspension which have not been invoiced previously in the same manner as set forth in Section 6.1.

6.3 Any CRO Services performed related to a Work Order, during a period when it is under suspension shall be invoiced on a time-and-materials basis at CRLS's then-current rates.

6.4 Upon suspension of CRO Services, CRL may reassign its personnel assigned to the suspended Work Order unless a retainer fee in an amount to be agreed upon by the Parties at such time is paid in advance of each month during which VistaGen wishes to reserve the assigned personnel. Payment of such retainer will ensure CRL will not reassign the designated personnel such that they are unavailable to provide the CRO Services upon resumption of CRO Services.

6.5 If any suspension initiated continues for a period of ninety (90) days, then unless either a retainer is being paid pursuant to Section 6.4 or the Parties agree to the contrary, at the end of the 90-day period the Work Order shall be deemed terminated either by VistaGen without cause or by CRL with cause, as applicable, such that the terms of Section 5.5 shall apply.

6.6 The resumption of CRO Services after any suspension shall be subject to any additional costs which may be incurred as a result of the Work Order having been suspended and then restarted, including without limitation the training of new personnel if the retainer has not been paid for personnel to remain with the project.

7. **Confidential Information.**

7.1 For purposes of this Section, the Party disclosing Confidential Information is known as "Disclosing Party" and the Party receiving information is known as "Receiving Party." As applied to CRL, each of these terms shall include CRL and any applicable Affiliates within the definition.

7.2 "Confidential Information" means: (i) all information furnished by the Disclosing Party to the Receiving Party in tangible, visible, electronic or verbal form or by observation or by any other means, including, but not limited to, business plans, protocols, processes, samples, formulae, chemical entities, compounds, mixtures, prospective and current products, clinical data and analyses, test results, toxicology and pharmacology information, study procedures and manuals, pharmacy dispensing instructions, case report forms and their content, statistical reports, project management and staffing, manufacturing processes, nonpublished patent applications, financial data, forecasts and projections, proprietary software and database structures, research, "know-how," technology under development, marketing information, agreements with or proprietary information of third parties, licensors and licensees and strategic partners, regardless of whether such disclosures are marked or otherwise designated as "Confidential"; and (ii) the terms and conditions of this Agreement, all proposals and requests for proposals (including those submitted to the Receiving Party prior to the date of this Agreement and marked as Confidential at the time of delivery), and the existence of the discussions between the Parties to which this Agreement pertains.

7.3 No information shall be within the above definition of Confidential Information if it:

(a) is generally known to the public at the time the Disclosing Party discloses it to any Receiving Party;

(b) becomes generally known to the public subsequent to the time of the Disclosing Party's disclosure to any Receiving Party without any fault or disclosure on the part of such Receiving Party;

(c) was known to any Receiving Party prior to the disclosure by the Disclosing Party, free of any obligation of confidence, as evidenced by such Receiving Party's written records;

(d) is independently developed by such Receiving Party without reference to or reliance on the Confidential Information as evidenced by Receiving Party’s written records;

(e) is, to such Receiving Party’s knowledge, rightfully communicated to it free of any obligation of confidence by anyone who is not a Party to this Agreement; or

(f) is communicated by the Disclosing Party free of any obligation of confidence to anyone that is not a Party to this Agreement.

By way of example and not limitation, information is not generally known to the public if it is not available without considerable research or if it can be primarily located in cached memories of materials otherwise deleted from internet sources. Notwithstanding the foregoing, specific Confidential Information shall not be deemed to be within any of the foregoing exclusions merely because it is within the scope of more general information within one or more of the exclusions. Further, any combination of Confidential Information (whether or not combined with nonconfidential information) shall not be deemed to be within the above exceptions merely because one or more individual items of Confidential Information are within the above exceptions. In furtherance but not limitation of the preceding sentence, any combination of items of Confidential Information shall not be deemed to fall within the foregoing exclusions merely because any or all of the items are published or otherwise in the rightful possession of the Receiving Party unless the combination itself and the principle of its use are published or otherwise in the rightful possession of the Receiving Party.

7.4 Receiving Party shall neither use nor reproduce Disclosing Party’s Confidential Information except as necessary for: (a) negotiations, discussions and consultations with the personnel or authorized representatives of Disclosing Party; or (b) for the purpose of performing its obligations under this Agreement. Upon completion of the obligations under this Agreement that use the Confidential Information, or upon termination of this Agreement, Receiving Party shall, when requested by Disclosing Party in writing, promptly return to Disclosing Party all of the Confidential Information provided by Disclosing Party, except that Receiving Party may retain one (1) copy for recordkeeping purposes and Receiving Party shall not be required to remove or destroy any Confidential Information contained on backup media as a result of systematic backups of Receiving Party’s computer system, provided that Receiving Party shall not access such backup media for the purpose of recovering the Confidential Information.

7.5 Receiving Party shall not disclose, without the prior written consent of Disclosing Party, any of Disclosing Party's Confidential Information to any third party other than Receiving Party's, and its Affiliates', directors, officers, employees, agents and consultants, hospital or institution authorities, Institutional Review Board members, clinical investigators, and others who are involved in fulfilling Receiving Party's obligations under this Agreement and who, in each case, (a) need to know such information for the purposes of performing such obligations and (b) are bound by obligations of confidentiality and non-use at least as restrictive as those set forth herein. With respect to the obligation in 7.5(b) it shall be deemed met as to disclosures by CRL of VistaGen's confidential information if VistaGen has in place a nondisclosure agreement with the third party related to VistaGen's Confidential Information. Receiving Party shall take commercially reasonable steps to prevent the disclosure or use of any such Confidential Information by Receiving Party's, and its Affiliates', directors, officers, employees, agents or consultants except as provided in this Agreement.

7.6 If any Disclosing Party's Confidential Information is required to be disclosed by Receiving Party to any government or regulatory authority or court entitled by law to disclosure of the same, Receiving Party shall not, unless required by law, order, regulation or ruling, disclose Confidential Information until the Disclosing Party has first (a) received prompt written notice of such requirement to disclose and (b) had an adequate opportunity to obtain a protective order or other reliable assurance that confidential treatment will be accorded to the Confidential Information required to be disclosed. The Receiving Party shall, at the expense of the Disclosing Party, provide the Disclosing Party with any reasonable assistance requested, and shall not oppose reasonable actions by the Disclosing Party to assure confidential treatment. If the Disclosing Party is unable to obtain such protective order or other appropriate remedy, the Receiving Party and its Representatives will furnish only that portion of the Confidential Information which it is legally required to furnish. Any disclosure of Confidential Information pursuant to this Section 7.6 shall not affect or lessen the Receiving Party's obligations hereunder.

7.7 For purposes of this Agreement, the Parties hereby acknowledge and agree that, subject to the exceptions set forth in Section 7.3, this Agreement shall be considered VistaGen's Confidential Information; provided however, that either Party may disclose the terms of this Agreement to advisors, investors and others on a need-to-know basis under circumstances that reasonably ensure the confidentiality, nondisclosure and nonuse thereof. Notwithstanding the foregoing, VistaGen may disclose the existence of this Agreement in its sole discretion.

7.8 Receiving Party's obligations under this Section 7 shall terminate with respect to any Confidential Information of Disclosing Party five (5) years after the date of disclosure.

8. **Protected Health Information.** The Parties recognize that the Federal Health Insurance Portability and Accountability Act of 1996 and implementing regulations ("HIPAA") require written confidentiality agreements to protect the privacy and security of protected health information (as defined under HIPAA) that may be acquired in the course of performing this Agreement. The Parties agree to comply with HIPAA and other applicable laws and governmental regulations governing protected confidential health information. Under no circumstances shall VistaGen deliver to CRL any social security or other identification number issued to subjects/patients by any governmental agency as part of the data delivered to CRL under any Work Order.

9. **Ownership.**

9.1 VistaGen shall own all right, title, and interest in and to all data, information, improvements, discoveries, inventions, printed materials, and other work product contained the Deliverable. To the extent not covered by the preceding sentence, and except as limited by Section 9.2, all copyrights, patents, trade secrets and other intellectual property rights associated with any ideas, conepts, techniques, inventions, processes or works of authorship included in the Deliverable shall be treated in the same manner as the deliverable and as specified in the previous sentence.. Upon request of VistaGen and at VistaGen's expense, CRL shall take such further actions, including execution and delivery of instruments of conveyance necessary to obtain legal protection in the United States and foreign countries for such Deliverable and for the purpose of vesting title thereto in VistaGen. As used herein, “Deliverable” shall mean reports, information or other matters which are physically delivered (whether in hard copy or electronically) to VistaGen in accordance with the terms of the Work Order. To the extent the Work Order requires CRL to undertake general consulting services pursuant to which CRL provides generic explanations or information, only such part of any deliverable which contains VistaGen-specific subject matter shall be deemed a Deliverable subject to the terms of this Section 9.1

9.2 Notwithstanding the foregoing Section 9.1, VistaGen acknowledges that within the scope of the business practices of CRL and its Affiliates, they possess certain inventions, processes, know-how, trade secrets, improvements, other intellectual property and business assets, including forms, templates, analytical methods, protocols, procedures and techniques, computer technical expertise and software, independently developed or otherwise owned by CRL and its Affiliates and not specifically related to the Deliverables. In addition, during the course of performing or incidental to the CRO Services, CRL or its Affiliates may develop forms, templates, analytical methods, protocols, procedures and techniques, functions, computer code, database structures and other property that are not specific to the general functionality of the Deliverables, not specific to any Product unique to VistaGen, and which does not in its generic form rely on or otherwise incorporate any Confidential Information of VistaGen (collectively, the “Cato Property”). VistaGen and CRL agree that any Cato Property used, improved or modified by CRL or its Affiliates under or during the term of this Agreement shall be deemed Cato Property and owned solely by CRL or its Affiliates. If any Cato Property is incorporated into the Deliverables, then CRL hereby grants to VistaGen a fully paid-up, non-exclusive, perpetual worldwide license to use such Cato Property (without representation or warranty), to the extent reasonably necessary to use such Deliverables and to transfer rights to the VistaGen products or programs to which this Agreement relates.

9.3 CRL and its Affiliates shall be free to use and employ the general skills, knowhow, and expertise of their employees, and to use, disclose, and employ any generalized ideas, concepts, know-how, methods, techniques, or skills gained or learned by their employees and consultants during the course of any assignment, so long as they acquire and apply such information without disclosure of any Confidential Information of VistaGen and without any unauthorized use or disclosure of any Deliverable.

10. **Representations and Warranties.**

10.1 CRL represents and warrants that CRL has the experience, capability, personnel and resources necessary to perform CRO Services under this Agreement and each Work Order in a commercially reasonable manner.

10.2 VistaGen represents and warrants that it has the ability to comply with and perform all financial obligations under this Agreement. VistaGen further represents and warrants that it owns or otherwise has all necessary rights in and to the Product and all intellectual property rights therein (including without limitation the patent rights in all Products) so as to permit use of the Product and such intellectual property by CRL as contemplated in each Work Order; no third party has any right to prevent or to claim a payment is due from CRL as a result of its use of any Product or of the intellectual property rights therein as contemplated in any Work Order.

10.3 Each Party represents and warrants that (a) it has the corporate power and authority to enter into and perform its obligations under this Agreement and any Work Order; and (b) entering into and performing this Agreement and any Work Order will not conflict with or result in a violation of any of the terms or provisions, or constitute a default under any of its organizational documents, any mortgage, indenture, lease, contract or other agreement or instrument binding upon it or by which any of its properties are bound, or any permit, concession, franchise, license, judgment, order, decree, statute, law, ordinance, rule or regulation applicable to it or its properties.

10.4 Except as set forth in this Section 10, CRL makes no warranty, either express or implied, including without limitation the warranties of merchantability, fitness for a particular purpose, title and non-infringement as to any matter, and further including but not limited to the CRO Services, results of CRO Services, any Deliverables or any other matter or information produced or provided under this Agreement. Without limiting the foregoing, CRL does not warrant, guarantee, or make any warranty regarding the use, or the results of the use, of the Deliverable, reports, analyses, documents, memoranda or any other matter or information produced or provided under this Agreement.

11. **CRL Personnel.**

11.1 CRL shall be responsible for all aspects of the labor relations of the personnel undertaking the CRO Services including, but not limited to, wages, benefits, discipline, hiring, firing, promotions, pay raises, overtime, and job assignments. VistaGen shall have no power or authority in these areas. CRL shall ensure the payment of all contributions and taxes imposed by any federal or state governmental authority with respect to or measured by wages, salaries, or other compensation paid to persons employed to undertake the CRO Services.

11.2 VistaGen understands that the performance of CRO Services requires special skills, training and experience. VistaGen further understands that CRL and its Affiliates have expended considerable sums to train their personnel to perform the CRO Services requested by VistaGen from time to time under this Agreement, and CRL will give VistaGen access to experienced and highly skilled practitioners. When CRL or its Affiliates lose personnel, CRL or its applicable Affiliate incurs significant expenses in hiring and training his or her replacement. Accordingly, during the term of this Agreement and for a period of one (1) year after the termination or expiration of the last Work Order to terminate or expire under this Agreement, VistaGen agrees that it will not, without CRL's prior written permission, solicit for employment (directly or indirectly) or hire as an employee or independent contractor any employee or independent contractor of CRL or its Affiliates who has participated in the performance of CRO Services under this Agreement. VistaGen acknowledges that any breach by VistaGen of this Section 11.2 shall cause substantial damages to CRL which are difficult to calculate including, but not limited to, costs of hiring and training replacement personnel, lost revenue and damage to CRL's relationships with its other customers. Correspondingly, if VistaGen breaches this Section 11.2, VistaGen agrees that it shall pay CRL liquidated damages in an amount equal to the first-year annual guaranteed compensation (including base salary and any guaranteed bonus) of the hired person. ...

12. **Indemnification**.

12.1 VistaGen shall indemnify, defend and hold harmless each CRL Indemnified Party from and against all Losses resulting from, related to or (as appropriate) alleging any CRL Indemnified Conditions. The foregoing indemnification obligations of VistaGen under this Section 12.1 shall not include any Losses incurred by CRL when, and to the extent that, such Losses result from or are related to (a) the negligence, intentional misconduct or intentional omission of the CRL Indemnified Party, (b) the breach of this Agreement by CRL, an Affiliate of CRL or any other person for whose actions CRL is liable under this Agreement or applicable law, or (c) the violation by CRL, its directors, officers, employees or agents of any applicable law, regulation or other government requirement where such violation was caused by the conduct of the relevant CRL Indemnified Party and where CRL is seeking indemnification due to such breach.

12.2 CRL shall indemnify, defend and hold harmless each VistaGen Indemnified Party from and against all Losses resulting from, related to or (as appropriate) alleging any VistaGen Indemnified Conditions. The foregoing indemnification obligations of CRL under this Section 12.2 shall not include any losses incurred by VistaGen when, and to the extent that, such Losses result or are related to (a) the negligence, intentional misconduct or intentional omission of the VistaGen Indemnified Party; (b) the breach of this Agreement by VistaGen, an affiliate of VistaGen, or any other person for whose actions VistaGen is liable under this Agreement or applicable law; or (c) the violation by VistaGen, its directors, officers, employees or agents, of any applicable law, regulation or other governmental requirement. Notwithstanding the foregoing, CRL shall not be liable for, and this Section 12.2 does not require CRL to provide indemnification with respect to, the actions or omissions of any third party which CRL hires (excluding Affiliates of CRL) at VistaGen's request to provide services hereunder..

12.3 If an Indemnified Party receives notice of any claims for which the Indemnified Party wishes to seek indemnity under this Agreement, then the Indemnified Party shall promptly provide prompt written notice of the claim no later than thirty (30) calendar days following its notice of the claim to the Party required to provide indemnification by Section 12.1 or 12.2. The failure of an Indemnified Party to promptly provide such notice will not relieve the indemnifying Party of any indemnification responsibility under this Section 12, except to the extent, if any, that such failure materially prejudices the ability of the Indemnifying Party to defend such claims. The indemnifying Party shall have the right to control the defense or settlement of the claims with counsel of its own choosing provided that such counsel is reasonably acceptable to the Indemnified Party and provided further that the Indemnified Party will be entitled, at the Indemnified Party's expense, to participate with its own counsel in such defense and settlement. The Indemnified Party shall at all times cooperate in the investigation and defense of such claims and promptly deliver to the indemnifying Party (or its counsel) such information related to the basis for the claims as the indemnifying Party (or its counsel) may reasonably request. If the indemnifying Party declines to assume defense of any claim, and it is later determined by a court of competent jurisdiction that such claim was eligible for indemnification under Section 12.1 or 12.2, as applicable, then within thirty (30) calendar days following such determination, the Indemnifying Party shall reimburse the Indemnified Party in full for all judgments, costs and expenses (including reasonable attorneys' fees) incurred in connection with such claim. The indemnifying Party shall not settle any claim without the prior written consent of the Indemnified Party if such settlement: (a) materially diminishes any of the Indemnified Party's rights under this Agreement and/or the Work Order or seeks to impose additional obligations on the Indemnified Party; or (b) arises out of or is a part of any criminal action, suit or proceeding or contains a stipulation or admission or acknowledgement of any liability or wrongdoing (whether in contract, tort or otherwise) on the part of the Indemnified Party.

12.4 Definitions. The following definitions apply in this Section 12:

(a) "CRL Indemnified Party" means CRL and its Affiliates and the directors, officers, employees, consultants and agents of CRL and/or its Affiliates.

(b) "VistaGen Indemnified Party" means VistaGen and its Affiliates and the directors, officers, employees, consultants and agents of VistaGen and/or its Affiliates.

(c) "Indemnified Party" means either a CRL Indemnified Party or an VistaGen Indemnified Party.

(d) "Losses" mean all liability, loss, costs, claims, damages, expenses, judgments, awards, and settlements, including (without limitation) actual attorneys' fees and expenses, whether arising in tort or in contract, in law or in equity. arising from a claim brought by a third party, in response to any legal proceeding brought by a third party or occurring due to any contractual obligation to indemnify, defend and/or hold harmless any third party.

(e) "CRL Indemnified Conditions" means:

(i) the CRO Services;

(ii) the use of Deliverables;

(iii) any harm or bodily injury caused by any Product;

(iv) the infringement of or use of any intellectual property right or proprietary right in relation to VistaGen's Products, programs, procedures, materials, data, or other information used by, or on behalf of, or furnished by or on behalf of, VistaGen in connection with this Agreement or the provision of CRO Services under this Agreement;

(v) the material breach of this Agreement by VistaGen or by any other person for whose actions VistaGen is liable under this Agreement or applicable law;

(vi) the negligence, intentional misconduct or intentional omission of VistaGen or of any employee, contractor, agent or representative of VistaGen; or

(vii) any request for deposition, documents or other information legally compelled including, without limitation, by subpoena or by agreement made in lieu of subpoena, in connection with VistaGen's litigation, arbitration or other proceeding with any third party where CRL and/or any of its Affiliates are not also a party or in any investigation of VistaGen by any governmental authority.

(f) "VistaGen Indemnified Conditions" means:

(i) the negligence, intentional misconduct or intentional omission of CRL or any employee, contractor, agent or representative of CRL;

(ii) the material breach of this Agreement by CRL or any other person for whose actions CRL is liable under applicable law or this Agreement;

(iii) the violation by CRL, its directors, officers, employees or agents, of applicable law, regulation or other governmental requirement;

13. **Insurance**.

13.1 VistaGen shall maintain in full force and effect customary insurance coverage for all VistaGen Products, clinical trials or other projects related to the CRO Services, including, without limitation, products liability, general liability, and related insurance coverage with policy limits in an amount VistaGen's senior management reasonably determines to be sufficient to support VistaGen's indemnification obligations hereunder, but as of such date as VistaGen commences a clinical trial for which CRL or its Affiliates provide CRO Services, then in no event less than $5,000,000 per occurrence as it relates to clinical trials. Upon completing or otherwise terminating each clinical trial for which CRL provides CRO Services, VistaGen shall purchase and maintain a tail policy to cover claims first made and/or reported after completion of such clinical trial.

13.2 VistaGen's insurance policy(ies) covering any clinical trial shall name CRL and its respective officers, directors and employees as additional named insureds with a broad form additional insured endorsement (acceptable in form and content to CRL) and shall indicate that the policy will not be canceled or changed until thirty (30) days after written notice of such cancellation or change is delivered to CRL. At CRL's request, VistaGen shall provide CRL with an additional insured certificate and a copy of the additional insured endorsement from VistaGen's insurance carrier.

13.3 CRL shall maintain in full force and effect, at no cost to VistaGen, customary insurance coverage for the CRO Services to be undertaken under each Work Order with policy limits in an amount CRL's senior management reasonably determines to be commercially reasonable under the circumstances.

14. **Limitation of Liability.**

14.1 VistaGen agrees that, regardless of the form of any claim, VistaGen's sole remedy and CRL's sole obligation with respect to any claims made related to or arising out of this Agreement shall be governed by this Section.

14.2 VistaGen's remedies for defective performance by CRL under this Agreement shall be limited to, at CRL's option, either: (a) correction of the non-conforming CRO Services, or (b) reimbursements of payments (excluding payments for Expenses) made by VistaGen to CRL for such non-conforming CRO Services under the applicable Work Order during the six (6) month period immediately preceding the event for which the claim is made.

14.3 CRL's obligations for any reason other than as set forth in Section 14.2 shall not exceed the aggregate compensation paid to CRL for CRO Services actually performed during the rolling twelve (12) month period preceding the date on which notice of the claim is given under the Work Order to which the claim pertains; provided however, with respect to delivery of any notice of claim during the initial twelve (12) months of the applicable Work Order, such limitation shall be equal to the actual aggregate compensation paid to CRL during the first six months of such Work Order; and provided, further, with respect to delivery of any notice of claim following termination or expiration of this Agreement, such limitation shall be equal to the aggregate compensation paid to CRL during the final twelve (12) months of the applicable Work Order.

14.4 It is expressly agreed that in no event shall CRL, its Affiliates or anyone else who has been involved in the performance of this Agreement on behalf of CRL be liable for any indirect, consequential, incidental, special, punitive, or exemplary damages arising from any legal theory, even if such person had been apprised of the likelihood of such damages occurring. VistaGen agrees that, notwithstanding the applicable statute of limitations, it may not bring any claim against CRL more than one (1) year after the cause of action arose.

15. **Investigator and Other Third-Party Payments.**

15.1 CRL shall, at VistaGen's request in a Work Order, disburse payments to investigators, monitors, laboratories or other third parties contracted with VistaGen to provide services with respect to a clinical study for which CRL is providing CRO Services to VistaGen (each, a "Third-Party Contractor"). CRL will disburse all such payments (each, a "Third-Party Contractor Fee") in accordance with the provisions of the agreement between VistaGen and the Third-Party Contractor (each, a "Third-Party Contractor Agreement"), a copy of which shall be provided to CRL prior to any payment being made. CRL will not unreasonably withhold any Third-Party Contractor Fee and will not impose additional restrictions on the terms of payment for the Third-Party Contractor Fee set forth in the Third-Party Contractor Agreement.

15.2 VistaGen shall provide CRL with the funds to pay each Third-Party Contractor Fee, plus any related administrative fee, prior to the date on which CRL is scheduled to disburse such Third-Party Contractor Fee. To the extent payments to any Third-Party Contractors are to be made in a currency other than U.S. dollars, then contrary to the terms of Section 4.3 to make payment in U.S. dollars, funds for each such payment shall be made by VistaGen in the currency in which the Third-Party Contractor Fee is to be paid. If VistaGen does not provide the funds to CRL, then CRL will not disburse such Third-Party Contractor Fee until it receives the funds, including any administrative fee, from VistaGen. In such event, VistaGen shall be deemed to have released CRL from all legal liability, and to have covenanted to indemnify and not to sue CRL on any claims related to failure to disburse or otherwise pay the Third-Party Contractor Fee. VistaGen agrees that CRL shall not have any liability to VistaGen with respect to payments made to any Third-Party Contractor in accordance with the terms of the applicable Third-Party Contractor Agreement, even if VistaGen would prefer such payment not be made unless VistaGen shall have notified CRL, which notification may be made by any reasonable means (which may include email, depending on the circumstances), prior to the time the payment is due not to make the payment. If VistaGen notifies CRL not to make any payment, VistaGen agrees to indemnify CRL with respect to any claims made against it by the Third-Party Contractor related to failure to disburse or otherwise pay the Third-Party Contractor Fee withheld in accordance with VistaGen's instructions.

15.3 If VistaGen provides CRL with funds in excess of the total Third-Party Contractor Fees disbursed by CRL (plus any administrative fee for Third-Party Contractor Fees actually paid), then CRL shall prepare and send a reconciliation of such funds to VistaGen within ninety (90) days after the early termination or expiration of the Work Order under which such Fees were being disbursed. Any excess funds shall first be applied to undisputed amounts otherwise due to CRL hereunder, and then any remainder shall be refunded to VistaGen.

16. **Transfer of Responsibilities and Obligations.**

16.1 If VistaGen, pursuant to a Work Order, requests that CRL enter into agreements with investigators, monitors, laboratories, storage facilities, clinical material manufacturers or shippers, or other third parties to provide services with respect to a clinical study for which CRL is providing CRO Services to VistaGen (each a "Third-Party Agreement"), then subject to CRL undertaking its obligations under each Third-Party Agreement (except as with respect to payment which is governed by Section 16.2), VistaGen will assume all obligations and liabilities under such Third-Party Agreement, including but not limited to all regulatory and legal obligations, and indemnify CRL for any claims made against CRL for any liability incurred by it as a result of the execution and delivery by CRL of such Third-Party Agreement(s). Notwithstanding the foregoing, the Parties shall establish a process for review of Third-Party Agreements before execution, which process shall generally include an agreement on the base form, information provided by VistaGen on parameters for changes, and consultation with VistaGen on significant issues outside the parameters. If a Work Order terminates (for any reason) before completion of the CRO Services specified therein and pursuant to that Work Order, CRL has entered into any Third-Party Agreements, CRL shall be free to terminate such Third-Party Agreements and VistaGen shall pay all termination fees or other liabilities owed by CRL or its Affiliates due to such termination.

16.2 VistaGen shall provide CRL with the funds to pay each Third-Party Agreement (the "Third-Party Fees"), plus any administrative fee, before the date on which CRL is scheduled to disburse each such Third-Party Fee. To the extent payments to Third Parties are to be made in a currency other than U.S. dollars, then contrary to the terms of Section 4.3, funds for each such payment shall be made by VistaGen in the currency in which the Third-Party Fee is to be paid. If VistaGen does not provide the funds to CRL before the scheduled payment date, then CRL will not disburse such Third-Party Fee until it receives the funds (including any administrative fee) from VistaGen. CRL shall have no liability to VistaGen with respect to payments made to any Third Party in accordance with the terms of a Third-Party Agreement, even if VistaGen would prefer such payment not be made unless VistaGen instructs CRL not to make the payment before CRL does so. If VistaGen fails to provide the required funds on a timely basis or notifies CRL to withhold or otherwise not pay any Third-Party Fees required to be paid under an applicable Third-Party Agreement, then VistaGen agrees to indemnify CRL with respect to any claims made against CRL by the Third Party for failure to make (or delay in making) the payment of the Third-Party Fees (including, but not limited to, charges for interest and late payment fees). If VistaGen provides CRL with funds in excess of the total Third-Party Fees disbursed by CRL (plus the administrative fee), then CRL shall prepare and send a reconciliation of such funds to VistaGen within ninety (90) days after the early termination or expiration of the Work Order under which such Third-Party Fees were being disbursed. Any excess Third-Party Fees shall first be applied to undisputed amounts otherwise due to CRL hereunder, and then any remainder shall be refunded to VistaGen.

16.3 Transfer of sponsor obligations with respect to any clinical trial may only be made pursuant to a Work Order, a signed Transfer of Sponsor Obligation form, and otherwise in accordance with 21 CFR 312.52 and other applicable laws and regulations.

17. **Audits, Inspections and Site Visits**.

17.1 VistaGen and/or VistaGen's representative may, during normal business hours and upon no less than two (2) weeks' prior notice, meet with CRL or its applicable Affiliate(s) and their respective employees, consultants, and/or subcontractors engaged in the performance of CRO Services at CRL or at the location(s) of the facilities used to undertake the CRO Services to: (i) examine and inspect the facilities used for the performance of CRO Services, (ii) observe the progress of activities relating to the CRO Services; (iii) inspect and copy or have copied records, documents, information, data, and materials specifically relating to the CRO Services, and (iv) inspect and copy or have copied financial reports and other documents accounting for the fees, costs and expenses of the CRO Services.

17.2 CRL will, during regular business hours and on no less than two (2) weeks' notice, permit a regulatory auditor to have access to CRL's records pertaining to the CRO Services provided pursuant to this Agreement for the purpose of auditing and verifying such CRO Services.

17.3 CRL will, during regular business hours and on no less than two (2) weeks' notice, permit a financial auditor to have access to CRL's records pertaining to the CRO Services provided pursuant to this Agreement for the purpose of auditing and verifying the billing for such CRO Services.

17.4 At VistaGen's reasonable request, CRL shall cooperate with any regulatory authorities and allow them to review and copy applicable records and data related to the CRO Services. If a request is made directly to CRL (or its applicable Affiliate(s)) by any regulatory authority to review records and data, or to contact, visit, or inspect CRL's (or its applicable Affiliate's or investigator's) records and data, relating to any CRO Services or CRL's (or its applicable Affiliate's or investigator's) performance of CRO Services, then CRL shall notify VistaGen as soon as practicable (unless prohibited by law) after such regulatory authority issues or gives to CRL (or any such of its applicable Affiliate(s) or investigator) any notice of intent to inspect, notice of inspection, notice of inspectional observations, warning letter, or other written communication concerning any CRO Services, and CRL shall provide VistaGen a copy thereof. To the extent permitted by law, prior to any submission to a regulatory authority of any response that may be required as a result of the inspection or visit, CRL (its applicable Affiliate(s) or investigator) shall provide VistaGen with the opportunity to review and comment on the proposed response.

17.5 All persons sent by VistaGen to undertake such visits, inspections or audits pursuant to Sections 17.1-17.3 shall be qualified by education, training, and experience, and shall be reasonably acceptable to CRL. The number, extent and frequency of such visits, inspections or audits shall be reasonable under the circumstances and normally shall not exceed one in every twelve (12) month rolling period. Unless such person is an employee of VistaGen, he or she shall report to VistaGen only those facts and conclusions determined as a result of the visit which are directly related to VistaGen's interests. All information obtained from an audit shall be Confidential Information except as otherwise set forth in Section 7.3, above. Unless the visits, inspections and/or audits set forth in Sections 17.1-17.4 are specifically included in a Work Order, VistaGen shall, in addition to any other payment obligations under this Agreement, pay CRL, on a time-and-materials basis, at its current rates for the CRL or Affiliate personnel assigned to supervise or otherwise participate in or assist administratively with such audit, inspection or visit, including without limitation for any CRL or Affiliate personnel required to participate in it or meet with the regulatory inspectors.

18. **Force Majeure; Other Delays**.

18.1 If either Party is delayed in, hindered in, or prevented from the performance of any act required under this Agreement by reason of strike, lockout, labor problems, restrictions of government, judicial orders or decrees, riots, insurrection, terrorism, war, acts of God, inclement weather, or other causes that are beyond the reasonable control of such Party, then performance of such act shall be excused until the cause is remedied. The delayed Party shall use commercially reasonable efforts to resume performance as soon as possible.

Notwithstanding the foregoing, this Section 18.1 shall not apply to or excuse any failure to make payments when due.

18.2 CRL will not be liable to VistaGen nor be deemed to have breached this Agreement for errors, delays or other consequences arising from the failure of VistaGen or any third party not under CRL's direct control to provide documents, materials or information in a timely manner or otherwise cooperate in order for CRL to perform its obligations, and any such failure by VistaGen or any third party not under CRL's direct control shall automatically extend any timelines affected by such failure by at least the period of the delay (and such longer period as it may take as a result of the need to suspend and then wind up again), unless VistaGen agrees in writing to pay any additional costs that would be required to meet the original timeline.

19. **Independent Contractor**. CRL shall perform CRO Services as an independent contractor. Neither Party has authority to make any statement, representation, or commitment of any kind nor to take any action binding on the other Party without the other Party's prior written consent.

20. **Use of Names**. The Parties agree that they may use each other's name as a reference for prospective clients or in literature relating to their capabilities and strategic relationships, provided that such use does not violate Section 7 above.

21. **Notification**. Any notices given hereunder shall be in writing and shall be deemed to have been given on the earlier of personal receipt by an authorized representative of the Party, or receipt at the Party's notice address. Notice may be given by the following means: registered mail/return receipt requested, overnight courier, personal delivery, or, where specified in this Agreement, by email. All notices shall be sent to a Party at its address set forth on the signature page of this Agreement, or to such other address as is given by notice to the other Party. Notices are deemed given on receipt or attempted delivery (if receipt is refused).

22. **Waiver**. No waiver of any right or remedy with respect to any occurrence or event shall be valid unless it is in writing and executed by the waiving Party. No such valid waiver shall be deemed a waiver of such right or remedy with respect to such occurrence or event on a continuing basis or in the future unless the waiver states that it is intended to apply continuously or to future events. A waiver shall not excuse use a subsequent breach of the same term, unless the waiver so states.

23. **Severability**. If any provisions of this Agreement are determined to be invalid or unenforceable, those provisions shall be reformed to the extent necessary to comply with law and the Parties' intent, or struck if necessary, and the validity and effect of the other provisions of this Agreement shall not be affected.

24. **Contract Interpretation and Dispute Resolution**.

24.1 The official language of this Agreement and any interpretation of it is American English. All contract interpretations, notices and dispute resolutions shall be in English. Any attachments or amendments to this Agreement shall be in English. Translation of any of these documents shall not be construed as official or original versions of the documents.

24.2 This Agreement has been prepared following arm's-length negotiations in which each Party had the opportunity to consult with legal counsel regarding the provisions hereof. Every covenant, term and provision of this Agreement shall be construed according to its fair meaning and not strictly for or against any Party or Parties.

24.3 This Agreement shall be governed by, construed and interpreted in accordance with the laws of the United States and the State of New York, without regards to its conflict of law principles.

24.4 Any controversy, claim or dispute arising out of, in connection with or relating to this Agreement shall be first submitted to mediation, which mediation shall take place in San Diego, Calfornia, unless another location shall be agreed upon by the Parties. If mediation is not successful, then the dispute shall be resolved solely by binding arbitration, in accordance with Exhibit A and the Commercial Arbitration Rules of the American Arbitration Association ("AAA") in effect as of the day the arbitration demand is made. If the AAA rules conflict with Exhibit A, Exhibit A shall prevail.

24.5 Notwithstanding Section 24.4, (a) with respect to any uncollected invoice, if CRL asks VistaGen if VistaGen disputes that payment is due and either VistaGen does not reply within one (1) month or VistaGen replies that there is no dispute, then CRL may bring a collection suit in a court resident in Durham County, North Carolina and VistaGen consents to the personal jurisdiction of such courts in such matter; and (b) if damages for a breach are not likely to be an adequate remedy, then either Party may bring an injunction proceeding before any court with jurisdiction.

25. **Survival**. The representations and warranties of the Parties in Section 10 shall survive the events to which they relate and survive the expiration or earlier termination of this Agreement and the rights and obligations of the Parties set forth in Sections 3.2, 4, 5, 7 - 17, 20, 24 and 25 shall survive expiration or earlier termination of this Agreement.

26. **Assignment.** This Agreement may not be assigned by either Party without the prior written consent of the other Party, which shall not be unreasonably withheld; provided however, that either Party may assign this Agreement without prior written consent of the other Party in connection with a merger or the sale of all or substantially all of the assigning Party's assets or equity on the condition that such assignment shall be solely to the acquirer or purchaser of the assigning Party and such acquirer or purchaser must assume the assigning Party's obligations under this Agreement.

27. **Freedom to Contract**. Except with respect to CRO Services for which VistaGen specifically hires CRL to perform under this Agreement, (a) VistaGen is not required to use CRL for any specific work; (b) VistaGen is free to retain others to perform the same or similar CRO Services as offered by CRL; (c) CRL is not required to provide any CRO Services to VistaGen; and (d) CRL is free to provide CRO Services to other clients that are similar to CRO Services provided to VistaGen.

28. **Entire Agreement**. Exhibit A to this Agreement and Work Orders are incorporated into and made a part of this Agreement. This Agreement, including the incorporated Exhibit A and Work Orders, constitutes the entire agreement between the Parties relating to the subject matter hereof and supersedes all prior agreements, whether written or oral, relating to the subject matter hereof; provided however, that all prior confidentiality, nonuse and nondisclosure agreements shall remain in effect as to all matters not specifically covered by this Agreement. Except as otherwise authorized herein, changes, modifications, and amendments shall be valid only if made in writing and signed by both Parties. To be effective, any agreement between the Parties purporting to amend a term of this Agreement, including without limitation any Work Order, must specifically identify that term's Section number and state the Parties' specific intent to amend that term.

29. **Signatures.** This Agreement and any amendment or Work Order issued under it may be executed in one or more counterparts, each of which shall be deemed to be an original but all of which together shall constitute one and the same instrument. Facsimile signatures and signatures transmitted by email after having been scanned shall be accepted as originals for the purposes of this Agreement and any Work Orders issued hereunder.

The Parties have executed this Agreement as of the date first written above.

**Cato Research Ltd.**

By: Jo Cato

**The signer certifies that he/she has the authority to execute this Master Services Agreementon behalf of Cato Research Ltd.**

Name: Jo Cato
Title: COO

VistaGen Therapeutics, Inc.

By: Shawn K. Singh

**The signer certifies that he/she has the authority to execute this Master Services Agreement behalf of VistaGen Therapeutics, Inc.**

Name: Shawn J. Singh
Title: Chief Executive Officer

**EXHIBIT A**
**ARBITRATION PROCEDURES**

The following rules shall apply to any arbitration of the parties under Section 24:

1. **Location and Language**. The location of the arbitration shall be in San Mateo, California, unless the Parties should agree to a different location. The arbitration shall be conducted in American English and any findings and/or decisions shall be rendered in American English.

2. **Number and Selection of Arbitrator**. The arbitration shall be conducted by one arbitrator who is independent and disinterested with respect to the Parties, this Agreement, and the outcome of the arbitration (a "neutral arbitrator"). If the Parties cannot agree on a neutral arbitrator, then each Party shall select an arbitrator it believes to be neutral, who together shall select a third neutral arbitrator to conduct the arbitration. The arbitrator will be selected with consideration given to his or her experience with disputes of the type being submitted (e.g., the nature of the claim and the technology involved). It is the intent of the Parties that the final arbitrator be selected within thirty (30) days after the arbitration demand is first made.

3. **Case Management**. Prompt resolution of any dispute is important to both Parties and the Parties agree that the arbitration of any dispute shall be conducted expeditiously. The arbitrator is instructed and directed to assume case management initiative and control over the arbitration process (including scheduling of events, pre-hearing discovery and activities, and the conduct of the hearing), in order to complete the arbitration as expeditiously as is reasonably practical to obtain a just resolution of the dispute.

4. **Remedies**. The arbitrator shall follow and apply the applicable law. The arbitrator shall grant such legal or equitable remedies and relief in compliance with applicable law that the arbitrator deems just and equitable, but only to the extent that such remedies or relief could be granted by a state or federal court and as otherwise limited by the terms in this Agreement. No punitive damages may be awarded by the arbitrator. The arbitrator may not award punitive damages and no court action may be maintained seeking punitive damages.

5. **Expenses**. The expenses of the arbitration, including the arbitrator's fees, expert witness fees, and attorney's fees, may be awarded to the prevailing Party, in the discretion of the arbitrator, or may be apportioned between the Parties in any manner deemed appropriate by the arbitrator. Unless and until the arbitrator decides that one Party is to pay for all (or a share) of such expenses, both Parties shall share equally in the payment of the arbitrator's fees as and when billed by the arbitrator.

6. **Confidentiality**. The Parties shall keep confidential the fact of the arbitration, the dispute being arbitrated, and the decision of the arbitrator. Notwithstanding the foregoing, (a) the Parties may disclose information about the arbitration to persons who have a need to know, such as directors, trustees, management employees, witnesses, experts, investors, attorneys, lenders, insurers, and others who may be directly affected; (b) if a Party has stock that is publicly traded, the Party may make such disclosures as are required by applicable securities laws or listing rules; and (c) if a Party is expressly asked by a Third Party about the dispute or the arbitration, the Party may disclose and acknowledge in general and limited terms that there is a dispute with the other Party which is being (or has been) arbitrated.

**Exhibit 23.1**

**CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM**

We hereby consent to the incorporation by reference in the Registration Statements on Form S-8 (File Nos. 333-223556 and 333-208354) and Form S-3 (File No. 333-215671) of VistaGen Therapeutics, Inc. of our report dated June 25, 2019 (which report expresses an unqualified opinion and includes an explanatory paragraph expressing substantial doubt about the Company's ability to continue as a going concern), relating to the consolidated financial statements of VistaGen Therapeutics, Inc., which appears in this Annual Report on Form 10-K.

/s/ OUM & CO. LLP

San Francisco, California
June 25, 2019

**EXHIBIT 31.1**

**CERTIFICATION**

I, Shawn K. Singh, certify that;

1. I have reviewed this Annual Report on Form 10-K of VistaGen Therapeutics, Inc., a Nevada corporation;

2. Based on my knowledge, this report, does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by the report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

June 25, 2019

/s/ Shawn K. Singh
Shawn K. Singh, JD
Principal Executive Officer

**EXHIBIT 31.2**

**CERTIFICATION**

I, Jerrold D. Dotson, certify that:

1. I have reviewed this Annual Report on Form 10-K of VistaGen Therapeutics, Inc., a Nevada corporation;

2. Based on my knowledge, this report, does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by the report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

June 25, 2019

/s/ Jerrold D. Dotson
Jerrold D. Dotson
Principal Financial Officer

**EXHIBIT 32**

**CERTIFICATION PURSUANT TO 18 U.S.C. SECTION 1350,**
**AS ADOPTED PURSUANT TO**
**SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002**

Pursuant to 18 U.S.C. § 1350, as created by Section 906 of the Sarbanes-Oxley Act of 2002, the undersigned officer of VistaGen Therapeutics, Inc. (the "*Company* ") hereby certifies, to such officer's knowledge, that:

(i) the accompanying Annual Report on Form 10-K of the Company for the annual period ended March 31, 2019 (the "*Report*") fully complies with the requirements of Section 13(a) or Section 15(d), as applicable, of the Securities Exchange Act of 1934, as amended; and

(ii) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

June 25, 2019

/s/ Shawn K. Singh
Shawn K. Singh, JD
Principal Executive Officer

/s/ Jerrold D. Dotson
Jerrold D. Dotson
Principal Financial Officer