

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

FORM 10-K

(Mark One)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended December 31, 2019

OR

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934 FOR THE TRANSITION PERIOD FROM TO

Commission File Number 001-36517

Minerva Neurosciences, Inc.

(Exact name of Registrant as specified in its Charter)

Delaware
(State or other jurisdiction of
incorporation or organization)
1601 Trapelo Road, Suite 286
Waltham, MA
(Address of principal executive offices)

26-0784194
(I.R.S. Employer
Identification No.)

02451
(Zip Code)

Registrant's telephone number, including area code: (617) 600-7373

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

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, \$0.0001 par value per share	NERV	The NASDAQ Global 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 whether the Registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definition of "large accelerated filer", "accelerated filer", "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer Accelerated filer

Non-accelerated filer Smaller reporting company

Emerging growth company

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

Indicate by check mark whether the Registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). YES NO

The aggregate value of the Company's Common Stock held by non-affiliates of the Company was approximately \$211.1 million as of June 28, 2019, when the last reported sales price was \$5.63 per share.

The number of shares of Registrant's Common Stock outstanding as of March 5, 2020 was 39,219,134.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the Registrant's Definitive Proxy Statement relating to the 2020 Annual Meeting of Stockholders to be filed pursuant to Regulation 14A with the Securities and Exchange Commission are incorporated by reference into Part III of this Report. Such proxy statement will be filed with the Securities and Exchange Commission not later than 120 days following the end of the Registrant's fiscal year ended December 31, 2019.

MINERVA NEUROSCIENCES, INC.

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All trademarks, trade names, service marks, and copyrights appearing in this Annual Report on Form 10-K are the property of their respective owners.

This Annual Report on Form 10-K contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, as amended. These forward-looking statements reflect our plans, estimates and beliefs. These statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performances or achievements expressed or implied by the forward-looking statements. In some cases, you can identify forward-looking statements by terms such as “anticipates,” “believes,” “could,” “estimates,” “expects,” “intends,” “may,” “plans,” “potential,” “predicts,” “projects,” “should,” “would” and similar expressions intended to identify forward-looking statements. Forward-looking statements reflect our current views with respect to future events and are based on assumptions and subject to risks and uncertainties. Because of these risks and uncertainties, the forward-looking events and circumstances discussed in this report may not transpire. These risks and uncertainties include, but are not limited to, the risks included in this Annual Report on Form 10-K under Part I, Item IA, “Risk Factors.”

Given these uncertainties, you should not place undue reliance on these forward-looking statements. Also, forward-looking statements represent our estimates and assumptions only as of the date of this document. You should read this document with the understanding that our actual future results may be materially different from what we expect. Except as required by law, we do not undertake any obligation to publicly update or revise any forward-looking statements contained in this report, whether as a result of new information, future events or otherwise.

Part I

ITEM 1. Business

Overview

We are a clinical-stage biopharmaceutical company focused on the development and commercialization of a portfolio of product candidates to treat patients suffering from central nervous system (“CNS”) diseases. Leveraging our scientific insights and clinical experience, we have acquired or in-licensed three proprietary compounds that are currently in development. We believe these compounds have innovative mechanisms of action and therapeutic profiles that potentially address the unmet needs of patients with these diseases.

Our product portfolio and potential indications include: roluperidone (also known as MIN-101) for the treatment of negative symptoms in patients with schizophrenia; seltorexant (also known as MIN-202 or JNJ-42847922), which we are co-developing with Janssen Pharmaceutica NV (“Janssen”) for the treatment of insomnia disorder and adjunctive treatment of Major Depressive Disorder (“MDD”); and MIN-301 for the treatment of Parkinson’s disease. We believe our product candidates have significant potential to improve the lives of a large number of affected patients and their families who are currently not well-served by available therapies. According to Datamonitor, an independent market research firm, in 2019 approximately 2.9 million people suffered from schizophrenia and 2.1 million suffered from Parkinson’s disease in the United States (“U.S.”), Japan and the five major European Union (“EU”) markets of France, Germany, Italy, Spain and the United Kingdom. Approximately 30% of the adult U.S. population suffer from symptoms of insomnia and 10% are likely to suffer from chronic insomnia, making it the most common sleep disorder, and approximately 40% of all insomnia patients have a coexisting psychiatric condition. Comorbid mood and anxiety disorders are associated with high rates of severe insomnia complaints, which were independently associated with substantial functional impairment.

Our Strategy

Our strategy is to develop and commercialize first-in-class products that address critical unmet medical needs in the CNS therapeutic area. We are pursuing this strategy based on the following principles: selection of differentiated products with novel mechanisms of action that target therapeutic areas of high unmet need and significant disease burden; attention to patient safety and compliance; scientific rigor applied to patient selection and clinical trial conduct; engagement of highly trained clinical trial investigators; incorporation of patient and caregiver insights to drive clinical advancements; and integrity. With the experience and knowledge base of our clinicians and physicians, we have generated substantive data from randomized, double blind, placebo-controlled trials that support the clinical advancement of these products in defined patient populations and in multiple regulatory jurisdictions. In summary, key elements of our strategy are to:

- **Identify, acquire and develop differentiated products with innovative mechanisms of action based on biological and clinical insights into the unmet needs of patients;**
- **Leverage the randomized, double-blind, placebo-controlled data from completed trials to advance the clinical development of our product candidates in multiple regulatory jurisdictions;**

- *Prepare for the commercialization of our lead product, roluperidone, which will potentially be the first product approved to treat negative symptoms in patients with schizophrenia and, in the longer term as a potential treatment for other neuro-degenerative brain disorders in which negative symptoms represent a significant debilitating, unmet need;*
- *Selectively explore collaborations with leading pharmaceutical companies to maximize the value of our current product candidate portfolio, particularly in connection with pivotal clinical trials and subsequent regulatory review, approval and commercialization;*
- *Apply our management team’s expertise and current intellectual property portfolio to identify and explore additional indications to investigate with our current portfolio of compounds and to acquire additional product candidates.*

Our History

In November 2013, Cyrenaic Pharmaceuticals, Inc., or Cyrenaic, and Sonkei Pharmaceuticals, Inc., or Sonkei, merged, and the combined company was renamed Minerva Neurosciences, Inc. Cyrenaic had been incorporated in 2007 and had exclusively licensed roluperidone and other compounds with a similar structure and intended purpose from Mitsubishi Tanabe Pharma Corporation, or MTPC. Sonkei had been incorporated in 2008 and had exclusively licensed from MTPC a compound known as MIN-117 for which we recently discontinued development. We saw the merger as an opportunity to better serve underserved patient populations through combining a portfolio of promising product candidates targeting multiple CNS diseases. As a result of the merger, we have the rights to develop and commercialize roluperidone and MIN-117 globally, excluding most of Asia, where MTPC has retained commercialization rights.

We further expanded our product candidate portfolio in February 2014 by acquiring the shares of Mind-NRG Sarl, or Mind-NRG, which had exclusive rights to develop and commercialize MIN-301 globally. In addition, in February 2014 we entered into a co-development and license agreement with Janssen, one of the Janssen Pharmaceutical Companies of Johnson & Johnson. Pursuant to this agreement, subsequently amended in June 2017, we are co-developing seltorexant and have the right to commercialize this compound in the European Union, Switzerland, Liechtenstein, Iceland and Norway, or the Minerva Territory, subject to royalty payments to Janssen, with Janssen having commercialization rights outside of the Minerva Territory, subject to royalty payments to us.

We have not received regulatory approvals to commercialize any of our product candidates, and we have not generated any revenue from the sales or license of our product candidates. We have incurred significant operating losses since inception. We expect to incur net losses and negative cash flow from operating activities for the foreseeable future in connection with the clinical development and the potential regulatory approval, infrastructure development and commercialization of our product candidates.

Our Pipeline of Advanced Clinical-Stage Programs

Program	Primary Indications	Mechanism of Action	Preclinical	Phase 1	Phase 2	Phase 3
Roluperidone MIN-101	Negative symptoms in schizophrenia	<ul style="list-style-type: none"> • 5-HT_{2A} antagonist • Sigma₂ antagonist • α_{1A}-adrenergic antagonist • α_{1B}-adrenergic antagonist 	Pivotal Phase 3 (MIN-101C07) Screening Complete – TLR Q2 '20			
Seltorexant MIN-202	Primary insomnia Major depressive disorder, as adjunctive therapy	• Selective orexin-2 antagonist (SORA)	Phase 2b (MDD2001) Top Line Readout Q2 '19			completed
			Phase 2b (ISM2005) Top Line Readout Q2 '19			completed
			Phase 2 (MDD2002) Top Line Readout Q3 '19			completed
MIN-301	Parkinson’s disease	• Neuregulin-1β1 activating ErbB4	Pre-clinical			

Roluperidone (MIN-101)

Introduction

Roluperidone is a compound that has been shown to block serotonin receptors and sigma receptors, two receptors in the brain that are involved in the regulation of mood, cognition, sleep and anxiety. We are developing roluperidone to treat patients with schizophrenia. Roluperidone has been designed to block a specific subtype of serotonin receptor called 5-HT_{2A}. When 5-HT_{2A} is blocked, certain symptoms of schizophrenia, such as hallucinations, delusions, agitation and thought and movement disorders, as well as the side effects associated with antipsychotic treatments, can be minimized. Additionally, blocking 5-HT_{2A} promotes slow wave sleep, a sleep stage often disrupted in patients with schizophrenia. Roluperidone has also been designed to block a specific subtype of sigma receptor called sigma₂, which is involved in movement control, psychotic symptom control and learning and memory. Blocking sigma₂ also increases calcium levels in neurons in the brain, which can improve memory. Recent pre-clinical findings provide evidence of the effect of roluperidone on Brain-Derived Neurotrophic Factor (“BDNF”), which has been associated with neurogenesis, neuroplasticity, neuroprotection, synapse regulation, learning and memory.

We believe the scientifically supported and innovative mechanisms of action of roluperidone may potentially address the unmet needs of schizophrenic patients, which include negative symptoms and cognitive impairment, without the side effects of existing therapies. Negative symptoms are lifelong debilitating symptoms and include: asociality, or the lack of motivation to engage in social interactions; anhedonia, or the inability to experience positive emotions; alogia, or failure to engage in normal conversation; avolition, or loss of energy and interest in activities; and blunted affect, or diminished emotional expression. We plan to seek approval of roluperidone initially as a first line treatment of negative symptoms in patients diagnosed with schizophrenia, and we also may study its use to treat all aspects of the disease, including positive symptoms and relapse prevention. We believe that roluperidone, if approved, could treat the majority of patients diagnosed with schizophrenia. An estimated 69% of patients diagnosed with schizophrenia have negative symptoms, with at least 42% of patients diagnosed with schizophrenia having prominent negative symptoms.

Beyond schizophrenia, we believe roluperidone may possess therapeutic utility in brain disorders where negative symptoms are a significant unmet need and a core feature of the disease associated with a range of poor clinical outcomes. These potential indications include apathy in dementia, for which we have filed an Investigational New Drug (“IND”) application, Alzheimer’s disease, Parkinson’s disease and depression.

Clinical Development

Phase 3 Clinical Trial

In December 2017, the first patient was screened in the pivotal Phase 3 clinical trial of roluperidone (Study “MIN-101C07”) as monotherapy for negative symptoms in patients diagnosed with schizophrenia. The trial is a multicenter, randomized, double-blind, parallel-group, placebo-controlled, 12-week study to evaluate the efficacy and safety of 32 milligrams (“mg”) and 64 mg of roluperidone as compared to placebo in adult patients with negative symptoms of schizophrenia. The 12-week study is being followed by a 40-week, open-label extension period during which patients on roluperidone will continue receiving their original dose and patients on placebo will receive either 32 mg or 64 mg doses of roluperidone.

We have completed enrollment and a total of 515 patients were randomized in this trial at clinical sites in the U.S. and Europe. We anticipate top-line results from the 12-week, double-blind portion of the study to be available in the second quarter of 2020.

The primary endpoint of this trial is improvement in negative symptoms in patients treated with roluperidone compared to placebo as measured by the change in the Positive and Negative Syndrome Scale, or PANSS, Marder negative symptoms factor score (“NSFS”) over the 12-week double-blind treatment period. The key secondary endpoint is the effect of roluperidone compared to placebo as measured by the Personal and Social Performance, or PSP, total score over the same period. Additional secondary endpoints include the effect of roluperidone compared to placebo on the Clinical Global Impression of Severity (“CGI-S”) score, the PANSS total and subscale scores, the remaining Marder 4 factor scores, and safety and tolerability.

Patients admitted into the trial had a documented diagnosis of schizophrenia for at least one year and been symptomatically stable for at least 6 months with moderate to severe negative symptoms (>20 on the PANSS negative symptom subscale) and stable positive symptoms. Patients without moderate to severe symptoms of excitement/hyperactivity, suspiciousness/persecution, hostility, uncooperativeness, or poor impulse control were recruited. We believe these eligibility criteria represent the real-world patient population who may benefit when the drug is used in clinical practice. In addition, patients treated with psychotropic agents needed to undergo a wash-out period of a few days before receiving study drug. These parameters were applied in screening the population enrolled in the Phase 2b trial.

Chemistry, Manufacturing and Controls program

The chemistry, manufacturing and controls (“CMC”) scale-up program for roluperidone is ongoing to ensure consistency between the drug batches used during Phase 3 testing and those that will be available for potential marketing and commercialization pending the completion of our Phase 3 trial and subsequent regulatory submission and review of a New Drug Application (“NDA”) for roluperidone. The CMC program requires validation of all aspects of the manufacturing processes required to result in a drug product that consistently meets approved quality standards.

On September 23, 2019, we announced that we have entered into a long-term commercial supply agreement for roluperidone with Catalent, Inc. (“Catalent”), a leading global provider of advanced delivery technologies, development, and manufacturing solutions for drugs, biologics, gene therapies, and consumer health products. Under the terms of the agreement, Catalent will manufacture and package the finished dose form of roluperidone at its facility in Schorndorf, Germany. To date, Catalent has worked with us to enable the transfer from pilot to commercial-scale production. This has included analytical methods transfer and validation, process optimization, stability studies, and registration batch manufacturing, as well as packaging studies and the assessment of the influence of formulation factors on the product’s critical quality attributes as required by Quality by Design process.

Drug-Drug Interaction Studies

We have recently completed certain pharmacology trials that include a Drug-Drug Interaction (“DDI”) study, which comprise a standard part of the NDA. We have studied interactions separately with molecules inhibiting two subtypes of the cytochrome P450 (CYP2D6 and CYP3A4). The data from this study show minimal to no interaction with the CYP3A4 inhibitor, and some interaction (< 1.6 folds increase in exposure) with the CYP2D6 inhibitor.

Dose Escalation Study

We have completed a prospective, double-blind, placebo-controlled, randomized single-escalating dose study in healthy subjects to evaluate the investigational drug roluperidone as monotherapy administered at nine ascending doses (16, 32, 64, 96, 128, 160, 192, 224 and 256 mg). The highest dose tested is 4 multiples of the highest dose (64 mg) being used in the ongoing Phase 3 trial.

The trial included a total of 90 subjects. 72 received 9 different doses of roluperidone, and 18 received placebo. All subjects who were dosed completed the study as planned except for one male subject who received placebo and subsequently withdrew his consent.

Data from this trial demonstrated the following:

- The pharmacokinetics of roluperidone and its metabolites were dose proportional.
- No QTcF duration > 480 milliseconds (“msec”) or increases > 60 msec compared to baseline values were observed in any subject.
- 160 mg was the only roluperidone dose to show an adjusted QTcF mean increase from baseline of 10.7 msec. All other doses showed means below 10 msec that ranged from -1.3 to 5 msec.
- No significant change in repolarization was observed.
- Two subjects (11%) in the placebo group and nine subjects (13%) in the roluperidone group reported adverse events that were mild to moderate in severity and resolved without sequelae.
- Doses up to 160 mg or 2.5 multiples of the highest dose being tested in the ongoing Phase 3 trial had no effect on any cardiac safety parameters.
- Slight but not clinically relevant increases in heart rate were observed in the placebo group and some of the roluperidone doses.
- No serious adverse events were reported.

We believe these findings suggest an expanded therapeutic window and a significantly improved safety margin for roluperidone. They provide further evidence that the formulation being used in the Phase 3 trial has a significantly reduced maximum concentration (“C_{max}”) of the BFB-520 metabolite when compared to the formulation used in the Phase 2b trial, thereby reducing the potential for transient QTc increases at the doses currently tested in the Phase 3 trial. Furthermore, we believe these data suggest the potential for future testing of roluperidone in schizophrenic patients with an exacerbation of psychosis at higher doses than those being used in the Phase 3 trial.

Brain-Derived Neurotrophic Factor (“BDNF”) Findings

We have completed non-clinical studies that provides evidence of the effect of roluperidone on Brain-Derived Neurotrophic Factor (“BDNF”) and on Glial Cell-Derived Neurotrophic Factor (“GDNF”). BDNF is the most widely distributed member of neurotrophins in the brain and has been associated with neurogenesis, neuroplasticity, neuroprotection, synaptic regulation and learning and memory. Its involvement in schizophrenia has also been described. GDNF is another neurotrophin known to promote the survival of different types of brain cells and has been shown to be essential for the maintenance and survival of dopamine neurons.

Data from this study were presented at the 2019 Congress of the Schizophrenia International Research Society on April 11, 2019. These findings demonstrate that administration of roluperidone significantly increased BDNF release by astrocytes and hippocampal neurons obtained from the cerebral cortex of newborn rats, as well as the release of GDNF in cultured astrocytes. Furthermore, data showed that roluperidone enhanced BDNF gene expression at drug concentrations comparable to those observed in humans at tested doses. Based on these results, we believe that the effect of roluperidone on BDNF and GDNF may indicate its potential for disease modification and improved neuroplasticity, in addition to its observed effects on the sigma2, serotonergic 5-HT_{2A}, and possibly α 1-adrenergic neurotransmitter pathways.

MIN-117

Introduction

On December 18, 2019, we announced that our Phase 2b trial of MIN-117 in adult patients suffering from moderate to severe major depressive disorder (“MDD”) and presenting with symptoms of anxious distress failed to meet its primary and key secondary endpoints. Neither the 5.0 mg nor the 2.5 mg dose of MIN-117 tested in this trial showed a statistically significant separation from placebo on the reduction in the symptoms of MDD over the 6-week treatment period as measured by the change in the Montgomery–Åsberg Depression Rating Scale (“MADRS”). In addition, neither dose showed a statistically significant separation from placebo on the key secondary endpoint, reduction of symptoms of anxiety as measured by Hamilton Anxiety Rating Scale (“HAM-A”) over the 6-week treatment period. Patients treated with the 2.5 mg dose experienced an improvement of 1.6 points compared to placebo at Week 2 ($p \leq 0.029$). No other statistically significant separation from placebo on HAM-A was observed.

MIN-117 was generally well tolerated, and the incidence of patients who reported treatment emergent adverse events over the duration of 6 weeks of treatment and 2 weeks of follow-up were 37% for the 2.5 mg, 39% for the 5 mg, and 38% for placebo. Only headaches were reported at $\geq 5\%$ in this study at 12% for both the 2.5 and 5 mg, and 7% for placebo. There were no deaths, and only 5 patients in total discontinued from the study due to TEAE (2 for 2.5 mg, 1 for 5 mg, and 2 for placebo).

As a result of these findings, we have no plans for the further clinical development of MIN-117 in MDD.

Seltorexant (MIN-202)

Introduction

Seltorexant is an innovative selective orexin 2 receptor antagonist we are co-developing with Janssen for the treatment of insomnia and aMDD. Insomnia is the repeated difficulty with sleep initiation, maintenance or quality that occurs despite adequate time and opportunity for sleep, resulting in daytime impairment. Insomnia can be the primary condition for patients or a secondary symptom of, and contributor to, another medical or psychiatric condition, such as MDD or schizophrenia.

In the brain, the orexin system is involved in the control of several key functions, including metabolism and wakefulness. Seltorexant seeks to inhibit the activity of the neurons that promote wakefulness by selectively blocking the orexin 2 receptor. Rather than making an individual sleepier as is the case with many commercially available therapies that mediate their effect via the Gamma-Aminobutyric Acid (“GABA”) neurotransmitter pathway, blocking the orexin 2 receptor reduces the level of the neurotransmitters that signal the brain to maintain vigilance and wakefulness, which can be helpful for patients with insomnia.

We are co-developing seltorexant with Janssen and own the exclusive rights to develop and commercialize the compound in the Minerva Territory subject to royalty payments to Janssen and we have the right to receive royalties on any sales outside the Minerva Territory.

Clinical Development

Two Phase 2b Trials in MDD

On May 13, 2019, we announced positive top-line results from a Phase 2b trial of seltorexant (the “MDD2001 Trial”) as adjunctive therapy to antidepressants in adult patients with MDD who have responded inadequately to antidepressant therapy, including selective serotonin reuptake inhibitors (“SSRIs”) and/or serotonin-norepinephrine reuptake inhibitors (“SNRIs”). In this dose finding study, the 20 mg dose of seltorexant showed a statistically significant improvement in the MADRS score compared to placebo. The least squares mean (LS mean) difference from placebo of the change in MADRS total score at the end of week 6 was 3.1 for the 20 mg dose of seltorexant, and the 2-sided p-value was 0.083, which is below the pre-specified 2-sided type I error level of 0.1.

After three weeks of treatment, seltorexant at the 20 mg dose also showed a statistically significant improvement over placebo, highlighting its short onset of action time. In addition, a key secondary outcome measure, which was based on patient stratification according to baseline Insomnia Severity Index (“ISI”), showed an even greater difference from placebo for the seltorexant 20 mg arm in patients with clinically significant insomnia ($ISI \geq 15$) with LS mean difference versus placebo of 4.9 on the MADRS total score and a 2-sided p-value of 0.050 compared to the overall patient population in this trial.

The 40 mg dose, to which further enrollment was stopped following the interim analysis, showed an improvement in the MADRS total score versus placebo at the end of week 6 but did not reach statistical significance. Results for the 10 mg dose were not interpretable due to the small sample size of patients receiving this dose.

Seltorexant was well tolerated, and observed adverse events were comparable to those seen in previous studies and similar to or lower than those observed in the placebo group.

We believe these results represent the first clinical observation in a large, late-stage study that a selective orexin molecule can achieve a positive effect as an adjunctive treatment in patients with MDD who have an inadequate response to SSRIs and SNRIs. We believe these findings, if confirmed in Phase 3 studies, will suggest a novel approach to treating MDD with an improved safety profile compared to existing therapies. Approximately 60%-70% of patients diagnosed and treated with first-line therapies, including SSRIs and/or SNRIs, do not experience adequate treatment response, and seltorexant potentially represents a unique opportunity to improve treatment response rates safely in most of these patients.

On October 1, 2019, we announced top-line results from a Phase 2b clinical trial in which flexibly dosed seltorexant (20 mg or 40 mg) was compared to flexibly dosed quetiapine XR (150 mg or 300 mg) for adjunctive treatment of patients with MDD (the “MDD2002 Trial”). There were 102 patients enrolled, each with MDD not responding adequately to SSRIs and SNRIs. The primary endpoint was all cause discontinuation of therapy over 6 months. Mood improvement, measured using the MADRS, and safety and tolerability were evaluated. The primary intent of this exploratory trial was to generate data to assist with the planning of Phase 3 studies; it was not powered to detect statistical significance. Quetiapine XR was used as a comparator, because it is the only medication approved for the adjunctive treatment of MDD in both the U.S. and Europe.

Seltorexant showed a quantitative advantage in the number of discontinuations due to all causes, with 41% discontinuation in the seltorexant arm versus 47% in the quetiapine XR arm. As expected, there was not a statistical separation between the two treatment arms.

Mood improvement as measured by MADRS total score showed patients treated with seltorexant 20 mg dose experienced a greater improvement at week 24 (-22.7 points), compared to those treated with seltorexant 40 mg dose (-7.9 points), quetiapine 150 mg dose (-17.0 points) and quetiapine 300 mg dose (-14.8 points). As was shown in previous trials of seltorexant in MDD, a greater improvement in MADRS total score was observed in patients with sleep disturbance ($ISI \geq 15$) who received the 20 mg seltorexant dose. In these patients with insomnia, the improvements observed were -26.5 for the 20 mg seltorexant dose, -7.0 for the 40 mg seltorexant dose, -18.2 for the 150 mg quetiapine dose and -13.8 for the 300 mg quetiapine dose.

The overall safety profile of the seltorexant groups was favorable compared to quetiapine, consistent with prior seltorexant studies, and extended to longer-term exposure over 6 months. Patients receiving seltorexant also experienced fewer potentially treatment-related discontinuations than did patients receiving quetiapine (29.4% vs 47.1%).

The results of this study, taken with the results of the two previous studies (MDD2001 in MDD patients and ISM2005 in patients with insomnia), will help to define a Phase 3 clinical development program for seltorexant that potentially will encompass both MDD and insomnia.

Phase 1b trial in MDD

We have recently analyzed data from an exploratory, biomarker, multicenter, placebo-controlled, randomized, double-blind Phase 1b trial of seltorexant (the “MDD1009 Trial”), administered at doses of 20 and 40 mg, as monotherapy in 128 subjects with moderate to severe MDD. The primary objective of this study was to analyze the treatment effect of seltorexant versus placebo on symptoms of depression as measured by the Hamilton Rating Scale for Depression (HDRS). The presence of subjective sleep disturbance (subjective sleep assessment, ISI, and Ruminative Response Scale (“RRS”)) as a possible indicator of hyper-arousal was used as a stratification factor in patient randomization.

Results of the primary endpoint analysis showed a significant positive treatment effect at week 5 for seltorexant versus placebo. The efficacy signal for the 20 mg dose was statistically significant and more pronounced in the MDD population with sleep disorder, measured as having an ISI > 15 and subjective sleep onset latency >30 min during at least 3 nights over 7 recorded days, and in MDD patients with higher rumination, measured as a having RRS ≥ 50.

The seltorexant 40 mg dose did not show a statistically significant effect at week 5, although the efficacy signal was also more pronounced in the subgroups (MDD patients with presence of subjective sleep disorder, measured as having an ISI >15 or RRS ≥ 50). We believe these data further characterize the mechanism of seltorexant as an antagonist of the orexin system, which is involved in the control of several key functions in the brain, including mood, metabolism and wakefulness.

Phase 2b Trial in Insomnia Disorder

On June 24, 2019, we announced positive top-line results from a Phase 2b clinical trial of seltorexant in patients with insomnia disorder (the “ISM2005 Trial”) that demonstrated highly statistically significant ($p \leq 0.001$) and clinically meaningful improvement on Latency to Persistent Sleep (“LPS”) at Night 1, the primary endpoint of the study. The mean decrease from baseline at Night 1 in LPS was 15 minutes for placebo, 30 minutes for seltorexant 5 mg, 50 minutes for seltorexant 10 mg, and 48 minutes for seltorexant 20 mg.

The key secondary endpoint, defined as Wake After Sleep Onset over the first 6 hours (“WASO-6”) at Night 1, showed improvement with a p-value ≤ 0.005 after treatment with 10 and 20 mg doses of seltorexant. The mean improvement from baseline at Night 1 was 15 minutes for placebo, 23 minutes for seltorexant 5 mg, 43 minutes for 10 mg, and 45 minutes for 20 mg of seltorexant. Furthermore, multiple secondary endpoints were also improved versus placebo and standard of care zolpidem, which is available under the brand name Ambien.

We believe these findings demonstrate that seltorexant significantly improves sleep induction and maintenance, while also showing a significantly greater improvement in these sleep parameters compared to zolpidem. In addition, the beneficial effects on LPS and WASO of seltorexant in elderly patients in the study, in conjunction with a favorable tolerability profile, suggest its potential benefit in the large and growing population of elderly patients whose prevalence of insomnia is higher than in younger patients, thus representing an important therapeutic option.

Based on the results from the ISM2005 Trial, observations of seltorexant include a clinically meaningful effect on insomnia in a wide age range of patients. We believe this demonstration of a significant benefit across a broad spectrum of patients who suffer with insomnia who have not responded adequately to existing therapies reflects a differentiated clinical profile and suggests a new potential way to address these unmet medical needs.

Phase 3 development

After reviewing the data from the Phase 2b trials already conducted, we are not in agreement with Janssen that Decision Point 4 under the Agreement has been reached. Under the Agreement, our cost-sharing obligations do not begin until Decision Point 4 has been reached. Following occurrence of Decision Point 4, Janssen is responsible for 60% of the cost of Phase 3 development in all indications except insomnia and Minerva is responsible for 40%. We have the right to opt-out of the Agreement at any time after Decision Point 4, and if we opt-out, we collect a royalty on worldwide sales of seltorexant in the mid-single digits with no further obligations to Janssen. In January 2020, Janssen invoiced us for \$3.4 million, representing our 40% portion of the Phase 3 development costs through December 31, 2019. Janssen estimates it will spend approximately \$100 million in Phase 3 development costs in 2020. We have been conducting discussions with Janssen regarding this disagreement and have not accrued any Phase 3 development costs incurred by Janssen.

Janssen has proposed a Phase 3 development program with a target indication of “adjunctive treatment of MDD (aMDD) in patients with insomnia symptoms” and clinical trials to support that target indication. We and Janssen are consulting with FDA and EMA/CHMP about this target indication and these trials. We believe that under the terms of the Agreement we have the right to strategic control of the proposed development program, and this matter is part of the ongoing discussions that we are conducting with Janssen.

Amendment to Co-Development and License Agreement with Janssen

In June 2017, we entered into an amendment (the “Amendment”) to the co-development and license agreement with Janssen dated February 13, 2014 (the “Agreement”). The effectiveness of the Amendment was contingent upon approval of its terms by the European Commission and the closing of the acquisition of Actelion Ltd. by affiliates of Janssen. These conditions were subsequently met, and the Amendment became effective on August 29, 2017. Under the Amendment, Janssen has waived its right to royalties on seltorexant insomnia sales in the Minerva Territory. We retain all of our rights to seltorexant, including commercialization of the molecule for the treatment of insomnia and aMDD, which include an exclusive license in the Minerva Territory, with royalties payable by us to Janssen on seltorexant sales outside of the insomnia indication. Royalties on sales outside of the Minerva Territory are payable by Janssen to us. Janssen made an upfront payment to us of \$30 million upon the effectiveness of the Amendment and agreed to make a \$20 million payment at the start of a Phase 3 insomnia trial for seltorexant and a \$20 million payment when 50% of the patients are enrolled in this trial. Janssen further agreed to waive development payments from us until completion of the Phase 2b development milestone, which is referred to as “Decision Point 4.” The \$30 million payment and \$11.2 million in previously accrued collaborative expenses, which were forgiven upon the effective date of the Amendment, are earned and recognized as revenue as the services are performed from the commencement of Phase 3 development to the completion of the development activities using the proportional performance method. The \$30 million payment along with the \$11.2 million in previously accrued collaborative expenses have been included under deferred revenue on our balance sheet at December 31, 2019 and 2018. If we opt out of the program, then any remaining deferred revenue would be recognized at the time of the opt out. In connection with the Amendment, we repurchased all of the approximately 3.9 million shares of our common stock previously owned by Johnson & Johnson Innovation-JJDC Inc. at a per share price of \$0.0001, for an aggregate purchase price of approximately \$389.

As a result of the Amendment, we assumed strategic control of matters relating to the clinical development of seltorexant for insomnia and have no further financial obligations until after Decision Point 4. After Decision Point 4, both we and Janssen have the right to opt-out of the Agreement.

If we opt-out, we collect a royalty on worldwide sales of seltorexant in the single digits with no further obligations to Janssen. If Janssen opts-out, the Minerva Territory would be expanded to include North America and we would pay Janssen royalties on sales of seltorexant outside of the insomnia indication in the single digits.

If both parties elect to continue past Decision Point 4 into Phase 3, we would be obligated to fund the clinical trials related to insomnia, receive up to \$40 million in milestone payments from Janssen, and be responsible for 40% of all costs incurred in the Phase 3 aMDD program.

MIN-301

Introduction

We are developing MIN-301, a soluble recombinant form of the Neuregulin-1b1, or NRG-1b1, protein, for the treatment of Parkinson’s disease and potentially for other neurodegenerative disorders. We believe MIN-301 has the potential to slow the onset of, and restore the brain tissue damage caused by, the disease. MIN-301 is produced by recombinant technology, which is a type of process that modifies the genetics of a biological organism to cause it to produce a particular product. MIN-301 is a peptide that contains the extracellular domain of the human neureglin-1 beta 1 protein and is produced using an *Escherichia coli* organism that is genetically engineered to express this peptide. Once administered, this peptide binds to a particular receptor, ErbB4, which produces certain biological effects. For instance, binding to ErbB4 modulates the levels of certain neurotransmitters such as Gamma-Aminobutyric Acid (“GABA”) and glutamate in the brain, which are often unbalanced in individuals with Parkinson’s disease. Further, ErbB4 promotes oxygenation and metabolism of neurons and it is involved in the control of brain inflammation, which may indicate that MIN-301 could reverse the damage caused by Parkinson’s disease.

Current treatments for Parkinson’s disease improve the symptoms of patients, but none have been proven to delay the onset of the disease, slow or prevent the progression of the disease or reverse its effects. Due to MIN-301’s novel mechanism of action that targets neurological deficits, we believe MIN-301 has the potential to address these unmet needs of patients and, if approved, may be used as an early-stage monotherapy as well as a complementary therapy to existing treatments.

Pre-clinical Development

Results from a non-human primate study showed that treatment with an analog of MIN-301 resulted in improvements in a range of symptoms associated with a Parkinson's disease model in primates. The results confirmed the beneficial effects of MIN-301 in non-primate pre-clinical models. We believe these data provide support for advancing MIN-301 into clinical trials for the treatment of Parkinson's disease in humans. Building upon these data, we are continuing to conduct pre-clinical studies in preparation for an IND or Investigational Medicinal Product Dossier ("IMP") filing, with a Phase 1 study expected to commence thereafter.

License Agreements

Roluperidone License Agreement with MTPC

We have entered into a license agreement with MTPC dated as of August 30, 2007, as amended, or the Roluperidone License Agreement. Under the terms of the Roluperidone License Agreement, we acquired an exclusive license to the lead compound known as CYR-101 (subsequently renamed MIN-101 and roluperidone), and other compounds with a similar structure and intended purpose and other data included within the valid claims of certain patents licensed to us under the Roluperidone License Agreement. The license is for world-wide rights other than certain countries in Asia, including China, Japan, India and South Korea. We will pay MTPC a tiered royalty for net sales of product by us or any of our affiliates or sublicensees containing the licensed compound at a range of percentages of the high single digits to the low teens depending on net sales of products under the Roluperidone License Agreement. We were also required to make certain milestone payments upon the achievement of certain development and commercial milestones, potentially up to \$57.5 million for roluperidone and up to \$59.5 million for additional products.

In January 2014, we renegotiated the structure of the license for roluperidone such that we are required to make milestone payments upon the achievement of one development milestone totaling \$0.5 million and certain commercial milestones, which could total up to \$47.5 million, in the aggregate, as well as the tiered royalty payments described above. In addition, in the event that we sell the rights to the license, MTPC will be entitled to a percentage of milestone payments in the low teens and a percentage of royalties received by us in the low double digits. This license agreement has a term of the later of 12 years from the launch of the product in each country in our territory, or the expiration of our obligation to pay royalties, upon which we will have a fully paid-up, non-exclusive, perpetual, irrevocable license. Our obligation to pay royalties continues, on a country-by-country basis, until the expiration of the last-to-expire patent that covers roluperidone in each country in our territory.

MIN-117 License Agreement with MTPC

Sonkei entered into a license agreement with MTPC dated September 1, 2008, as amended, or the MIN-117 License Agreement. Under the terms of the MIN-117 License Agreement, we acquired an exclusive license to the lead compound known as SON-117 (subsequently renamed MIN-117) and other data included within the valid claims of certain patents licensed to us under the MIN-117 License Agreement. Sonkei paid MTPC an initial license fee of \$0.5 million. The license is for world-wide rights other than certain countries in Asia, including China, Japan, India and South Korea. We will pay a tiered royalty for net sales of product by it or any of its affiliates or sublicensees containing the licensed compound ranging from the high single digits to the low teens depending on net sales of products under the MIN-117 License Agreement. Through the date of the agreement, as amended, we were required to make payments up to \$57.5 million upon the achievement of certain commercial milestones.

In January 2014, we renegotiated the structure of the license for MIN-117 such that we are required to make certain milestone payments upon the achievement of certain commercial milestones up to \$47.5 million. In addition, in the event that we sell the rights to the license, MTPC will be entitled to a percentage of milestone payments in the low teens and a percentage of royalties received by us in the low double digits. This license agreement has a term of the later of 10 years from the launch of the product in each country in our territory, or the expiration of our obligation to pay royalties, upon which we will have a fully paid-up, non-exclusive, perpetual, irrevocable license. Our obligation to pay royalties continues, on a country-by-country basis, until the expiration of the last-to-expire patent that covers MIN-117 in each country in our territory. In April 2015, we amended the diligence milestone obligation under the license agreement for MIN-117 to extend the deadline from April 30, 2015 to June 30, 2015 to begin enrollment in a Phase 2a or Phase 2b study with MIN-117 in patients suffering major mood disorders. As consideration for the two-month extension, we paid MTPC, and recorded an expense for, \$80,000 in the year ended December 31, 2015. We met the enrollment milestone obligation in June 2015.

Seltorexant Co-Development and License Agreement with Janssen

On February 13, 2014, we signed a co-development and license agreement (the “Agreement”) with Janssen, which became effective upon completion of our initial public offering and the payment of a \$22.0 million license fee. Under the Agreement, Janssen, the licensor, granted us an exclusive license, with the right to sublicense, in the Minerva Territory, under (i) certain patent and patent applications to sell products containing any orexin 2 compound, controlled by the licensor and claimed in a licensor patent right as an active ingredient and (ii) seltorexant for any use in humans. In addition, upon regulatory approval in the Minerva Territory (and earlier if certain default events occur), we will have rights to manufacture seltorexant, also known as JNJ-42847922. We have granted to the licensor an exclusive license, with the right to sublicense, under all patent rights and know-how controlled by us related to seltorexant to sell seltorexant outside the Minerva Territory. In consideration of the licenses granted on July 7, 2014, we made a license fee payment of \$22.0 million, which was included as a component of research and development expense in 2014.

The Agreement contains certain provisions, which include our ability to opt-out of the Agreement upon completion of certain milestones. If we elect to participate in the development program through to the potential commercial approval of seltorexant we will pay a quarterly royalty percentage to the licensor in the high single digits on aggregate net sales for seltorexant products sold by us, our affiliates and sublicensees in the Minerva Territory. The licensor will pay a quarterly royalty percentage to us in the high single digits on aggregate net sales for seltorexant products sold by the licensor outside the Minerva Territory.

We account for the Agreement as a joint risk-sharing collaboration in accordance with ASC 808, “Collaborative Arrangements”. Payments between us and the licensor with respect to each party’s share of seltorexant development costs that have been incurred pursuant to the joint development plan are recorded within research and development expenses or general and administrative expenses, as applicable, in the accompanying consolidated statements of operations due to the joint risk-sharing nature of the activities.

On July 6, 2016, we and Janssen agreed that “Decision Point 2” had been reached as defined under the Agreement. As neither party exercised their right to withdraw from the Agreement, we paid Janssen \$3.5 million and have incurred direct expenses of \$0.3 million related to development activities under the current phase of development.

In June 2017, we entered into an amendment (“the Amendment”) to the co-development and license agreement with Janssen dated February 13, 2014 (the “Agreement”). The effectiveness of the Amendment was contingent upon approval of its terms by the European Commission and the closing of the acquisition of Actelion Ltd. by affiliates of Janssen. These conditions were subsequently met, and the Amendment became effective on August 29, 2017. Under the Amendment, Janssen has waived its right to royalties on seltorexant insomnia sales in the Minerva Territory. We retain all of our rights to seltorexant, including commercialization of the molecule for the treatment of insomnia and as an adjunctive therapy for MDD, which include an exclusive license in the Minerva Territory, with royalties payable by us to Janssen on seltorexant sales outside of the insomnia indication. Royalties on sales outside of the Minerva Territory are payable by Janssen to us. Janssen made an upfront payment to us of \$30 million upon the effectiveness of the Amendment and agreed to make a \$20 million payment at the start of a Phase 3 insomnia trial for seltorexant and a \$20 million payment when 50% of the patients are enrolled in this trial. Janssen further agreed to waive development payments from us until completion of the Phase 2b development milestone, which is referred to as “Decision Point 4.” The \$30 million payment and \$11.2 million in previously accrued collaborative expenses, which were forgiven upon the effective date of the Amendment, are earned and recognized as revenue as the services are performed from the commencement of Phase 3 development to the completion of the development activities using the proportional performance method. The \$30 million payment along with the \$11.2 million in previously accrued collaborative expenses have been included under deferred revenue on our balance sheet at December 31, 2019 and 2018. If we opt out of the program, then any remaining deferred revenue would be recognized at the time of the opt out. In connection with the Amendment, we repurchased all of the approximately 3.9 million shares of our common stock previously owned by Johnson & Johnson Innovation-JJDC Inc. at a per share price of \$0.0001, for an aggregate purchase price of approximately \$389. As a result of the Amendment, we did not incur any development expense during the year ended December 31, 2019 or 2018.

Also as result of the Amendment, we assumed strategic control of matters relating to the clinical development of seltorexant for insomnia and have no further financial obligations until after Decision Point 4. After Decision Point 4, both we and Janssen have the right to opt-out of the Agreement.

If we opt-out, we collect a royalty on worldwide sales of seltorexant in the single digits with no further obligations to Janssen. If Janssen opts-out, the Minerva Territory would be expanded to include North America and we would pay Janssen royalties on sales of seltorexant outside of the insomnia indication in the single digits.

If both parties elect to continue past Decision Point 4 into Phase 3, we would be obligated to fund the clinical trials related to insomnia, receive up to \$40 million in milestone payments from Janssen, and be responsible for 40% of all costs incurred in the Phase 3 MDD program.

Competition

Roluperidone: Competition in the Pharmaceutical Market for the Treatment of Schizophrenia

Current drug therapies for the treatment of schizophrenia mainly target the positive symptoms of the disease. When patients present positive symptoms and require treatment, they are typically given either conventional “first-generation” antipsychotic medication, such as GlaxoSmithKline’s Thorazine Sanofi-Aventis’ Largactil (chlorpromazine) and Johnson & Johnson’s Haldol (haloperidol), or second-generation “atypical antipsychotics,” such as Novartis’ Clozaril (clozapine), Johnson & Johnson’s Risperdal (risperidone), AstraZeneca’s Seroquel (quetiapine), Eli Lilly’s Zyprexa (olanzapine) and Bristol-Myers Squibb’s Abilify (aripiprazole).

Both types of existing therapies have limited ability to improve negative symptoms and cognitive symptoms. In addition, existing therapies have extensive side effects such as weight gain, metabolic syndrome, sedation, nausea, movement disorders, restlessness, insomnia, impairment of cognitive skills, and prolactin increase. Since schizophrenia has a wide range of symptoms, multiple therapeutics are often prescribed in an attempt to address all aspects of the disease, compounding these side effects.

Given the focus of currently approved drug therapies for positive symptoms and their side effect profiles, we believe these therapies are unlikely to be directly competitive with roluperidone, which is intended to target primarily negative symptoms and cognitive impairment. However, new drug therapies in addition to roluperidone are being developed to address the limitations of current therapies. Several new pharmacological approaches have been investigated. One targets a neurotransmitter called glutamate and the other targets a neurotransmitter called nicotine. Glutamate is the most predominant neurotransmitter system in maintaining the brain in an active state and is involved in maintaining accurate vigilance, attention and contributing to some cognitive skills. Nicotine is among the most predominant neurotransmitter system involved in learning and some other cognitive skills.

Specific compounds under late-stage development that include negative symptoms as a target include Acadia Pharmaceuticals’ Pimavanserin, a selective serotonin 5HT_{2a} inverse agonist (“SSIA”) that is approved for the treatment of hallucinations and delusions associated with Parkinson’s disease psychosis. In January 2019, Lundbeck indicated they would begin proof of concept studies for Lu AF11167, a PDE-10 inhibitor for the treatment of persistent negative symptoms in schizophrenia. Other products in clinical development whose targets include negative symptoms (although not necessarily defined as a primary outcome of their clinical trials) are Roche’s RO6889450/RG-7906, Takeda’s TAK-831, SyneuRx’s NaBen, and Avanir Pharmaceuticals’ AVP-786.

Seltorexant: Competition in the Pharmaceutical Market for the Treatment of Insomnia

Most of the pharmaceuticals on the market for insomnia target neurotransmitter pathways involved in depressing the brain activity, such as the histamine and GABA pathways, to induce a decrease in vigilance and attention, leading to sedation and sleep induction. The leading molecule among the current third generation of GABAergic drugs is Sanofi’s zolpidem, often marketed under the name Ambien, and is available in generic form. However, zolpidem requires careful utilization to avoid tolerance and drug abuse and extensive sleep studies have demonstrated that zolpidem does not restore physiological sleep and does not allow restorative sleep, which prevents good daytime performance.

Unlike existing therapies, seltorexant, if approved, is expected to inhibit wakefulness-promoting neurotransmitters, rather than activating sleep-promoting neurotransmitters. In August 2014, Merck & Co.’s dual orexin receptor antagonist, suvorexant, was approved by the FDA and is currently marketed under the name Belsomra®. In December 2019, Eisai announced U.S. FDA approval of DAYVIGO™ (lemborexant), a dual orexin receptor antagonist for the treatment of insomnia in adult patients. If approved, we believe seltorexant, which is a single orexin receptor antagonist that targets orexin 2 pathways only and has a different pharmacokinetic profile from Belsomra and Dayvigo, may have equal or superior efficacy, less residual sedation and impaired daytime functioning, and superior preservation of appropriate levels of rapid eye movement sleep as compared to Belsomra.

MIN-301: Competition in the Pharmaceutical Market for the Treatment of Parkinson’s Disease

Current treatments for Parkinson’s disease are intended to improve the symptoms of patients. The cornerstone of Parkinson’s therapy is levodopa, as it is the most effective therapy for reducing symptoms of Parkinson’s disease. However, levodopa may cause unpleasant systemic side effects, such as dyskinesias, and is often used with dopaminergics to manage these side effects. While initially effective, symptoms become increasingly difficult to control over time, and patients experience a pattern of motor complications that include motor fluctuations, dyskinesias, off-period dystonia, freezing and falls. Accordingly, there are advantages to deferring their use to later stages of the disease, or using them with other therapies to reduce the side effects of motor fluctuations and dyskinesia that 50% of levodopa patients experience.

Unlike currently available therapies, MIN-301, if approved, is intended to delay the onset of the disease, slow or prevent the progression of the disease or reverse its effects. Since MIN-301 is expected to target Parkinson's disease, rather than merely its symptoms, and current therapies are not fully effective at improving the symptoms of Parkinson's disease without side effects, we believe that levodopa and other currently available generic products may not be directly competitive with MIN-301. While there are other drug therapies in development that will target the disease, such as gene and stem cell therapy and A2A receptor agonists, the majority of products in development for Parkinson's disease are still in the pre-clinical stage.

Intellectual Property

We strive to protect the proprietary products and technologies that we believe are important to our business, including seeking and maintaining patent protection intended to cover the composition of our product candidates, their methods of use, related technology and other inventions that are important to our business. We also rely on trade secrets and careful monitoring of our proprietary information to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection.

The patent portfolios for our product candidates, which we own or are exclusively licensed to us, are summarized below.

Roluperidone

Compound

Under our agreement with MTPC, we have an exclusive license to U.S. Patent No. 7,166,617, which claims the roluperidone compound, as well as to corresponding patents in the following countries: Australia, Canada, Europe (Albania, Austria, Belgium, Republic of Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Monaco, Netherlands, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, Turkey, and United Kingdom), Israel, New Zealand, and Russia. The U.S. patent is scheduled to expire no earlier than May 17, 2021, and a patent term extension of up to 5 years may be available. The foreign patents are scheduled to expire no earlier than February 26, 2021.

In addition to U.S. Patent No. 7,166,617, Minerva also owns numerous other granted patents and patent applications worldwide that provide strong protection for roluperidone. These include patents and applications directed to pharmaceutical compositions comprising roluperidone and methods of using roluperidone.

Pharmaceutical Compositions

We own three granted U.S. patents, U.S. Patent Nos. 9,458,130, 9,730,920 and 10,258,614, and pending applications in the U.S., Australia, Brazil, Canada, Chile, Colombia, Eurasia, Europe, Israel, Mexico, New Zealand, Peru, Ukraine, and South Africa that cover a novel formulation comprising roluperidone. This novel formulation provides improved therapeutic response and minimizes the potential for transient QTc increases – and thus safety issues - when compared to previous formulations. Because of this improved safety profile, it is this formulation of roluperidone that is being used in Phase 3 clinical trials, and it is this formulation that we expect will be the basis for approval in the US and EU. The granted U.S. patents, as well as any other U.S. or foreign patents that may grant from these applications, will expire no earlier than November 30, 2035. These patents are listable in the FDA's Orange Book and would, we believe, bar generic competition during their terms. In addition to the patent terms referenced above, a patent term extension of up to 5 years may also be available.

We also own pending applications in the U.S., Australia, Brazil, Canada, Chile, Colombia, Eurasia, Europe, Israel, Mexico, New Zealand, Peru, Ukraine, and South Africa that cover gastro-resistant, controlled release dosage formulations of roluperidone. The terms of any future granted patents in this patent family would expire no earlier than June 21, 2038.

Methods of Use

We own U.S. Patent No. 9,732,059, two granted patents in Russia, and a single patent in Europe (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, and United Kingdom), as well as pending applications in United States, Brazil, Canada, Europe, and Russia across two patent families that are directed to methods of use of roluperidone to treat negative and other symptoms of schizophrenia, sleep disorders, depression, and other sigma-2 disorders or conditions. U.S. Patent No. 9,732,059 covers the use of roluperidone to treat one or more negative symptoms of schizophrenia and will not expire until 2033. This patent is listable in the FDA's Orange Book and would, we believe, bar generic competition during their terms. A patent term extension of up to 5 years may also be available. The foreign patents, as well as any future U.S. or foreign patents granting in these families, are scheduled to expire no earlier than July 20, 2031.

We also own U.S. and EP patent applications directed to the use of roluperidone to treat negative symptoms in non-schizophrenic patients. Any patents granting from these applications would expire no earlier than May 23, 2037.

In addition, we own U.S. and PCT applications directed to the use of roluperidone to treat negative symptoms, various disorders (including autism disorders, amblyopia, personality disorders, traumatic brain injury), as well as increasing neuroplasticity and promoting neuroprotection in subjects in need thereof. Any patents granting from the U.S. application, or any national phase applications that may be filed based upon the PCT application, would expire no earlier than August 21, 2039.

MIN-117

Compound

Under our agreement with MTPC, we have an exclusive license to U.S. Patent No. 6,720,320, which claims the MIN-117 compound, as well as to corresponding patents in Canada and Europe (Germany, France, Italy, Netherlands, Spain and United Kingdom). The U.S. patent expires no earlier than August 13, 2020, and a patent term extension of up to 5 years may be available. The foreign patents are scheduled to expire no earlier than May 22, 2020.

Pharmaceutical Compositions and Methods of Use

We own granted patents in Australia and Chile, as well as several pending applications in the United States, Europe, Australia, Brazil, Canada, Colombia, Israel, Mexico, New Zealand, Peru, Russia, and South Africa that cover compositions comprising a low dose of MIN-117 and their use for treating depression, sleep disorders, and improving cognitive impairment in patients with depression. Patents that grant from these applications will expire no earlier than January 24, 2034. A patent term extension of up to five years may be available in the United States.

We also own U.S. and EP patent applications directed to the use of MIN-117 to treat anxiety disorders. Any patents granting from these applications would expire no earlier than May 23, 2037.

New Patent Application Related to Pain

We also own U.S. patent application and PCT application directed to the use of MIN-117 to treat pain. Pre-clinical rat models submitted in the patent application included peripheral motoneuropathy, inflammatory pain and chemotherapy-induced peripheral neuropathic pain. Findings in these models showed that MIN-117 restored approximately 60 percent of the nociceptive pain threshold after peripheral motoneuropathy or inflammatory pain and significantly reduced, in a dose-dependent manner, chemotherapy-induced peripheral neuropathic pain.

These results suggest that MIN-117 may be a candidate for study in the treatment of diseases with chronic pain symptoms and may have the potential to address the urgent need for non-opioid therapeutic options for the treatment of pain. Furthermore, the currently available treatments for chronic pain are often not satisfactory and may be associated with adverse reactions, tolerance, dependence and reductions in the quality of life for patients. Any patents granting from the U.S. application, or any national phase applications that may be filed based upon the PCT application, would expire no earlier than September 4, 2039.

Seltorexant

Compound

Under our agreement with Janssen, we are an exclusive licensee of European Patent EP2491038, which claims the seltorexant compound and was validated in 39 European countries. These patents will expire no earlier than October 21, 2030.

Methods of Use

We also have rights to a PCT application filed in 2017, which is directed to the use of seltorexant to treat depression. National phase applications based upon this PCT application were filed in 2018, and the terms of any patents issuing from these applications will expire no earlier than March 9, 2037.

MIN-301

We own a patent family that is directed to the use of MIN-301 for treating neurologic and psychiatric diseases, including Parkinson's disease. This patent family includes patents granted in the U.S., Australia, Canada, Europe (Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and United Kingdom), Japan, Mexico and Russia. Applications are also pending in the United States and Brazil. Any existing and future granted patents in this family will expire no earlier than November 17, 2028. A patent term extension of up to five years may be available in the United States.

Data and Marketing Exclusivity

In addition to patent protection, our product candidates may also be eligible for data and marketing exclusivity protection in the U.S., EU and certain other countries. If this protection is available, no competitor may use the data in our marketing application to obtain marketing approval of a generic product during the exclusivity period.

For small molecules, such as roluperidone, seltorexant and MIN-117, the data and marketing exclusivity period is generally five years in the U.S. and ten years in the EU, measured from the FDA and EU approval dates, respectively. If MIN-301 is approved as a biologic product, it may be eligible for a data and marketing exclusivity period of twelve years in the U.S. and ten years in the EU. The data and marketing exclusivity periods in the U.S. may be extended by 6 months of pediatric exclusivity if a qualifying pediatric study is performed or in the EU by 12 months if approval for a new indication is obtained during the initial 8 year data exclusivity period and there are no existing therapies for that indication, or there are existing therapies for that indication, but there is a significant clinical benefit to using the drug for which the extra market protection is sought.

Manufacturing

We do not have any manufacturing facilities or personnel. We currently rely, and expect to continue to rely, on third parties for the manufacturing of our product candidates for pre-clinical and clinical testing, as well as for commercial manufacturing if our product candidates receive marketing approval. Our product candidates are manufactured in reliable and reproducible synthetic processes from readily available starting materials. The chemistry does not require unusual equipment in the manufacturing process. We expect to continue to develop product candidates that can be produced cost-effectively at contract manufacturing facilities.

Commercialization

We began to expand our internal capabilities related to commercial planning, strategic product development and product marketing in late 2017. Except for most of Asia, we have global commercialization rights for two of our product candidates, roluperidone and MIN-117, and European Union commercialization rights for seltorexant. We have worldwide rights for MIN-301. We believe that it will be possible for us to access European and, in the case of roluperidone, MIN-117 and MIN-301, other priority markets including the United States, Asia, and Latin America, through a focused, specialized sales force where the population dynamics would prove efficient. We may enter into sales, distribution or other marketing arrangements with third parties for priority markets or limited to certain territories for any of our drug candidates that obtain marketing approval.

Subject to receiving marketing approvals, we expect to commence commercialization activities by building a focused sales and marketing organization, either alone or through collaborations with third parties, in the United States, EU and Latin America to sell our product candidates. We believe that such an organization will be able to target the community of physicians who are the key specialists in treating the patient populations for which our product candidates are being developed. Additionally, we plan to engage fully with all key constituencies involved in treatment decisions, including payors, patients and others.

Government Regulation and Product Approval

Clinical Trials and Marketing Authorization in the European Union

In Europe, a clinical trial application, or CTA, must currently be submitted to the competent national regulatory authority and to independent ethics committees in each country in which we intend to conduct clinical trials. Once the CTA is approved in accordance with that country's requirements, clinical trial development may proceed in that country. Under the new Regulation on Clinical Trials, which is expected to take effect in 2020, there will be a centralized application procedure where one national authority takes the lead in reviewing the application and the other national authorities have only a limited involvement. Any substantial changes to the trial protocol or other information submitted with the clinical trial applications must be notified to or approved by the relevant competent authorities and ethics committees. In all cases, the clinical trials must be conducted in accordance with good clinical practices and other applicable regulatory requirements and medicines used in clinical trials must be manufactured in accordance with good

manufacturing practices. A clinical trial may only be undertaken subject to certain conditions. The relevant ethics committee must give its opinion, before a clinical trial commences, on any issue requested. Clinical trials information must be entered into a European database. There are strict requirements in relation to the labeling and packaging of our product candidates, the verification of compliance with the provisions on good clinical and manufacturing practice and the notification of adverse events and serious adverse reactions.

Under European Union regulatory systems, a company may not market a medicinal product without marketing authorization.

There are four procedures for submitting a Marketing Authorization Application, or MAA, in the EU: (i) the national procedure, (ii) the mutual recognition procedure, or MRP; (iii) the decentralized, or DCP and (iv) the centralized procedure, or CP. The submission strategy for a given product will depend on the nature of the product, the target indication(s), the history of the product, and the marketing plan. The centralized procedure is compulsory for certain medicinal products which are produced by biotechnology processes, advanced therapy medicinal products and for those which are designated as orphan medicinal products. Besides the products falling under the mandatory scope, the centralized procedure is also optional for medicinal products that constitute a significant therapeutic, scientific or technical innovation i.e. new active substances or other medicinal products that constitute a significant therapeutic, scientific or technical innovation that contain an active substance not authorized in the European Union before May 20, 2004 or for which a centralized procedure would be in the interest of patients.

The centralized procedure leads to approval of the product in all 27 EU member states and in Norway, Iceland and Liechtenstein, collectively referred to herein as the EEA. Submission of one MAA thus leads to one assessment process and one authorization that allows access to the market of the entire EEA. The process of the centralized procedure is triggered when the applicant submits an MAA to the EMA. The letter of intent also initiates the assignment of the Rapporteur and Co-Rapporteur, who are the two appointed members of the Committee for Human Medicinal Products, or CHMP, representing two EU member states. Under the centralized procedure, the maximum timeframe for the evaluation of an MAA by the EMA is 210 days. This excludes so-called clock stops, during which additional written or oral information is to be provided by the applicant in response to questions asked by the Committee for Human Medicinal Products, or CHMP. At the end of the review period, the CHMP provides an opinion to the European Commission. If this is opinion favorable, the Commission may then adopt a decision to grant a marketing authorization. In exceptional cases, the CHMP might perform an accelerated review of an MAA in no more than 150 days. This is usually when the product is of major interest from the point of view of public health and, in particular, from the viewpoint of therapeutic innovation.

When using the MRP or DCP, the applicant must select which and how many EU member states in which to seek approval. In the case of an MRP, the applicant must initially receive national approval in one EU member state. This will be the so-called reference member state, or RMS, for the MRP. Then, the applicant seeks approval for the product in other EU member states, the so-called concerned member states, or CMS, in a second step: the mutual recognition process. For the DCP, the applicant will approach all chosen member states at the same time. To do so, the applicant will identify the RMS that will assess the submitted MAA and provide the other selected member states with the conclusions and results of the assessment.

The European Union medicines rules expressly permit the EU Member States to adopt national legislation prohibiting or restricting the sale, supply or use of any medicinal product containing, consisting of or derived from a specific type of human or animal cell, such as embryonic stem cells. While the products we have in development do not make use of embryonic stem cells, it is possible that the national laws in certain EU Member States may prohibit or restrict us from commercializing our products, even if they have been granted an EU marketing authorization.

An innovator company enjoys a period of “data exclusivity” during which their pre-clinical and clinical trials data may not be referenced in the regulatory filings of another company (typically a generic company) for the same drug substance.

Data exclusivity in Europe is 8 years from the date of first authorization in Europe with an additional period of 2 years of “market exclusivity.” This is the period of time during which a generic company may not market an equivalent generic version of the originator’s pharmaceutical product. An additional 1 year may be obtained where the innovator company is granted a marketing authorization within the above 8-year period for a significant new indication for the relevant medicinal product.

The Pediatric Regulation provides that an application for a new marketing authorization must include the results of all trials performed and details of all information collected in compliance with an agreed pediatric investigation plan, or PIP, unless a deferral or waiver applies on the basis that pediatric use is not relevant - also the requirement can be deferred by agreement.

When the application for marketing authorization is made, the competent authority responsible for granting a marketing authorization must verify whether the application complies with the relevant requirements, including compliance with the agreed PIP. Assuming it does, the marketing authorization may be granted and the relevant results are included in the summary of product characteristics, or SmPC, for the product, along with a statement indicating compliance with the agreed PIP. The applicant then receives the six month extension to the SPC. It is not necessary for the product actually to be indicated for use in the pediatric population (for example, if the results show that that would not be appropriate).

U.S. FDA Approval Process

In the United States, pharmaceutical products are subject to extensive regulation by the FDA. The Federal Food, Drug, and Cosmetic Act, or the FDCA, and other federal and state statutes and regulations, govern, among other things, the research, development, testing, manufacture, packaging, storage, recordkeeping, approval, labeling, advertising, promotion and marketing, distribution, post-approval monitoring and reporting, sampling, and import and export of pharmaceutical products. MIN-301, a peptide, may be regulated as a biologic and additionally subject to the Public Health Service Act. Failure to comply with applicable U.S. requirements may subject a company to a variety of administrative or judicial sanctions, such as FDA refusal to allow pending Investigational New Drug Applications, or INDs, and approve NDAs, withdrawal of a marketing approval, imposition of clinical holds or termination of clinical trials, or issuance of Warning or Untitled Letters, product recalls, product seizures, refusal to allow imports or exports total or partial suspension of production or distribution, debarment, injunctions, fines, refusal of government contracts, exclusion from participation in federal and state healthcare programs, restitution, disgorgement, civil penalties and criminal prosecution, including criminal fines and imprisonment.

FDA approval is required before any new unapproved drug or dosage form, including a new use of a previously approved drug, can be marketed in the United States. Pharmaceutical product development in the United States typically involves, among other things, pre-clinical laboratory and animal tests, the submission to the FDA of an IND, which must become effective before clinical testing may commence, and adequate and well-controlled clinical trials to establish the safety and effectiveness of the drug for each indication for which FDA approval is sought. Satisfaction of FDA pre-market approval requirements typically takes many years and significant financial investment, and the actual time and cost required may vary substantially based upon the type, complexity and novelty of the product or disease indicated for treatment.

Pre-clinical tests include laboratory evaluation of product chemistry, pharmacology, stability, formulation and toxicity, as well as animal trials to assess the characteristics and potential safety and efficacy of the product. The conduct of the preclinical tests must comply with federal regulations and requirements including good laboratory practices. The results of pre-clinical testing are submitted to the FDA as part of an IND along with other information including information about product chemistry, manufacturing and controls, any available clinical data or literature, and a proposed clinical trial protocol, among other items. Certain pre-clinical tests, such as animal tests of reproductive toxicity and carcinogenicity, may be conducted after the IND is submitted. A 30-day waiting period after the submission of each IND is required prior to the commencement of clinical testing in humans. If the FDA has not placed a clinical hold on the IND within this 30-day period, the clinical trial proposed in the IND may begin. Should FDA place a clinical hold on the IND, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial may begin.

Clinical trials involve the administration of the investigational new drug to human subjects under the supervision of a qualified investigator. Clinical trials must be conducted in compliance with federal regulations, good clinical practices, or GCP, which include the ethical principles that all research subjects provide their informed consent in writing for their participation in any clinical trial, and that all trials be approved and monitored on an ongoing basis by an institutional review board, or IRB. Clinical trials must also be conducted under protocols detailing the objectives of the trial, trial procedures, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated, and a statistical analysis plan. Each protocol involving testing in U.S. subjects and subsequent protocol amendments must be submitted to the FDA as part of the IND. The study protocol and informed consent information for subjects in clinical trials, along with all amendments, must also be submitted to an IRB for approval.

Clinical trials to support NDAs for marketing approval are typically conducted in three sequential phases, but the phases may overlap. In Phase 1, the initial introduction of the drug into healthy human subjects or subjects with the target disease or condition, the drug is tested to assess safety, metabolism, pharmacokinetics, pharmacological actions, side effects associated with increasing doses and, if possible, early evidence of effectiveness. Phase 2 usually involves trials in a limited subject population with the target disease or condition to evaluate the effectiveness of the drug for a particular indication or indications, dosage tolerance and optimum dosage, and identify possible adverse effects and safety risks. If a compound demonstrates evidence of effectiveness and an acceptable safety profile in Phase 2 evaluations, generally two adequate and well-controlled Phase 3 trials are undertaken to obtain additional information about clinical efficacy and safety in a larger number of subjects, typically at geographically dispersed clinical trial sites, to establish the overall benefit-risk relationship of the drug and to provide adequate information for the labeling of the drug. In some cases, the FDA may condition approval on the sponsor's agreement to conduct additional clinical trials to further assess the drug's safety and effectiveness after approval. Such post-approval trials are typically referred to as Phase 4 trials. Progress reports detailing the results of the clinical trials must be submitted at least annually to the FDA and more frequently if serious adverse events occur. Information about certain clinical trials, including a description of the study and study results must also be submitted within specific timeframes to the National Institutes of Health, or NIH, for public dissemination on their clinicaltrials.gov website.

The manufacture of investigational drugs for the conduct of human clinical trials is subject to the Current Good Manufacturing Practices, or cGMPs. Investigational drugs and active pharmaceutical ingredients imported into the United States are also subject to regulation by FDA relating to their labeling and distribution. Further, the export of investigational drug products outside of the United States is subject to regulatory requirements of the receiving country as well as United States export requirements.

The FDA may suspend or terminate a clinical trial, or impose other sanctions, at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk or if it believes that the clinical trials are not being conducted in accordance with FDA requirements. 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 subjects, or may impose other conditions on the conduct of the research. 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 regularly reviews accumulated data and advises the study sponsor regarding the continuing safety of trial subjects, potential trial subjects, and the continuing validity and scientific merit of the clinical trial. Sponsors may also suspend or terminate a clinical trial based on safety concerns, a lack of evidence of drug efficacy, evolving business objectives and/or competitive climate.

After completion of the required clinical testing, an NDA is prepared and submitted to the FDA. FDA approval of the NDA is required before marketing of the product may begin in the United States. The NDA must include the results of all pre-clinical, clinical and other testing and a compilation of data relating to the product's pharmacology, chemistry, manufacture and controls, and proposed labeling, among other things. Under federal law, the submission of most marketing applications is subject to a substantial application user fee, and the sponsor of an approved application is also subject to annual program fees.

In addition, under the Pediatric Research Equity Act, or PREA, a marketing application or supplement to a marketing application for a new active ingredient, indication, dosage form, dosage regimen or route of administration must contain data that are adequate to assess the safety and effectiveness of the drug for the claimed indications in all relevant pediatric subpopulations, and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults, or full or partial waivers from the pediatric data requirements.

The FDA also may require submission of a risk evaluation and mitigation strategy, or REMS, either during the application process or after the approval of the drug to mitigate any identified or suspected serious risks, and to identify any new risks that were not apparent in clinical investigations. The REMS plan could include medication guides, physician communication plans, assessment plans, and elements to assure safe use, such as restricted distribution methods, patient registries or other risk minimization tools.

The FDA has 60 days from its receipt of an NDA to determine whether the application will be accepted for filing based on the agency's threshold determination that it is sufficiently complete to permit substantive review. Once the submission is accepted for filing, the FDA begins an in-depth review. The FDA reviews an NDA to determine, among other things, whether the drug is safe and effective and whether the facility in which it is manufactured, processed, packaged or held meets standards designed to assure the product's continued safety, quality and purity.

Under the Prescription Drug User Fee Act the FDA has agreed to certain performance goals in the review of NDAs. The FDA has a goal of reviewing ninety percent of applications for non-priority drug products within 10 months of the FDA's acceptance of the full application for filing. The review process may be extended by the FDA under certain circumstances.

Under the FDCA and FDA guidance, before approving a drug for which no active ingredient (including any ester or salt of the active ingredients) has previously been approved by the FDA or a first-of-a-kind, first-in-class biologic, FDA must either refer that drug to an external advisory committee or provide in an action letter, a summary of the reasons why FDA did not refer the drug to an advisory committee. The external advisory committee review may also be required for other drugs because of certain other issues, including clinical trial design, safety and effectiveness, and public health questions. An advisory committee is a panel of independent experts, including clinicians and other experts, for review, evaluation and a recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions.

Additionally, the FDA will inspect the facility or the facilities at which the drug is manufactured. The FDA will not approve the product unless the facility, and all of its subcontractors and contract manufacturers, demonstrate compliance with cGMPs, and provide adequate assurance that they can consistently produce the product within required specifications, and the NDA contains data that provides substantial evidence that the drug is safe and effective for the indication sought in the proposed labeling. Additionally, the FDA will typically inspect one or more clinical trial sites to assure compliance with GCPs before approving a marketing application. After the FDA evaluates the marketing application and the manufacturing facilities, it may issue an approval letter, or a complete response letter. A complete response letter generally outlines the deficiencies in the submission and may require substantial additional testing or information in order for the FDA to reconsider the application. Even with submission of this additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval. If and when those deficiencies have been addressed to the FDA's satisfaction in a resubmission of the NDA, the FDA may issue an approval letter.

An approval letter authorizes commercial marketing of the drug with specific prescribing information for specific indications. As a condition of NDA approval, the FDA may require substantial post-approval testing and surveillance to monitor the drug's safety or efficacy and may impose other conditions, including labeling restrictions, limitations on the approved indications, contraindications, warnings or precautions, such as black boxed warnings, distribution restrictions or other risk-management mechanisms under a REMS which can materially affect the potential market and profitability of the drug. The FDA may prevent or limit further marketing of a product based on the results of post-marketing trials or surveillance programs. Further, if there are any modifications to the drug, including changes in indications, labeling, manufacturing processes or facilities, or new safety issues arise, a new or supplemental NDA or a post-implementation notification or other report may be required or requested depending on the change, which may require additional data or additional pre-clinical studies and clinical trials. Once granted, product approvals may be withdrawn if compliance with regulatory standards is not maintained or problems are identified following initial marketing.

Post-Approval Requirements

Drugs manufactured or distributed pursuant to FDA approvals are subject to pervasive and continuing regulation by the FDA, including, among other things, requirements relating to recordkeeping, periodic reporting, product sampling and distribution, advertising and promotion, and reporting of adverse experiences with the product and drug shortages. After approval, most changes to the approved product, such as adding new indications, manufacturing changes or other labeling claims, are subject to further testing requirements and prior FDA review and approval.

In addition, drug manufacturers and other entities involved in the manufacture and distribution of approved drugs are subject to periodic announced and unannounced inspections by the FDA and these state agencies for compliance with cGMP and other regulatory requirements. Changes to the manufacturing process are strictly regulated and may require prior FDA approval or notification before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP and impose reporting and documentation requirements upon the sponsor and any third-party manufacturers that the sponsor may decide to use.

Once an approval is granted, the FDA may withdraw the approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market.

Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in mandatory revisions to the approved labeling to add new safety information; imposition of post-market trials or clinical trials to assess new safety risks; or imposition of distribution or other restrictions under a REMS program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- fines, Untitled Letters, Warning Letters or holds on post-approval clinical trials;
- refusal of the FDA to approve pending NDAs or supplements to approved NDAs, or suspension or revocation of product license approvals;
- product seizure or detention, or refusal to permit the import or export of products; or
- injunctions or the imposition of administrative civil or criminal penalties, including fines and imprisonment.

The FDA strictly regulates marketing, labeling, advertising and promotion of products that are placed on the market. Although physicians, in the practice of medicine, may prescribe approved drugs for unapproved indications if in their professional medical judgment they believe it to be appropriate, pharmaceutical companies may only market and promote their drug products for the FDA approved indications and in accordance with the provisions of the approved label. The FDA and other agencies actively enforce the laws prohibiting the marketing and promotion of off-label uses, and a company that is found to have improperly marketed or promoted off-label uses may be subject to significant liability, including, among others, criminal and civil penalties under the FDCA and False Claims Act, exclusion from participation in federal healthcare programs, and mandatory compliance programs.

In addition, the distribution of prescription pharmaceutical products is subject to the Prescription Drug Marketing Act, or PDMA, which regulates the distribution of drugs and drug samples at the federal level, and sets minimum standards for the registration and regulation of drug distributors by the states. Both the PDMA and state laws limit the distribution of prescription pharmaceutical product samples and impose requirements to ensure accountability in distribution.

Moreover, the Drug Quality and Security Act imposes obligations on manufacturers of pharmaceutical products, among others, related to product and tracking and tracing.

In the European Union, holders of a marketing authorization must establish and maintain a pharmacovigilance system and appoint an individual qualified person for pharmacovigilance, or QPPV, who is responsible for oversight of that system. Key obligations include expedited reporting of suspected serious adverse reactions and submission of periodic safety update reports, or PSURs.

All new European marketing authorization applications must include a risk management plan, or RMP, describing the risk management system that the company will put in place and documenting measures to prevent or minimize the risks associated with the product. The regulatory authorities may also impose specific obligations as a condition of the marketing authorization. Such risk-minimization measures or post-authorization obligations may include additional safety monitoring, more frequent submission of PSURs, or the conduct of additional clinical trials or post-authorization safety studies. RMPs and PSURs are routinely available to third parties requesting access, subject to limited redactions. All advertising and promotional activities for the product must be consistent with the approved summary of product characteristics, and therefore all off-label promotion is prohibited. Direct-to-consumer advertising of prescription medicines is also prohibited in the European Union. Although general requirements for advertising and promotion of medicinal products are established under EU directives, the details are governed by regulations in each EU Member State and can differ from one country to another.

Federal and State Fraud and Abuse, Data Privacy and Security and Transparency Laws

In addition to FDA restrictions on marketing and promotion of pharmaceutical products, other federal and state healthcare laws restrict business practices in the biopharmaceutical industry. These laws include, without limitation, state and federal anti-kickback and false claims laws, data privacy and security laws, as well as transparency laws regarding payments or other items of value provided to healthcare providers. Applicable state anti-kickback and false claims laws may be broader in scope than federal law and may apply regardless of payor, in addition to items and services reimbursed under Medicaid and other state programs.

We may also be subject to 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 the Health Insurance and Portability and Accountability Act (“HIPAA”), thus complicating compliance efforts. In addition, we may be subject to reporting requirements under state transparency laws, as well as state laws that require pharmaceutical companies to comply with the industry’s voluntary compliance guidelines and the applicable compliance guidance promulgated by the federal government that otherwise restricts certain payments that may be made to healthcare providers and entities.

If our operations are found to be in violation of any of the health regulatory laws described above or any other laws that apply to us, we may be subject to penalties, including potentially significant criminal and civil and/or administrative penalties, damages, fines, disgorgement, individual imprisonment, exclusion from participation in government healthcare programs, contractual damages, reputational harm, administrative burdens, diminished profits and future earnings, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, and the curtailment or restructuring of our operations, any of which could adversely affect our ability to operate our business and our results of operations. To the extent that any of our products are sold in a foreign country, we may be subject to similar foreign laws.

Coverage and Reimbursement

The commercial success of our product candidates and our ability to commercialize any approved product candidates successfully will depend in part on the extent to which governmental authorities, private health insurers and other third-party payors provide coverage for and establish adequate reimbursement levels for our product candidates, once approved.

Government health administration authorities, private health insurers and other third-party payors generally decide which drugs they will pay for and establish reimbursement levels for healthcare. In particular, in the United States, private health insurers and other third-party payors often provide reimbursement for products and services based on the level at which the government (through the Medicare or Medicaid programs) provides reimbursement for such treatments. Sales of our product candidates will therefore depend substantially, both domestically and abroad, on the extent to which the costs of our product candidates will be covered by third-party payors. The market for our product candidates will depend significantly on access to third-party payors’ formularies without prior authorization, step therapy, or other limitations such as approved lists of treatments for which third-party payors provide coverage and

reimbursement. Also, third-party payors are developing increasingly sophisticated methods of controlling healthcare costs. Coverage and reimbursement for therapeutic products can differ significantly from payor to payor. A third-party payor's decision to provide coverage for a medical product or service does not imply that an adequate reimbursement rate will be approved. One third-party payor's decision to cover a particular medical product or service does not ensure that other payors will also provide coverage for the medical product or service, or will provide coverage at an adequate reimbursement rate. As a result, the coverage determination process will require us to provide scientific and clinical support for the use of our products to each payor separately, with no assurance that adequate coverage and reimbursement will be obtained.

In the United States, the European Union and other potentially significant markets for our product candidates, government authorities and other third-party payors are developing increasingly sophisticated methods of controlling healthcare costs and are increasingly imposing additional requirements and restrictions on coverage.

Further, the increased emphasis on managed healthcare in the United States and on country and regional pricing and reimbursement controls in the European Union will put additional pressure on product pricing, reimbursement and utilization, which may adversely affect our future product sales and results of operations. These pressures can arise from rules and practices of managed care organizations, competition within therapeutic classes, availability of generic equivalents or biosimilars, judicial decisions and governmental laws related to Medicare, Medicaid and healthcare reform, pharmaceutical coverage and reimbursement policies and pricing in general. The cost containment measures that healthcare payors and providers are instituting and the effect of any healthcare reform implemented in the future could significantly reduce our revenues from the sale of any approved product candidates. We cannot provide any assurances that we will be able to obtain and maintain governmental or private third-party coverage or adequate reimbursement for our product candidates in whole or in part.

Additionally, there has been increasing legislative and enforcement interest in the United States with respect to specialty drug pricing practices. Specifically, there have been several recent U.S. congressional inquiries and proposed federal and proposed and enacted state legislation designed to, among other things, bring more transparency to drug pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drugs. At the federal level, Congress and the Trump administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. At the state level, legislatures are increasingly passing legislation and implementing regulations designed to control pharmaceutical and biological product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing.

Healthcare Reform

The United States and some foreign jurisdictions are considering enacting or have enacted a number of additional legislative and regulatory proposals designed to change the healthcare system in ways that could affect our ability to sell our products profitably.

In the United States, the pharmaceutical industry has been a particular focus of these efforts and has been significantly affected by major legislative initiatives, including the Patient Protection and Affordable Care Act of 2010, as amended by the Health Care and Education Reconciliation Act of 2010, or collectively, the ACA, which substantially changed healthcare financing and delivery by both governmental and private insurers, and significantly impacted the pharmaceutical industry. The ACA contains provisions that may potentially reduce the profitability of products, including, for example, increased rebates for products sold to Medicaid programs, extension of Medicaid rebates to Medicaid managed care plans, mandatory discounts for certain Medicare Part D beneficiaries and annual fees based on pharmaceutical companies' share of sales to federal health care programs. There have been judicial and congressional challenges to the ACA, as well as efforts by the Trump administration to repeal or replace certain aspects of the ACA. Since January 2017, President Trump has signed two Executive Orders designed to delay the implementation of certain provisions of the ACA or otherwise circumvent some of the requirements for health insurance mandated by the ACA. While Congress has not passed comprehensive repeal legislation, two bills affecting the implementation of certain taxes under the ACA have been signed into law, including the repeal, effective January 1, 2019, of 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" and delays in the implementation of the so-called "Cadillac" tax on certain high cost employer-sponsored insurance plans, the annual fee imposed on certain health insurance providers based on market share, and the medical device excise tax on imposed on certain non-exempt medical devices. Further, the Bipartisan Budget Act of 2018, or the BBA, among other things, amends the ACA, effective January 1, 2019, to increase from 50% to 70% the point-of-sale discount that is owed by pharmaceutical manufacturers who participate in Medicare Part D and to close the coverage gap in most Medicare drug plans, commonly referred to as the "donut hole." More recently, in July 2018, CMS published a final rule permitting further collections and payments to and from certain ACA qualified health plans and health insurance issuers under the ACA adjustment program in response to the outcome of federal district court litigation regarding the method CMS uses to determine this risk adjustment. Congress could still consider other legislation to repeal or repeal and replace all or portions of the ACA. Additionally, on December 14, 2018, a Texas U.S. District Court Judge ruled

that the ACA is unconstitutional in its entirety because the “individual mandate” was repealed by Congress as part of the Tax Act. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA. We expect that healthcare reform measures that may be adopted in the future may result in more rigorous coverage criteria and lower reimbursement, and in additional downward pressure on the price that may be charged for any of our product candidates, if approved.

The Foreign Corrupt Practices Act

The Foreign Corrupt Practices Act, or the FCPA, prohibits any U.S. individual or business from paying, offering, or authorizing payment or offering of anything of value, directly or indirectly, to any foreign official, political party or candidate for the purpose of influencing any act or decision of the foreign entity in order to assist the individual or business in obtaining or retaining business. The FCPA also obligates companies whose securities are listed in the United States to comply with accounting provisions requiring the company to maintain books and records that accurately and fairly reflect all transactions of the corporation, including international subsidiaries, and to devise and maintain an adequate system of internal accounting controls for international operations. Activities that violate the FCPA, even if they occur wholly outside the United States, can result in criminal and civil fines, imprisonment, disgorgement, oversight, and debarment from government contracts.

Brexit and the Regulatory Framework in the United Kingdom

On June 23, 2016, the electorate in the United Kingdom voted in favor of leaving the European Union, commonly referred to as “Brexit” and the United Kingdom officially withdrew from the European Union on January 31, 2020. The United Kingdom and the European Union are currently in a transition period during which the United Kingdom and the European Union are negotiating additional arrangements, including their future trading arrangement. The United Kingdom has stated that it wants the transition period to expire, and the future trading terms to be agreed, by December 31, 2020. Since the regulatory framework for pharmaceutical products in the United Kingdom covering quality, safety and efficacy of pharmaceutical products, clinical trials, marketing authorization, commercial sales and distribution of pharmaceutical products is derived from European Union directives and regulations, immediately following Brexit, it is expected that the United Kingdom’s regulatory regime will remain aligned to European regulations. It remains to be seen how, if at all, Brexit will impact regulatory requirements for product candidates and products in the United Kingdom. In the longer term, Brexit could materially impact the future regulatory regime which applies to products and the approval of product candidates in the United Kingdom.

Employees

As of December 31, 2019, we had 13 full-time employees. In addition, we are or have engaged with a number of consultants and companies, including Pharma Partnering in Research & Strategy SAS, or PPRS, that provide expertise in the key functions involved with the development of our products. None of our employees is subject to a collective bargaining agreement and we consider our relationship with our employees to be good.

Available Information

We file reports with the Securities and Exchange Commission (“SEC”), including annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K any other filings required by the SEC. We make available on our website (www.minervaneurosciences.com) our annual report on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and all amendments to those reports as soon as reasonably practicable after such material is electronically filed with or furnished to the SEC. These materials are available free of charge on or through our website via the Investor Relations page at www.minervaneurosciences.com. References to our website address in this report are intended to be inactive textual references only, and none of the information contained on our website is part of this report or incorporated in this report by reference.

The SEC maintains an Internet site (<http://www.sec.gov>) that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC.

ITEM 1A. Risk Factors

This Annual Report on Form 10-K contains forward-looking information based on our current expectations. Because our actual results may differ materially from any forward-looking statements that we make or that are made on our behalf, this section includes a discussion of important factors that could affect our actual future results, including, but not limited to, our capital resources, the progress and timing of our clinical programs, the safety and efficacy of our product candidates, risks associated with regulatory filings, risks associated with determinations made by regulatory agencies, the potential clinical benefits and market potential of our product candidates, commercial market estimates, future development efforts, patent protection, effects of healthcare reform, reliance on third parties, and other risks set forth below.

Risks Related to Our Financial Position and Capital Requirements

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

We are a clinical development-stage biopharmaceutical company. In November 2013, we merged with Sonkei Pharmaceuticals, Inc., or Sonkei, and, in February 2014, we acquired Mind-NRG, which were also clinical development-stage biopharmaceutical companies. Investment in biopharmaceutical product development is highly speculative because it entails substantial upfront capital expenditures and significant risk that any potential product candidate will fail to demonstrate adequate effect or an acceptable safety profile, gain regulatory approval or become commercially viable. As an early stage company, we have limited experience and have not yet demonstrated an ability to successfully overcome many of the risks and uncertainties frequently encountered by companies in new and rapidly evolving fields, particularly the biopharmaceutical area. We have no products approved for commercial sale and have not generated any revenue from product sales to date, and we continue to incur significant research and development and other expenses related to our ongoing operations.

We are not profitable and have incurred losses in each period since our inception in 2007. For the year ended December 31, 2019, and 2018, we reported net losses of \$72.2 million and \$50.2 million, respectively. As of December 31, 2019, we had an accumulated deficit of \$286.7 million.

We expect to continue to incur significant losses for the foreseeable future, and we expect these losses to increase as we continue our research and development of, and seek regulatory approvals for, our product candidates. If any of our product candidates fail in clinical trials or do not gain regulatory approval, or if any of our product candidates, if approved, fail to achieve market acceptance, we may never generate revenue or become profitable. Even if we achieve profitability in the future, we may not be able to sustain profitability in subsequent periods. We may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business. The size of our future net losses will depend, in part, on the rate of future growth of our expenses and our ability to generate revenues. Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital.

We will require additional capital to finance our operations, which may not be available to us on acceptable terms, or at all. As a result, we may not complete the development and commercialization of our product candidates or develop new product candidates.

Our operations and the historic operations of Sonkei and Mind-NRG have consumed substantial amounts of cash since inception. We expect our research and development expenses to increase substantially in connection with our ongoing activities to develop and commercialize products.

As of December 31, 2019, we had cash, cash equivalents, restricted cash, and marketable securities of \$46.0 million. We believe that our existing cash, cash equivalents, restricted cash, and marketable securities will be sufficient to meet our cash commitments for at least the next 12 months after the date that the year-end condensed financial statements are issued. The process of drug development can be costly and the timing and outcomes of clinical trials is uncertain. The assumptions upon which we have based our estimates are routinely evaluated and may be subject to change. The actual amount of our expenditures will vary depending upon a number of factors including but not limited to the design, timing and duration of future clinical trials, the progress of our research and development programs, the infrastructure to support a commercial enterprise, the cost of a commercial product launch, and the level of financial resources available.

Our future funding requirements, both short and long-term, will depend on many factors, including:

- the initiation, progress, timing, costs and results of pre-clinical studies and clinical trials for our product candidates and future product candidates we may develop;
- the outcome, timing and cost of seeking and obtaining regulatory approvals from the EMA, FDA, and comparable foreign regulatory authorities, including the potential for such authorities to require that we perform more studies than those that we currently expect;
- the cost to establish, maintain, expand and defend the scope of our intellectual property portfolio, including the amount and timing of any payments we may be required to make, or that we may receive, in connection with licensing, preparing, filing, prosecution, defense and enforcement of any patents or other intellectual property rights;
- the effect of competing technological and market developments;
- market acceptance of any approved product candidates;
- the costs of acquiring, licensing or investing in additional businesses, products, product candidates and technologies; and
- the cost of establishing sales, marketing and distribution capabilities for our product candidates for which we may receive regulatory approval and that we determine to commercialize ourselves or in collaboration with our partners.

When we need to secure additional financing, such additional fundraising efforts may divert our management from our day-to-day activities, which may adversely affect our ability to develop and commercialize our product candidates. In addition, we cannot guarantee that future financing will be available in sufficient amounts or on terms acceptable to us, if at all. If we raise additional equity financing, our stockholders may experience significant dilution of their ownership interests, and the per-share value of our common stock could decline. If we engage in debt financing, we may be required to accept terms that restrict our ability to incur additional indebtedness and force us to maintain specified liquidity or other ratios. Further, the evolving and volatile global economic climate and global financial market conditions could limit our ability to raise funding and otherwise adversely impact our business or those of our collaborators and providers. If we are unable to raise additional capital in sufficient amounts or on terms acceptable to us we may have to significantly delay, scale back or discontinue the development or commercialization of one or more of our product candidates. Any of these events could significantly harm our business, financial condition and prospects.

Changes in estimates regarding fair value of intangible assets may result in an adverse impact on our results of operations.

We test goodwill and in-process research and development for impairment annually or more frequently if changes in circumstances or the occurrence of events suggest impairment exists. The test for impairment of in-process research and development requires us to make several estimates about fair value, most of which are based on projected future cash flows. Changes in these estimates may result in the recognition of an impairment loss in our results of operations. An impairment analysis is performed whenever events or changes in circumstances indicate that the carrying amount of any individual asset may not be recoverable. For example, if we or our counterparties fail to perform our respective obligations under an agreement, or if we lack sufficient funding to develop our product candidates, an impairment may result. In addition, any significant change in market conditions, estimates or judgments used to determine expected future cash flows that indicate a reduction in carrying value may give rise to impairment in the period that the change becomes known.

The recently passed comprehensive tax reform bill could adversely affect our business and financial condition.

On December 22, 2017, President Trump signed into law new legislation that significantly revises the Internal Revenue Code of 1986, as amended (the "Code"). The newly enacted federal income tax law, among other things, contains significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense to 30% of adjusted earnings (except for certain small businesses), limitation of the deduction for net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks, one time taxation of offshore earnings at reduced rates regardless of whether they are repatriated, elimination of U.S. tax on foreign earnings (subject to certain important exceptions), immediate deductions for certain new investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits. Notwithstanding the reduction in the corporate income tax rate, the overall impact of the new federal tax law is uncertain and our business and financial condition could be adversely affected. In addition, it is uncertain if and to what extent various states will conform to the newly enacted federal tax law.

We plan to use potential future operating losses and our federal and state net operating loss, or NOL, carryforwards to offset taxable income from revenue generated from operations or corporate collaborations. However, our ability to use existing NOL carryforwards may be limited as a result of issuance of equity securities.

As of December 31, 2019, we had approximately \$75.9 million of Federal NOL carryforwards. These Federal NOL carryforwards will begin to expire at various dates beginning in 2027, if not utilized. Under the newly enacted Federal income tax law, Federal NOLs incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such Federal NOLs is limited. We plan to use our operating losses to offset any potential future taxable income generated from operations or collaborations. To the extent we generate taxable income, we plan to use our existing NOL carryforwards and future losses to offset income that would otherwise be taxable. If substantial changes in ownership have occurred, there could be annual limitations on the amount of carryforwards that can be realized in future periods. We have not performed a detailed analysis to determine whether an ownership change occurred upon consummation of the merger between us and Sonkei, upon the acquisition of Mind-NRG or our initial public offering, the concurrent private placements or our subsequent public offerings. However, as a result of these transactions, it is likely that an ownership change has occurred. Therefore, it is likely that some or all of our existing NOL carryforwards would be limited by the provisions of Section 382 of the Code. Further, state NOL carryforwards may be similarly limited. We had approximately \$71.6 million of state net operating carryforwards at December 31, 2019. It is also possible that future changes in ownership, including as a result of subsequent sales of securities by us or our stockholders, could similarly limit our ability to utilize NOL carryforwards. It is possible that all of our existing NOL carryforwards have been or will be disallowed. Any such disallowances may result in greater tax liabilities than we would incur in the absence of such a limitation and any increased liabilities could adversely affect our business, results of operations, financial condition and cash flow.

Risks Related to Our Business and Industry

We cannot give any assurance that any of our product candidates will receive regulatory approval in a timely manner or at all, which is necessary before they can be commercialized.

The regulatory approval process is expensive and the time required to obtain approval from the EMA, FDA or other regulatory authorities in other jurisdictions to sell any product is uncertain and may take years.

Whether regulatory approval will be granted is unpredictable and depends upon numerous factors, including the substantial discretion of the regulatory authorities. Moreover, the filing of a marketing application, including a New Drug Application (“NDA”), or Biologics License Application, or BLA, requires a payment of a significant user fee upon submission. The filing of marketing applications for our product candidates may be delayed due to our lack of financial resources to pay such user fee.

If, following submission, our application is not accepted for substantive review or approval, the EMA, FDA or other comparable foreign regulatory authorities may require that we conduct additional clinical or pre-clinical trials, provide additional data, manufacture additional validation batches or develop additional analytical tests methods before they will reconsider our application. If the EMA, FDA or other comparable foreign regulatory authorities requires additional studies or data, we would incur increased costs and delays in the marketing approval process, which may require us to expend more resources than we have available. In addition, the EMA, FDA or other comparable foreign regulatory authorities may not consider any additional required trials, data or information that we perform or provide to be sufficient, or we may decide, or be required, to abandon the program.

Moreover, policies, regulations, or the type and amount of pre-clinical and clinical data necessary to gain approval may change during the course of a product candidate’s clinical development and may vary among jurisdictions. It is possible that none of our existing product candidates or any of our future product candidates will ever obtain regulatory approval, even if we expend substantial time and resources seeking such approval.

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

- The EMA, FDA or other regulatory authorities may disagree with the design or implementation of our clinical trials. We have not yet consulted with the EMA or the FDA on the design and conduct of the clinical trials that have already been conducted or that we intend to conduct. Thus, the EMA, FDA and other comparable foreign authorities may not agree with the design or implementation of these trials. We intend to seek guidance from the EMA in relation to the European Union clinical trial program and the FDA on the design and conduct of clinical trials of our compounds when we initiate a clinical program in the United States in the future.
- We may be unable to demonstrate to the satisfaction of the EMA, FDA or other regulatory authorities that a product candidate is safe and effective for its proposed indication.

- The results of clinical trials may not meet the level of statistical significance required by the EMA, FDA or other regulatory authorities for approval.
- We may be unable to demonstrate that a product candidate's clinical and other benefits outweigh any safety risks.
- The EMA, FDA or other regulatory authorities may disagree with our interpretation of data from pre-clinical studies or clinical trials.
- The data collected from clinical trials of our product candidates may not be sufficient to support an NDA or other submission or to obtain regulatory approval in the United States or elsewhere.
- The EMA, FDA or other regulatory authorities may fail to approve the manufacturing processes or facilities of third-party manufacturers with which we contract for clinical and commercial supplies.
- The approval policies or regulations of the EMA, FDA or other regulatory authorities may significantly change in a manner rendering our clinical data insufficient for approval.

Even if we obtain approval for a particular product, regulatory authorities may approve that product for fewer or more limited indications, including more limited patient populations, than we request, may require that contraindications, warnings, or precautions be included in the product labeling, including a black box warning, may grant approval contingent on the performance of costly post-marketing clinical trials or other post-market requirements, including risk evaluation and mitigation strategies, or REMS, or may approve a product candidate with a label that does not include the labeling claims necessary or desirable for the successful commercialization of that product. Any of the foregoing could materially harm the commercial prospects for our product candidates.

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

The results of pre-clinical studies and early clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials. Interpretation of results from early, usually smaller, trials that suggest positive trends in some subjects, require caution. Results from later stages of clinical trials enrolling more subjects may fail to show the desired safety and efficacy results or otherwise fail to be consistent with the results of earlier trials of the same product candidate. This may occur for a variety of reasons, including differences in trial design, trial endpoints (or lack of trial endpoints in exploratory studies), subject population, number of subjects, subject selection criteria, trial duration, drug dosage and formulation or due to the lack of statistical power in the earlier trials. A number of companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in advanced clinical trials due to lack of efficacy or unacceptable safety profiles, notwithstanding promising results in earlier trials.

The results of clinical trials conducted at sites outside the United States may not be accepted by the FDA and the results of clinical trials conducted at sites in the United States may not be accepted by international regulatory authorities.

We plan to conduct our clinical trials outside the United States. Although the FDA may accept data from clinical trials conducted outside the United States, acceptance of this data would be subject to certain conditions imposed by the FDA. For example, the clinical trial must be well-designed and conducted and performed by qualified investigators in accordance with ethical safeguards such as institutional review board, or IRB, or ethics committee approval and informed consent. The study population must also adequately represent the applicable United States population, and the data must be applicable to the American population and medical practice in ways that the FDA deems clinically meaningful. In addition, while clinical trials conducted outside of the United States are subject to the applicable local laws, FDA acceptance of the data from such trials will be dependent upon its determination that the trials were conducted consistent with all applicable United States laws and regulations. There can be no assurance the FDA will accept data from trials conducted outside of the United States as adequate support of a marketing application, and it is not unusual for the FDA to require some Phase 3 clinical trial data to be generated in the United States. If the FDA does not accept the data from our international clinical trials, it would likely result in the need for additional trials in the United States, which would be costly and time-consuming and could delay or permanently halt the development of one or more of our product candidates.

If we experience delays in clinical testing, we will be delayed in commercializing our product candidates, our costs may increase and our business may be harmed.

We do not know whether our clinical trials will be completed on schedule, or at all. Our product development costs will increase if we experience delays in clinical testing. Significant clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize our product candidates or allow our competitors to bring products to market before we do, which would impair our ability to successfully commercialize our product candidates and may harm our business, results of operations and prospects.

The commencement and completion of clinical development can be delayed or halted for a number of reasons, including:

- difficulties obtaining regulatory approval to commence a clinical trial or complying with conditions imposed by a regulatory authority regarding the scope or term of a clinical trial;
- delays in reaching or failure to reach agreement on acceptable terms with prospective clinical research organizations, or CROs, and trial sites, which can be subject to extensive negotiation and may vary significantly among different CROs and trial sites;
- deviations from the trial protocol by clinical trial sites and investigators, or failing to conduct the trial in accordance with regulatory requirements;
- failure of our third parties, such as CROs, to satisfy their contractual duties or meet expected deadlines;
- insufficient or inadequate supply or quantity of product material for use in trials due to delays in the importation and manufacture of clinical supply, including delays in the testing, validation, and delivery of the clinical supply of the investigational drug to the clinical trial sites;
- delays in identification and auditing of central or other laboratories and the transfer and validation of assays or tests to be used;
- delays in having subjects complete participation in a trial or return for post-treatment follow-up;
- difficulties obtaining IRB or ethics committee approval to conduct a trial at a prospective site, or complying with conditions imposed by IRBs or ethics committees;
- challenges recruiting and enrolling subjects to participate in clinical trials for a variety of reasons, including competition from other programs for the treatment of similar conditions;
- severe or unexpected drug-related adverse events experienced by subjects in a clinical trial;
- difficulty retaining subjects who have initiated a clinical trial but may be prone to withdraw due to side effects from the therapy, lack of efficacy or personal issues, which are common among schizophrenia and MDD subjects who we require for our clinical trials of two of our product candidates, roluperidone and MIN-117;
- delays in adding new investigators and clinical sites;
- withdrawal of clinical trial sites from clinical trials;
- lack of adequate funding; and
- clinical holds or termination imposed by the European Union national regulatory authorities, the FDA or IRBs or ethics committees.

Clinical trials may also be delayed as a result of ambiguous or negative interim results. In addition, clinical trials may be suspended or terminated by us, an IRB or ethics committee overseeing the clinical trial at a trial site (with respect to that site), the European Union national regulatory authorities or the FDA due to a number of factors, including:

- failure to conduct the clinical trial in accordance with regulatory requirements, the trial protocols and applicable laws;
- observations during inspection of the clinical trial operations or trial sites by the EMA, FDA or other comparable foreign regulatory authorities that ultimately result in the imposition of a clinical hold;
- unforeseen safety issues; or
- lack of adequate funding to continue the clinical trial.

Failure to conduct a clinical trial in accordance with regulatory requirements, the trial protocols and applicable laws may also result in the inability to use the data from such trial to support product approval. Additionally, changes in regulatory requirements and guidance may occur, and we may need to amend clinical trial protocols to reflect these changes. Amendments may require us to resubmit our clinical trial protocols to the EMA, FDA, IRBs or ethics committees for reexamination, which may impact the costs, timing and successful completion of a clinical trial. Many of the factors that cause, or lead to, a delay in the commencement or completion of a clinical trial may also ultimately lead to the denial of regulatory approval of the associated product candidate. If we experience delays in completion of, or if we terminate any of our clinical trials, our ability to obtain regulatory approval for our product candidates may be materially harmed, and our commercial prospects and ability to generate product revenues will be diminished.

We have no experience in advancing product candidates beyond Phase 2, which makes it difficult to assess our ability to develop and commercialize our product candidates.

We have no experience in progressing clinical trials past Phase 2, obtaining regulatory marketing approvals or commercializing product candidates. We merged with Sonkei and acquired Mind-NRG and have limited operating history since the respective merger and acquisition. We may encounter unforeseen expenses, difficulties, complications, delays and other known or unknown factors in pursuing our business objectives. We expect our financial condition and operating results to continue to fluctuate significantly from quarter to quarter and year to year due to a variety of factors, many of which are beyond our control. Accordingly, you should not rely upon the results of any quarterly or annual periods as indications of future operating performance.

If we are unable to enroll subjects in clinical trials, we will be unable to complete these trials on a timely basis or at all.

The timely completion of clinical trials largely depends on subject enrollment. Many factors affect subject enrollment, including:

- the size and nature of the subject population;
- the number and location of clinical sites we enroll;
- competition with other companies for clinical sites or subjects;
- the eligibility and exclusion criteria for the trial;
- the design of the clinical trial;
- inability to obtain and maintain subject consents;
- risk that enrolled subjects will drop out before completion; and
- clinicians' and subjects' perceptions as to the potential advantages or disadvantages of the drug being studied in relation to other available therapies, including any new drugs that may be approved for the indications we are investigating.

We rely on CROs and clinical trial sites to ensure the proper and timely conduct of our clinical trials in Europe and, we expect, eventually in the United States and, while we have agreements governing their committed activities, we have limited influence over their actual performance. We may also experience difficulties enrolling subjects for our clinical trials relating to roluperidone due to the mental health of the subjects that we will need to enroll, related diagnoses and drop-out rates.

Our clinical trials may fail to demonstrate adequately the safety and efficacy of our product candidates, which could prevent or delay regulatory approval and commercialization, and also increase costs.

Before obtaining regulatory approvals for the commercial sale of our product candidates, we must demonstrate through lengthy, complex and expensive pre-clinical testing and clinical trials that our product candidates are both safe and effective for use in each target indication, and failures can occur at any stage of testing. Clinical trials often fail to demonstrate safety and statistically significant efficacy of the product candidate studied for the target indication in later stages of clinical development. For example, our MIN-117 Phase 2b trial in MDD failed to achieve its primary endpoint and we have decided to discontinue development of MIN-117 for MDD. Furthermore, although we believe our Phase 2b trial with roluperidone met its primary endpoint as we observed the statistically significant benefit of roluperidone over placebo in improving negative symptoms in patients with schizophrenia, our Phase 3 trial with roluperidone, may fail to demonstrate safety and efficacy. Regulatory authorities may find that our studies do not support, in combination with other studies, approval of our product candidates for the target indication. In addition, our product candidates may be associated with undesirable side effects or have characteristics that are unexpected, which may result in abandoning their development or regulatory authorities restricting or denying marketing approval. For instance, prior clinical studies indicated that roluperidone and MIN-117 may cause adverse events, including, but not limited to, dizziness, vital sign changes, central nervous system events, cardiac events, including prolongation of the QT/QTc interval, and gastrointestinal events. Most product candidates that commence clinical trials are never approved by the applicable regulatory authorities.

In the case of our product candidate roluperidone, we are seeking to develop a treatment for schizophrenia, which adds a layer of complexity to our clinical trials and may delay regulatory approval. We do not fully understand the cause and pathophysiology of schizophrenia, and our results will rely on subjective subject feedback, which is inherently difficult to evaluate, can be influenced by factors outside of our control and can vary widely from day to day for a particular subject, and from subject to subject and site to site within a clinical study. The placebo effect may also have a more significant impact on our clinical trials.

If our product candidates are not shown to be both safe and effective in clinical trials, we will not be able to obtain regulatory approval or commercialize our product candidates.

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

Because we have limited financial and management resources, we focus on a limited number of research programs and product candidates. For instance, at the present time we are prioritizing the clinical trials and development of the most advanced of our product candidates, roluperidone. As a result, we may forego or delay pursuit of opportunities with other product candidates, including MIN-117, seltorexant and MIN-301, or for other indications 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 products. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through collaboration, licensing or other arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights.

Even if we complete the necessary clinical trials, we cannot predict when or if we will obtain marketing approval to commercialize a product candidate or the approval may be for a more narrow indication than we expect.

We cannot commercialize a product candidate until the appropriate regulatory authorities have reviewed and approved the product candidate. Even if our product candidates demonstrate safety and efficacy in clinical trials, the regulatory agencies may not complete their review processes in a timely manner, or we may not be able to obtain marketing approval from the relevant regulatory agencies. Additional delays may result if the EMA, FDA, an FDA Advisory Committee, or other regulatory authority recommends non-approval or restrictions on approval. In addition, we may experience delays or rejections based upon additional government regulation from future legislation or administrative action, or changes in regulatory agency policy during the period of product development, clinical trials and the review process.

Even if our product candidates receive regulatory approval, they may still face future development and regulatory difficulties, including ongoing regulatory obligations and continued regulatory review. Additionally, our product candidates, if approved, could be subject to labeling and other restrictions and market withdrawal and we may be subject to administrative sanctions or penalties if we fail to comply with regulatory requirements or experience unanticipated problems with our products.

Even if we obtain regulatory approval for a product candidate, product candidates may be approved for fewer or more limited indications, including more limited subject populations, than we request, and regulatory authorities may require that contraindications, warnings, or precautions be included in the product labeling, including a black box warning, may grant approval contingent on the performance of costly post-marketing clinical trials or other post-market requirements, such as REMS, may require post-marketing surveillance, or may approve a product candidate with a label that does not include the labeling claims necessary or desirable for the successful commercialization of that product candidate. For instance, in 2007, the FDA requested that makers of all antidepressant medications update existing black box warnings about increased risk of suicidal thoughts and behavior in young adults, ages 18 to 24, during initial treatment. If approved for marketing, our drugs may be required to carry warnings similar to this and other class-wide warnings.

Any approved products would further be subject to ongoing requirements imposed by the EMA, FDA, and other comparable foreign regulatory authorities governing the manufacture, quality control, further development, labeling, packaging, storage, distribution, safety surveillance, import, export, advertising, promotion, marketing, recordkeeping and reporting of safety and other post-market information. If there are any modifications to the drug, including changes in indications, labeling, manufacturing processes or facilities, or if new safety issues arise, a new or supplemental NDA, post-implementation notification or other reporting may be required or requested, which may require additional data or additional pre-clinical studies and clinical trials.

The EMA, FDA and other comparable foreign regulatory authorities will continue to closely monitor the safety profile of any product even after approval. If the EMA, FDA or other comparable foreign regulatory authorities become aware of new adverse safety information after approval of any of our product candidates, a number of potentially significant negative consequences could result, including:

- we may suspend marketing of, or withdraw or recall, such product;
- regulatory authorities may withdraw approvals of such product;
- regulatory authorities may require additional warnings or otherwise restrict the product's indicated use, label, or marketing;
- the EMA, FDA or other comparable foreign regulatory bodies may issue safety alerts, Dear Healthcare Provider letters, press releases or other communications containing warnings about such product;
- the FDA may require the establishment or modification of a REMS or the EMA or a comparable foreign regulatory authority may require the establishment or modification of a similar strategy that may, for instance, require us to issue a medication guide outlining the risks of such side effects for distribution to subjects or restrict distribution of our products and impose burdensome implementation requirements on us;
- regulatory authorities may require that we conduct post-marketing studies or surveillance;
- we could be sued and held liable for harm caused to subjects or patients; and
- our reputation may suffer.

In addition, manufacturers of drug products and their facilities, including contracted facilities, are subject to continual review and periodic inspections by national regulatory authorities in the European Union, the FDA and other regulatory authorities for compliance with current Good Manufacturing Practices, or cGMP, regulations and standards. The European Union cGMP guidelines are as set forth in Commission Directive 2003/94/EC of October 8, 2003. If we or a regulatory agency or authority discover previously unknown problems with a product, such as adverse events of unanticipated severity or frequency, the product's stability (changes in levels of impurities or dissolution profile) or problems with the facility where the product is manufactured, we may be subject to reporting obligations, additional testing and additional sampling, and a regulatory agency or authority may impose restrictions on that product, the manufacturing facility, our suppliers, or us, including requiring recall or withdrawal of the product from the market or suspension of manufacturing. If we, our product candidates, the manufacturing facilities for our product candidates, our CROs, or other persons or entities working on our behalf fail to comply with applicable regulatory requirements either before or after marketing approval, a regulatory agency may, depending on the stage of product development and approval:

- issue adverse inspectional findings;
- issue Warning Letters or Untitled Letters;
- mandate modifications to promotional materials or require us to provide corrective information to healthcare practitioners;
- amend and update labels or package inserts;
- require us to enter into a consent decree, which can include imposition of various fines, reimbursements for inspection costs, required due dates for specific actions and penalties for noncompliance;
- seek an injunction or impose civil, criminal and/or administrative penalties, damages or monetary fines or imprisonment;
- suspend or withdraw regulatory approval;
- suspend or terminate any ongoing clinical studies;
- bar us from submitting or assisting in the submission of new regulatory applications;
- refuse to approve pending applications or supplements to applications filed by us;
- refuse to allow us to enter into government contracts;
- suspend or impose restrictions on operations, including restrictions on marketing or manufacturing of the product, or the imposition of costly new manufacturing requirements or use of alternative suppliers; or
- seize or detain products, refuse to permit the import or export of products, or require us to initiate a product recall.

The occurrence of any event or penalty described above may inhibit our ability to commercialize our products and generate revenue.

Our product candidates and the activities associated with their development and commercialization in the United States, including, but not limited to, their advertising and promotion, will further be heavily scrutinized by the FDA, the United States Department of Justice, the United States Department of Health and Human Services' Office of Inspector General, state attorneys general, members of Congress and the public. Violations of applicable law, including advertising, marketing and promotion of our products for unapproved (or off-label) uses, are subject to enforcement letters, inquiries and investigations, and civil, criminal and/or administrative sanctions by regulatory agencies. Additionally, comparable foreign regulatory authorities will heavily scrutinize advertising and promotion of any product candidate that obtains approval outside of the United States. In this regard, advertising and promotion of medicines in the European Union is governed by Directive 2001/83 EC, as amended, and any such activities which we may undertake in the European Union will have to be in strict compliance with the same. Any advertising of a prescription medicinal product to the public and any promotion of a medicinal product that does not have marketing authorization or is not promoted in accordance with that marketing authorization is prohibited. Advertisements and promotions of medicinal products are monitored nationally in the European Union, and each country will have its own additional advertising laws and industry governing bodies, whose obligations may go further than those set out in Directive 2001/83. For instance, in the United Kingdom the code of practice of the Association of the British Pharmaceutical Industry (the lead United Kingdom trade association) is considerably stricter than applicable legislative requirements. Any violations and sanctions will similarly be decided and administered by the relevant country's national authority.

In the United States, engaging in the impermissible promotion of products for off-label uses can also subject the entity engaging in such conduct to false claims litigation under federal and state statutes, which can lead to civil, criminal and/or administrative penalties, damages, monetary fines, disgorgement, exclusion from participation in Medicare, Medicaid and other federal healthcare programs, curtailment or restructuring of its operations and agreements that materially restrict the manner in which it promotes or distributes drug products. Accordingly, we are subject to the federal civil False Claims Act, which prohibits persons and entities from knowingly filing, or causing to be filed, a false claim, or the knowing use of false statements, to obtain payment from the federal government. Certain suits filed under the civil False Claims Act, known as "qui tam" actions, can be brought by any individual on behalf of the government and such individuals, commonly known as "whistleblowers," may share in certain amounts paid by the entity to the government in fines or settlement. When an entity is determined to have violated the civil False Claims Act, it may be required to pay up to three times the actual damages sustained by the government, plus civil penalties for each separate false claim. Various states have also enacted laws modeled after the federal civil False Claims Act. We are also subject to the federal criminal False Claims Act, which imposes criminal fines or imprisonment against individuals or entities who make or present a claim to the government knowing such claim to be false, fictitious, or fraudulent. Additionally, we may be subject to civil monetary penalties that may be imposed against any person or entity that, among other things, is determined to have presented or caused to be presented a claim to a federal health program that the person knows or should know is for an item or service that was not provided as claimed or is false or fraudulent.

False Claims Act lawsuits against pharmaceutical companies have increased significantly in volume and breadth, leading to substantial civil and criminal settlements regarding certain sales practices, including promoting off-label drug uses. This growth in litigation has increased the risk that a pharmaceutical company will have to defend a false claims action, pay settlement fines or restitution, agree to comply with burdensome reporting and compliance obligations, and/or be excluded from Medicare, Medicaid and other federal and state healthcare programs. If we do not lawfully promote our products, we may become subject to such litigation, which may have a material adverse effect on our business, financial condition and results of operations.

While no definition of “off-label use” exists at the European Union level, promotion of a medicinal product for a purpose that has not been approved is strictly prohibited. Such promotion also gives rise to criminal prosecution in the European Union, and national healthcare supervisory authorities may impose administrative fines. Engaging in such promotions in the European Union could also lead to product liability claims, in accordance with EU product liability regime under Directive 85/374.

The EMA’s, FDA’s, and other applicable government agencies’ policies may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval and marketing authorization, and the sale and promotion of our product candidates. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained, and be subject to civil, criminal and administrative enforcement, which would adversely affect our business, prospects and ability to achieve or sustain profitability.

The regulatory pathway for our product candidate, MIN-301, has not yet been determined. Depending on the pathway, we may be subject to different regulatory requirements.

MIN-301 is a peptide, and, as a peptide, may be subject to the Public Health Service Act, or PHSA, and the Food, Drug, and Cosmetic Act, or FDCA. We have yet to meet with the FDA regarding the approval pathway for this product candidate. Based on the definition of a biologic in the PHSA, we believe that MIN-301 meets the definition of a biologic and, thus, we will need to submit a Biologics License Application, or BLA, for product approval. Moreover, based on an FDA intercenter agreement, we believe that MIN-301 will be regulated by the FDA’s Center for Drug Evaluation and Research. However, we intend to discuss jurisdiction with the FDA to determine the appropriate regulatory pathway and corresponding requirements. Depending on the pathway, we may be subject to different regulatory requirements, including different regulatory and testing requirements, shorter or longer periods of market exclusivity, and different approval processes for generic drug and biosimilar competitors.

If the market opportunities for any product that we or our collaborators develop are smaller than we believe, our revenue may be adversely affected and our business may suffer.

Our product candidates are intended for the treatment of schizophrenia, insomnia, MDD, and Parkinson’s disease. Our projections of both the number of people who have these disorders or diseases, as well as the subsets of people who have the potential to benefit from treatment with our product candidates and who will pursue such treatment, are based on our beliefs and estimates that may prove to be inaccurate. For instance, with respect to schizophrenia and MDD, our estimates are based on the number of patients that suffer from schizophrenia and MDD, but these disorders are difficult to accurately diagnose and high rates of patients may not seek or continue treatment. Our estimates and beliefs are also based on the potential market of other drugs in development for schizophrenia and MDD, which may prove to be inaccurate and our advantages over such drugs may not be, or may not be perceived to be, as significant as we believe they are. If our estimates prove to be inaccurate, even if our products are approved, we may not be able to successfully commercialize them. In addition, the cause and pathophysiology of schizophrenia and MDD are not fully understood, and additional scientific understanding and future drug or non-drug therapies may make our product candidates obsolete.

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

As product candidates are developed through pre-clinical to late stage clinical trials towards approval and commercialization, it is common that various aspects of the development program, such as manufacturing methods and formulation, are altered in an effort to optimize processes and results. Such changes carry the risk that they will not achieve these intended objectives. Any of these changes could cause our product candidates to perform differently and affect the results of planned clinical trials or future clinical trials to be conducted with the altered materials. Such changes may also require additional testing, EMA or FDA notification or EMA or FDA approval. This could delay completion of clinical trials, require the conduct of bridging clinical trials or the repetition of one or more clinical trials, increase clinical trial costs, delay approval of our product candidates and/or jeopardize our ability to commence product sales and generate revenue.

Our failure to obtain regulatory approval in additional international jurisdictions would prevent us from marketing our product candidates outside the European Union and the United States.

We plan to seek regulatory approval to commercialize our product candidates in the European Union and, other than selorexant, in the United States. We also expect to seek regulatory approval in additional foreign countries. To market and sell our products in other jurisdictions, we must obtain separate marketing approvals and comply with numerous and varying regulatory requirements. The approval procedure varies among countries and can involve additional testing. The time required to obtain approval may differ substantially from that required to obtain EMA or FDA approval. The regulatory approval process outside the European Union and United States generally includes risks substantially similar to those associated with obtaining EMA or FDA approval. In addition, in many countries outside the United States, we must secure product price and reimbursement approvals before regulatory authorities will approve the product for sale in that country or within a short time after receiving such marketing approval. Obtaining foreign regulatory approvals and compliance with foreign regulatory requirements could result in significant delays, difficulties and costs for us and could delay or prevent the introduction of our products in certain countries. Further, clinical trials conducted in one country may not be accepted by regulatory authorities in other countries and regulatory approval in one country does not ensure approval in any other country, while a failure or delay in obtaining regulatory approval in one country may have a negative effect on the regulatory approval process in others. Also, regulatory approval for any of our product candidates may be withdrawn. If we fail to comply with the regulatory requirements in international markets or do not receive applicable marketing approvals, our target market will be reduced and our ability to realize the full market potential of our product candidates will be harmed and our business will be adversely affected. We may not obtain foreign regulatory approvals on a timely basis, if at all, especially because some foreign jurisdictions require prior approval of a treatment by the domestic regulatory agency. Our failure to obtain approval of any of our product candidates by regulatory authorities in another country may significantly diminish the commercial prospects of that product candidate and our business prospects could decline.

We face substantial competition, which may result in others discovering, developing or commercializing products before or more successfully than us.

The biopharmaceutical industry is intensely competitive and subject to rapid and significant technological change. We face competition with respect to our current product candidates and will face competition with respect to any future product candidates from major pharmaceutical companies, specialty pharmaceutical companies and biotechnology companies worldwide. Many of our competitors have significantly greater financial, technical and human resources. Smaller and early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies.

Our competitors may obtain regulatory approval of their products more rapidly than us or may obtain patent protection or other intellectual property rights that limit our ability to develop or commercialize our product candidates. Our competitors may also develop drugs that are more effective, more convenient, more widely used, less costly and/or have a better safety profile than our products, and competitors may also be more successful than us in manufacturing and marketing their products.

Our competitors will also compete with us in recruiting and retaining qualified scientific, management and commercial personnel, establishing clinical trial sites and subject registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs.

There are numerous currently approved therapies for treating the same diseases or indications for which our product candidates may be useful and many of these currently approved therapies act through mechanisms similar to our product candidates. Many of these approved drugs are well-established therapies or products and are widely accepted by physicians, patients and third-party payors. Some of these drugs are branded and subject to patent protection and regulatory exclusivity, while others are available on a generic basis. Insurers and other third-party payors may encourage the use of generic products or specific branded products. Moreover, it is difficult to predict the effect that introduction of biosimilars into the market will have on sales of the reference biologic product, which will depend on the FDA's standards for interchangeability, the structure of government and commercial managed care formularies, and state laws on substitution of biosimilars. We expect that if our product candidates are approved, they will be priced at a significant premium over competitive generics and biosimilars. This may make it difficult for us to differentiate our products from currently approved therapies, which may adversely impact our business strategy. In addition, any new product that competes with an approved product must demonstrate compelling advantages in efficacy, convenience, tolerability, and safety in order to overcome price competition and to be commercially successful. If we are not able to compete effectively against our current and future competitors, our business will not grow and our financial condition and operations will suffer. Moreover, many companies are developing new therapeutics, and we cannot predict what the standard of care will be as our product candidates progress through clinical development.

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

If any of our drug candidates receives marketing approval, it may nonetheless fail to gain sufficient market acceptance by physicians, patients, third-party payors and others in the medical community necessary for commercial success. If our drug candidates do not achieve an adequate level of acceptance, we may not generate significant revenue from drug sales and we may not become profitable. Our commercial success also depends on coverage and adequate reimbursement of our products by third-party payors, including government payors, which may be difficult or time-consuming to obtain, may be limited in scope or may not be obtained in all jurisdictions in which we may seek to market our products. The degree of market acceptance of our drug candidates, if approved for commercial sale, will depend on a number of factors, including:

- the efficacy and perceived and potential advantages compared to alternative treatments, including any similar generics and biosimilars;
- the timing of market introduction relative to alternative treatment;
- our ability to offer our drugs for sale at competitive prices relative to alternative treatments;
- the clinical indications for which the product candidate is approved;
- the convenience and ease of administration compared to alternative treatments;
- the willingness of the target patient population to try new therapies and of physicians to prescribe these therapies;
- the strength of our marketing and distribution support;
- the availability of third-party coverage and adequate reimbursement for our products or the willingness of patients to pay out-of-pocket in the absence of coverage and adequate reimbursement by third-party payors;
- unfavorable publicity relating to the products;
- the prevalence and severity of any side effects; and
- any restrictions on the use of our drugs together with other medications.

Our focus on CNS disorders, in particular, exposes us to an increased risk that serious side effects and disease events, including suicide, will occur during patient use of our products, even if such side effects and disease events are unrelated to the use of our products. Most approved CNS medicines carry boxed warnings for clinically significant adverse events, and our products may categorically need to carry such warnings as well.

We currently have a limited marketing and sales organization. If we are unable to establish greater marketing and sales capabilities or enter into agreements with third parties to market and sell our product candidates, we may not be able to effectively market and sell our product candidates, if approved, or generate product revenues.

We currently have a limited marketing or sales organization for the marketing, sales and distribution of pharmaceutical products. In order to commercialize any product candidates, we must build our marketing, sales, distribution, managerial and other non-technical capabilities or make arrangements with third parties to perform these services. We may not be successful in doing so on commercially reasonable terms or at all.

If our product candidates receive regulatory approval, we intend to establish our sales and marketing organization with technical expertise and supporting distribution capabilities to commercialize our product candidates, which will be expensive and time consuming and may require substantial investments prior to any product candidate being granted regulatory approval. In selling, marketing and distributing our products ourselves, we face a number of additional risks, including:

- our inability to recruit and retain adequate numbers of effective sales and marketing personnel;
- the inability of sales personnel to obtain access to physicians or educate adequate numbers of physicians on the clinical benefits of our products to achieve market acceptance;
- the lack of complementary products to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines;
- the costs associated with training sales personnel on legal compliance matters and monitoring their actions;
- liability for sales personnel failing to comply with the applicable legal requirements; and
- unforeseen costs and expenses associated with creating an independent sales and marketing organization.

Any failure or delay in the development of our internal sales, marketing and distribution capabilities would adversely impact the commercialization of these products.

We may choose to collaborate with third parties that have direct sales forces and established distribution systems, either to augment our own sales force and distribution systems or in lieu of our own sales force and distribution systems. 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. If we are unable to enter into such arrangements on acceptable terms or at all, we may not be able to successfully commercialize any of our product candidates that receive regulatory approval. Depending on the nature of the third party relationship, we may 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 are not successful in commercializing our product candidates, either on our own or through collaborations with one or more third parties, our future product revenue will suffer and we may incur significant additional losses.

Even if we commercialize any of our product candidates, these products may become subject to unfavorable pricing regulations, third-party reimbursement practices or healthcare reform initiatives, which could harm our business.

The laws that govern marketing approvals, pricing and reimbursement for new drug products vary widely from country to country. Current and future legislation may significantly change the approval requirements in ways that could involve additional costs and cause delays in obtaining approvals. In many countries, the pricing review period begins after marketing or product licensing approval is granted. Some countries require approval of the sale price of a drug before it can be marketed or soon thereafter. Additionally, in some foreign markets, prescription pharmaceutical pricing remains subject to continuing governmental control even after initial approval is granted. As a result, we might obtain marketing approval for a product in a particular country, but then be subject to price regulations that delay our commercial launch of the product, possibly for lengthy time periods, which could negatively impact the revenues we generate from the sale of the product in that particular country. Adverse pricing limitations may hinder our ability to recoup our investment in one or more product candidates even if our product candidates obtain marketing approval.

In the European Union, the pricing and reimbursement of prescription drugs is controlled by each member state. In these countries, pricing negotiations with governmental authorities can take considerable time after receipt of marketing approval for a product. In addition, there can be considerable pressure by governments and other stakeholders on prices and reimbursement levels, including as part of cost containment measures in the current economic climate in Europe. There is very limited harmonization on member state pricing and reimbursement practices in the European Union.

Reference pricing used by various European Union member states and parallel distribution, or arbitrage between low-priced and high-priced member states, can further reduce prices. In particular, Germany, Portugal and Spain have all introduced a number of short-term measures to lower healthcare spending, including mandatory discounts, clawbacks and price referencing rules, which could have a material adverse effect on our business.

Our ability to commercialize any products successfully will depend in part on the extent to which coverage and adequate reimbursement for these products and related treatments will be available from government health administration authorities and other third-party payors, such as private health insurers and health maintenance organizations. Government authorities and other third-party payors determine which medications they will cover and establish reimbursement levels. Assuming we obtain coverage for a given product by a third-party payor, the resulting reimbursement payment rates may not be adequate or may require co-payments that patients find unacceptably high. Patients who are prescribed medications for the treatment of their conditions, and their prescribing physicians, generally rely on third-party payors to reimburse all or part of the costs associated with their prescription drugs. Patients are unlikely to use our products unless coverage is provided and reimbursement is adequate to cover all or a significant portion of the cost of our products. Therefore, coverage and adequate reimbursement is critical to new product acceptance. Coverage decisions may depend upon clinical and economic standards that disfavor new drug products when more established or lower cost therapeutic alternatives are already available or subsequently become available.

Government authorities and other third-party payors are developing increasingly sophisticated methods of controlling healthcare costs, such as by limiting coverage and the amount of reimbursement for particular medications. Increasingly, third-party payors are requiring that drug companies provide them with predetermined discounts from list prices as a condition of coverage, are using restrictive formularies and preferred drug lists to leverage greater discounts in competitive classes, and are challenging the prices charged for medical products. In addition, in the United States, federal programs impose penalties on drug manufacturers in the form of mandatory additional rebates and/or discounts if commercial prices increase at a rate greater than the Consumer Price Index-Urban, and these rebates and/or discounts, which can be substantial, may impact our ability to raise commercial prices. Further, in the United States there has been heightened governmental scrutiny over the manner in which manufacturers set prices for their marketed products, which has resulted in several Congressional inquiries and proposed and enacted federal and state legislation designed to, among other things, bring more transparency to drug pricing, reduce the cost of prescription drugs under government payor programs, and review the relationship between pricing and manufacturer patient programs. While some of the proposed measures will require

authorization through additional legislation to become effective, U.S. Congress and the Trump administration have indicated that they will continue to seek new legislative and/or administrative measures to control drug costs. We expect that additional U.S. federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that the U.S. federal government will pay for healthcare products and services, which could result in reduced demand for our product candidates or additional pricing pressures.

Additionally, no uniform policy requirement for coverage and reimbursement for drug products exists among third-party payors in the United States. Therefore, coverage and reimbursement for drug products can differ significantly from payor to payor. As a result, the coverage determination process is often a time-consuming and costly process that will require us to provide scientific and clinical support for the use of our products to each payor separately, with no assurance that coverage and adequate reimbursement will be applied consistently or obtained in the first instance.

We cannot be sure that coverage and reimbursement will be available for any product that we commercialize and, if reimbursement is available, what the level of reimbursement will be. Coverage and reimbursement may impact the demand for, or the price of, any product candidate for which we obtain marketing approval. If coverage and reimbursement are not available or reimbursement is available only to limited levels, we may not successfully commercialize any product candidate for which we obtain marketing approval.

There may be significant delays in obtaining coverage and reimbursement for newly approved drugs, and coverage may be more limited than the purposes for which the drug is approved by the EMA, FDA or comparable foreign regulatory authorities. Moreover, eligibility for coverage and reimbursement does not imply that a drug will be paid for in all cases or at a rate that covers our costs, including research, development, manufacture, sale and distribution. Interim reimbursement levels for new drugs, if applicable, may also not be sufficient to cover our costs and may only be temporary. Reimbursement rates may vary according to the use of the drug and the clinical setting in which it is used, may be based on reimbursement levels already set for lower cost drugs and may be incorporated into existing payments for other services. Prices paid for a drug also vary depending on the class of trade. Prices charged to government customers and certain customers that receive federal funds are subject to price controls, and private institutions may obtain discounts through group purchasing organizations or use formularies to leverage discounts. Net prices for drugs may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that presently restrict imports of drugs from countries where they may be sold at lower prices than in the United States.

Additionally, there has been increasing legislative and enforcement interest in the United States with respect to specialty drug pricing practices. Specifically, there have been several recent U.S. Congressional inquiries and proposed federal and proposed and enacted state legislation designed to, among other things, bring more transparency to drug pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drugs. At the federal level, Congress and the Trump administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. At the state level, legislatures are increasingly passing legislation and implementing regulations designed to control pharmaceutical and biological product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. Our inability to promptly obtain coverage and profitable reimbursement rates from both government-funded and private payors for any approved products that we develop could have a material adverse effect on our operating results, our ability to raise capital needed to commercialize products and our overall financial condition.

Recently enacted and future legislation may increase the difficulty and cost for us to commercialize our product candidates and affect the prices we may obtain.

In the United States and many foreign jurisdictions, the legislative landscape continues to evolve. There have been a number of enacted or proposed legislative and regulatory changes affecting the healthcare system and pharmaceutical industry that could, among other things, prevent or delay marketing approval of our product candidates, restrict or regulate post-approval activities and affect our ability to profitably sell any product candidate for which we obtain marketing approval.

For example, in March 2010, President Obama signed into law the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act of 2010, or, collectively, the ACA, a law intended to, among other things, broaden access to health insurance, reduce or constrain the growth of healthcare spending, enhance remedies against healthcare fraud and abuse, add new transparency requirements for healthcare and health insurance industries, impose new taxes and fees on pharmaceutical and medical device manufacturers and impose additional health policy reforms. Since the ACA's enactment, there have been judicial and Congressional challenges to certain aspects of the ACA, and we expect there will be additional challenges and amendments to the ACA in the future. For example, the Tax Cuts and Jobs Act of 2017, or the Tax Act, was enacted, which 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”. Since the enactment of the Tax Act, there have been additional amendments to certain provisions of the ACA, and we expect the current Trump administration and Congress will likely continue to seek to modify, repeal or otherwise invalidate the entirety, or certain provisions of the ACA. Additionally, on December 14, 2018, a Texas U.S. District Court Judge ruled that the ACA is unconstitutional in its entirety because the “individual mandate” was repealed by Congress as part of the Tax Act. While the Texas U.S. District Court Judge, as well as the Trump administration and CMS, have stated that the ruling will have no immediate effect pending appeal of the decision, it is unclear how this decision, subsequent appeals, and other efforts to repeal and replace the ACA will impact the ACA and our business.

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

In international markets, reimbursement and healthcare payment systems vary significantly by country, and many countries have instituted price ceilings on specific products and therapies. In some countries, particularly in the European Union, the pricing of prescription pharmaceuticals is subject to governmental control. In these countries, pricing negotiations with governmental authorities can take considerable time after the receipt of marketing approval for a drug. To obtain coverage and reimbursement or pricing approval in some countries, we may be required to conduct a health technology assessment that compares the cost-effectiveness of our drug candidate to other available therapies. There can be no assurance that our products will be considered cost-effective, that an adequate level of reimbursement will be available or that a foreign country’s reimbursement policies will not adversely affect our ability to sell our products profitably.

If reimbursement of our drugs is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our business could be materially harmed.

Our international operations are subject to foreign currency and exchange rate risks.

Because we plan to continue to conduct our clinical trials in Europe, we are exposed to currency fluctuations and exchange rate risks. The costs of our CROs may be incurred in Euros and we may pay them in Euros, however, we expect to keep the substantial portion of our cash, cash equivalents, marketable securities and private placement transactions, in United States Dollars. Therefore, fluctuations in foreign currencies, especially the Euro, could significantly impact our costs of conducting clinical trials. In addition, we may have to seek additional funding earlier than expected, which may not be available on acceptable terms or at all. Changes in the applicable currency exchange rates might negatively affect the profitability and business prospects of the third parties conducting our future clinical trials. This might cause such third parties to demand higher fees or discontinue their operations. These situations could in turn increase our costs or delays our clinical development, which could have a material adverse effect on our business, financial condition and results of operations.

A variety of risks associated with international operations could materially adversely affect our business.

We expect to engage in significant cross-border activities, and we will be subject to risks related to international operations, including:

- different regulatory requirements for maintaining approval of drugs in foreign countries;
- reduced protection for contractual and intellectual property rights in certain countries;
- unexpected changes in tariffs, trade barriers and regulatory requirements;
- economic weakness, including inflation, political instability in particular foreign economies and markets, or public health issues or pandemics, such as the coronavirus;
- compliance with tax, employment, immigration and labor laws for employees living or traveling abroad;
- foreign currency fluctuations, which could result in increased operating expenses and reduced revenue, and other obligations incident to doing business in another country;
- workforce uncertainty in countries where labor unrest is more common than in North America;
- tighter restrictions on privacy and the collection and use of patient data; and
- business interruptions resulting from geopolitical actions, including war and terrorism, or natural disasters including earthquakes, typhoons, floods and fires.

If any of these issues were to occur, our business could be materially harmed.

If we are not successful in attracting and retaining highly qualified personnel, we may not be able to successfully implement our business strategy.

Our ability to compete in the highly competitive biotechnology and pharmaceuticals industries depends upon our ability to attract and retain highly qualified managerial, scientific and medical personnel. We are highly dependent on our management, scientific and medical personnel, especially Dr. Remy Luthringer, whose services are critical to the successful implementation of our product candidate development and regulatory strategies. We do not maintain “key man” insurance policies on the lives of these individuals or the lives of any of our other employees. In order to induce valuable employees to continue their employment with us, we have provided stock options that vest over time. The value to employees of stock options that vest over time is significantly affected by movements in our stock price that are beyond our control, and may at any time be insufficient to counteract more lucrative offers from other companies.

Despite our efforts to retain valuable employees, members of our management, scientific and development teams may terminate their employment with us on short notice. Pursuant to their employment arrangements, each of our executive officers may voluntarily terminate their employment at any time by providing as little as thirty days advance notice. Our employment arrangements, other than those with our executive officers, provide for at-will employment, which means that any of our employees (other than our executive officers) could leave our employment at any time, with or without notice. The loss of the services of any of our executive officers or other key employees and our inability to find suitable replacements could potentially harm our business, financial condition and prospects. Our success also depends on our ability to continue to attract, retain and motivate highly skilled junior, mid-level, and senior managers as well as junior, mid-level, and senior scientific and medical personnel.

We may not be able to attract or retain qualified management and scientific personnel in the future due to the intense competition for a limited number of qualified personnel among biopharmaceutical, biotechnology, pharmaceutical and other businesses. Many of the other pharmaceutical companies that we compete against for qualified personnel have greater financial and other resources, different risk profiles and a longer history in the industry than we do. They also may provide more diverse opportunities and better chances for career advancement. Some of these characteristics may be more appealing to high quality candidates than what we have to offer. If we are unable to continue to attract and retain high quality personnel, the rate and success at which we can develop and commercialize product candidates will be limited.

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

As of December 31, 2019, we had 13 full-time employees. As our development and commercialization plans and strategies develop, we expect to need additional managerial, operational, sales, marketing, financial and other resources. Future growth would impose significant added responsibilities on members of management, including:

- managing our clinical trials effectively;
- identifying, recruiting, maintaining, motivating and integrating additional employees;
- managing our internal development efforts effectively while complying with our contractual obligations to licensors, licensees, collaborators, contractors and other third parties;
- improving our managerial, development, operational and finance systems; and
- developing our compliance infrastructure and processes to ensure compliance with complex regulations and industry standards regarding us and our product candidates.

As our operations expand, we expect that we will need to manage additional relationships with various strategic partners, collaborators, suppliers and other third parties. Our future financial performance and our ability to 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 development efforts and clinical trials effectively and hire, train and integrate additional management, administrative and sales and marketing personnel. We may not be able to accomplish these tasks, and our failure to accomplish any of them could prevent us from successfully growing our company.

We are party to a loan and security agreement that contains operating and financial covenants that may restrict our business and financing activities.

On January 16, 2015, we entered into a Loan and Security Agreement with Oxford Finance LLC and Silicon Valley Bank, providing for term loans to us in an aggregate principal amount of up to \$15 million (the “Term Loans”), in two tranches of \$10 million and \$5 million, respectively. We borrowed the first tranche in January 2015. In June 2016, we irrevocably elected not to borrow the additional \$5 million available under the Term Loans. Borrowings under this loan and security agreement are secured by substantially all of our assets, excluding certain intellectual property rights. The loan and security agreement restricts our ability, among other things, to:

- sell, transfer or otherwise dispose of any of our business or property, subject to limited exceptions;
- make material changes to our business or management;
- enter into transactions resulting in significant changes to the voting control of our stock;
- make certain changes to our organizational structure;
- consolidate or merge with other entities or acquire other entities;
- incur additional indebtedness or create encumbrances on our assets;
- pay dividends, other than dividends paid solely in shares of our common stock, or make distributions on and, in certain cases, repurchase our stock;
- enter into transactions with our affiliates;
- repay subordinated indebtedness; or
- make certain investments.

In addition, we are required under our loan agreement to comply with various affirmative operating covenants. The operating covenants and restrictions and obligations in our loan and security agreement, as well as any future financing agreements that we may enter into, may restrict our ability to finance our operations, engage in business activities or expand or fully pursue our business strategies. Our ability to comply with these covenants may be affected by events beyond our control, and we may not be able to meet those covenants. A breach of any of these covenants could result in a default under the loan and security agreement, which could cause all of the outstanding indebtedness under the facility to become immediately due and payable and eliminate our eligibility to receive additional loans under the agreement.

If we are unable to generate sufficient cash available to repay our debt obligations when they become due and payable, either as when such obligations become due, when they mature, or in the event of a default, we may not be able to obtain additional debt or equity financing on favorable terms, if at all, which may negatively impact our business operations and financial condition.

The Term Loans matured on August 1, 2018 and we made a final repayment in the amount of \$510 thousand on such date.

Future acquisitions, mergers or joint ventures could disrupt our business and otherwise harm our business.

We actively evaluate various strategic transactions on an ongoing basis and may acquire other businesses, products or technologies as well as pursue strategic alliances, joint ventures or investments in complementary businesses. We merged with Sonkei in November 2013 and acquired Mind-NRG in February 2014, but otherwise do not have any substantial experience integrating or managing acquired businesses or assets. Strategic transactions expose us to many risks, including:

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

Foreign acquisitions, such as the acquisition of Mind-NRG, a Swiss company, involve unique risks in addition to those mentioned above, including those related to integration of operations across different cultures and languages, currency risks and the particular economic, political and regulatory risks associated with specific countries.

Also, the anticipated benefit of any strategic alliance, joint venture or acquisition may not materialize. Future acquisitions or dispositions could result in potentially dilutive issuances of our equity securities, the incurrence of debt (including on terms that are unfavorable to us that we are unable to repay or that may place burdensome restrictions on our operations), contingent liabilities or amortization expenses or write-offs of goodwill, any of which could harm our financial condition. We cannot predict the number, timing or size of future joint ventures or acquisitions, or the effect that any such transactions might have on our operating results.

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

We face an inherent risk of product liability as a result of the clinical testing of our product candidates and will face an even greater risk if we commercialize any products. For example, we may be sued if any product 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 brought by subjects enrolled in our clinical trials, patients, healthcare providers or others using, administering or selling our products. 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, if approved. 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 our product candidates or products that we may develop;
- termination of clinical trial sites or entire trial programs;
- injury to our reputation and significant negative media attention;
- withdrawal of clinical trial participants;
- initiation of investigations by regulators;
- costs to defend the related litigation;
- a diversion of management's time and our resources;
- substantial monetary awards to trial participants or patients;
- product recalls, withdrawals or labeling revisions, marketing or promotional restrictions;
- loss of revenues from product sales; and
- the inability to commercialize our product candidates.

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. We do not currently carry any product liability insurance. Although we anticipate obtaining and maintaining such insurance in line with our needs for our upcoming trials, such insurance may be more costly than we anticipate and 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 such insurance or that is in excess of the limits of such insurance coverage. We also expect our insurance policies will 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.

Our business and operations would suffer in the event of system failures.

Despite the implementation of security measures, our internal computer systems and those of our CROs and other contractors and consultants are vulnerable to damage from computer viruses, unauthorized access, natural disasters, outbreaks of contagious diseases, such as coronavirus, terrorism, war and telecommunication and electrical failures. For example, a cyber-attack on one of our external contractors during the summer of 2019 resulted in a disruption to patient recruitment in our Phase 3 clinical trial of roluperidone. Further similar events could occur and cause interruptions in our operations, and could result in a material disruption of our drug development programs. For example, the loss of clinical trial data from completed or ongoing or planned clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. To the extent that any disruption or security breach results in a loss of or damage to our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability and the further development of our product candidates could be delayed.

If we fail to maintain an effective system of internal control over financial reporting, we may not be able to accurately report our financial condition, results of operations or cash flows, which may adversely affect investor confidence in us and, as a result, the value of our common stock.

We are required to comply with the SEC's rules that implement Section 404 of the Sarbanes-Oxley Act and the Committee on Sponsoring Organizations, or COSO, Report on Internal Control – Integrated Framework, which require, among other things, that we maintain effective internal controls for financial reporting and disclosure controls and procedures. Under Section 404 of the Sarbanes-Oxley Act, we are required to furnish a report by management on, among other things, the effectiveness of our internal control over financial reporting. This assessment must include disclosure of any material weaknesses identified by management in our internal control over financial reporting. A material weakness is a control deficiency, or combination of control deficiencies, in internal control over financial reporting that results in more than a reasonable possibility that a material misstatement of annual or interim financial statements will not be prevented or detected on a timely basis.

Our compliance with Section 404 requires that we compile the system and process documentation necessary to perform an appropriate evaluation. During the evaluation and testing process, if we identify one or more material weaknesses in our internal control over financial reporting, we will be unable to assert that our internal control over financial reporting is effective. While we have established certain procedures and control over our financial reporting processes, we cannot assure you that these efforts will prevent restatements of our financial statements in the future. If we identify any future significant deficiencies or material weaknesses, the accuracy and timing of our financial reporting may be adversely affected and we may be unable to maintain compliance with securities law requirements regarding timely filing of periodic reports. In addition, investors' perceptions that our internal controls are inadequate or that we are unable to produce accurate financial statements on a timely basis may harm our stock price and business prospects. Failure to remedy any material weakness in our internal control over financial reporting, or to implement or maintain other effective control systems required of public companies, could also restrict our future access to the capital markets.

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

We are subject to the periodic reporting requirements of the Securities Exchange Act of 1934, as amended, or the Exchange Act. We designed our disclosure controls and procedures to reasonably assure us that the information we disclose in reports we file in accordance with the Exchange Act is accurate, complete, reviewed by management and reported within the required time period. We believe that any disclosure controls and procedures, no matter how well-conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met.

These inherent limitations include the realities that judgments in decision-making can be faulty, and that breakdowns can occur because of simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons, by collusion of two or more people or by an unauthorized override of the controls. Accordingly, because of the inherent limitations in our control system, misstatements due to error or fraud may occur and not be detected.

Prior to November 2013, we operated without full-time employees, relying on the services of consultants, including representatives of our former affiliate, Care Capital LLC, to provide certain accounting and finance functions. We have since hired personnel and continue to develop our disclosure control procedures; however, if we are unsuccessful in building an appropriate infrastructure, or unable to develop procedures and controls to ensure timely and accurate reporting, we may be unable to meet our disclosure requirements under the Exchange Act, which could adversely affect the market price of our common stock and impair our access to the capital markets.

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

We are exposed to the risk of employee fraud or other misconduct. Misconduct by employees and independent contractors, such as principal investigators, CROs, manufacturers, consultants, commercial partners and vendors, could include failures to comply with EMA or FDA regulations, to provide accurate information to the FDA, to comply with manufacturing standards we have established, to comply with European, federal and state healthcare fraud and abuse laws, to report financial information or data accurately or to disclose unauthorized activities to us. In particular, sales, marketing and other business arrangements in the healthcare industry are subject to extensive laws intended to prevent fraud, kickbacks, self-dealing and other abusive practices. These laws may restrict or prohibit a wide range of business activities, including, but not limited to certain activities related to research, manufacturing, distribution, pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements. Employee and independent contractor misconduct could also involve the improper use of individually identifiable information, including, without limitation, information obtained in the course of clinical trials, which could result in sanctions, monetary penalties, and serious harm to our reputation. In addition, federal procurement laws impose substantial penalties for misconduct in connection with government contracts and require certain contractors to maintain a code of business ethics and conduct.

We have adopted a code of business ethics and conduct, but it is not always possible to identify and deter employee and independent contractor misconduct, and the precautions we take to detect and prevent improper activities may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations. If any such actions are instituted against us, those actions could have a significant impact on our business, including the imposition of civil, criminal and administrative penalties, damages, monetary fines, disgorgement, individual imprisonment, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, contractual damages, reputational harm, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws, diminished profits and future earnings and curtailment or restructuring of our operations, any of which could adversely affect our ability to operate.

Any relationships with healthcare professionals, principal investigators, consultants, customers (actual and potential) and third-party payors in connection with our current and future business activities may and may continue to be subject, directly or indirectly, to federal and state healthcare fraud and abuse laws, false claims laws, marketing expenditure tracking and disclosure (or “sunshine”) laws, government price reporting, and health information privacy and security laws. If we are unable to comply, or have not fully complied, with such laws, we could face penalties, contractual damages, reputational harm, diminished profits and future earnings and curtailment or restructuring of our operations.

Our business operations and activities may be directly, or indirectly, subject to various federal, state and local healthcare laws, including, without limitation, the federal Anti-Kickback Statute and the federal False Claims Act. These laws may impact, among other things, our current activities with principal investigators and research subjects, as well as proposed and future sales, marketing and education programs. In addition, we may be subject to patient data privacy and security regulation by the federal government, state governments and foreign jurisdictions in which we conduct our business. The healthcare laws and regulations that may affect our ability to operate include, but are not limited to:

- The federal Anti-Kickback Statute, which prohibits, among other things, individuals and entities from knowingly and willfully soliciting, receiving, offering or paying any remuneration (including any kickback, bribe or rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce, or in return for, the referral of an individual for the furnishing or arranging for the furnishing of any item or service, or the purchase, lease, order, arrangement for, or recommendation of the purchase, lease, or order of any good, facility, item or service for which payment may be made, in whole or in part, under a federal healthcare program, such as the Medicare and Medicaid programs.
- The federal civil False Claims Act, which imposes civil penalties, including through civil whistleblower or qui tam actions, against individuals or entities for, among other things, knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent; knowingly making, using or causing to be made or used, a false record or statement to get a false or fraudulent claim paid or approved by the government; conspiring to defraud the government by getting a false or fraudulent claim paid or approved by the government; or knowingly making, using or causing to be made or used a false record or statement to avoid, decrease or conceal an obligation to pay money to the federal government.
- The federal criminal False Claims Act, which imposes criminal fines or imprisonment against individuals or entities who make or present a claim to the government knowing such claim to be false, fictitious or fraudulent.
- The civil monetary penalties statute, which imposes penalties against any person or entity who, among other things, is determined to have presented or caused to be presented a claim to a federal health program that the person knows or should know is for an item or service that was not provided as claimed or is false or fraudulent.
- The Veterans Health Care Act of 1992 that requires manufacturers of “covered drugs” to offer them for sale to certain federal agencies, including but not limited to, the Department of Veterans Affairs, on the Federal Supply Schedule, which requires compliance with applicable federal procurement laws and regulations and subjects manufacturers to contractual remedies as well as administrative, civil and criminal sanctions.
- The federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which created additional federal criminal statutes that prohibit knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program or obtain, by means of false or fraudulent pretenses, representations or promises, any of the money or property owned by, or under the custody or control of, any healthcare benefit program, regardless of the payor (e.g., public or private), knowingly and willfully embezzling or stealing from a health care benefit program, willfully obstructing a criminal investigation of a health care offense and knowingly and willfully falsifying, concealing or covering up by any trick or device a material fact or making any materially false statements in connection with the delivery of, or payment for, healthcare benefits, items or services relating to healthcare matters.
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and their respective implementing regulations, which impose requirements on certain covered healthcare providers, health plans and healthcare clearinghouses as well as their respective business associates that perform services for them that involve individually identifiable health information, relating to the privacy, security and transmission of individually identifiable health information without appropriate authorization, including mandatory contractual terms as well as directly applicable privacy and security standards and requirements.
- The federal Physician Payments Sunshine Act and its implementing regulations requires manufacturers of drugs, devices, biologicals and medical supplies for which payment is available under Medicare, Medicaid or the Children’s Health Insurance Program (with certain exceptions) to report annually to the United States Department of Health and Human Services, or HHS, information related to payments or other transfers of value made to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors) and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members.
- Federal consumer protection and unfair competition laws, which broadly regulate marketplace and other activities that potentially harm consumers.

- State law equivalents of each of the above federal laws, such as anti-kickback, false claims, consumer protection and unfair competition laws which may apply to our business practices, including but not limited to our research, distribution, sales and marketing arrangements and our practices for submitting claims involving healthcare items or services reimbursed by any third-party payors, including commercial insurers. State laws may also (1) require that pharmaceutical companies comply with the pharmaceutical industry’s voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government that otherwise restrict the payments that may be made to healthcare providers, (2) require that drug manufacturers file reports with states regarding marketing information, such as the tracking and reporting of gifts, compensations and other remuneration and items of value provided to healthcare professionals and entities (compliance with such requirements may require investment in infrastructure to ensure that tracking is performed properly, and some of these laws result in the public disclosure of various types of payments and relationships, which could potentially have a negative effect on a pharmaceutical company’s business and/or increase enforcement scrutiny of its activities), (3) require the reporting of information related to drug pricing, and (4) govern the privacy and security of health information in certain circumstances. State laws are not uniform, may differ from each other in significant ways and may be applied with differing effects.

In addition, any sales of our products or product candidates once commercialized outside the United States will also likely subject us to foreign equivalents of the healthcare laws mentioned above, among other foreign laws such as, for instance, the UK Bribery Act 2010 other national anti-corruption legislation made as a consequence of a member states’ adherence to the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions, the European Union data protection regime set out in Directive 95/46/EC as implemented nationally by the member states, and European Union consumer laws protecting against defective products, including Directive 85/374/EEC. In addition, there are national laws and codes which are comparable to the United States “sunshine laws,” including certain provisions under the UK ABPI Code of Practice and French disclosure requirements on manufacturers to publicly disclose interactions with French health care professionals.

Efforts to ensure that our business arrangements will comply with applicable healthcare laws may involve substantial costs. It is possible that governmental and enforcement authorities will conclude that our business practices may not comply with current or future statutes, regulations or case law interpreting applicable fraud and abuse or other healthcare laws. If our operations are found to be in violation of any of the laws described above or any other governmental regulations that apply to us, we may be subject to, without limitation, civil, criminal and administrative penalties, damages, monetary fines, disgorgement, individual imprisonment, possible exclusion from participation in Medicare, Medicaid and other federal healthcare programs, contractual damages, reputational harm, diminished profits and future earnings, additional reporting requirements and oversight if we become subject to a corporate integrity agreement or similar agreement to resolve allegations of non-compliance with these laws and curtailment or restructuring of our operations, any of which could adversely affect our ability to operate.

We are subject to the Foreign Corrupt Practices Act.

The Foreign Corrupt Practices Act, or the FCPA, prohibits any U.S. individual or business from paying, offering, or authorizing payment or offering of anything of value, directly or indirectly, to any foreign official, political party or candidate for the purpose of influencing any act or decision of the foreign entity in order to assist the individual or business in obtaining or retaining business. The FCPA also obligates companies whose securities are listed in the United States to comply with accounting provisions requiring the company to maintain books and records that accurately and fairly reflect all transactions of the corporation, including international subsidiaries, and to devise and maintain an adequate system of internal accounting controls for international operations. Activities that violate the FCPA, even if they occur wholly outside the United States, can result in criminal and civil fines, imprisonment, disgorgement, oversight, and debarment from government contracts.

We and our service providers are subject to EU data protection laws. Failure to comply with such laws could harm our financial condition and operating results and involve distraction from other aspects of our business.

In October 2015, the Court of Justice of the European Union (CJEU) invalidated the EU-U.S. Safe Harbor Framework, which had established a means for legitimating the transfer of personal data, as the term is used in the context of the EU Data Protection Directive, to the U.S. and required U.S.-based companies that have certified with the Department of Commerce as part of the Safe Harbor Framework to provide assurance that they are adhering to relevant European standards for data protection. As Minerva is not Safe Harbor certified, the CJEU’s ruling invalidating the Safe Harbor has no direct effect on Minerva’s own compliance with EU data protection laws; however, in light of the CJEU’s recent decision, we are reviewing the practices of third party service providers with whom we work, which include the transfer of personal data between the European Economic Area (“EEA”) and the U.S. to ensure that all data transfers to us comply with EU data protection laws. In February 2016, the EU Commission announced that it had reached agreement with the U.S. replacement regime to the Safe Harbor Framework. We require our EEA-based services providers, and U.S.-based service providers undertaking clinical trials on our behalf in the EEA, to confirm that all of the personal data which we receive from them is legitimately transferred to us. In many cases we believe that patients and subjects consent to the transfer of their data in a

manner which satisfies the requirements of EU data protection law. Where appropriate and pending the ratification of the replacement regime, we may require third party service providers to adopt an alternative means of legitimizing data transfers from the EEA, such as the Standard Contractual Clauses which have been approved by the EU Commission as a means of transferring data to the U.S. These confirmations and, if necessary, additional actions may involve substantial time and expense to both Minerva and its third party service providers, and could divert management's attention and resources from other aspects of our business. If data transfers to the U.S. are not legitimized, the EU data protection authorities can impose a number of different sanctions, including fines and, ultimately, a prohibition on transfers, any of which could harm our business, financial condition and operating results.

Risks Related to Our Dependence on Third Parties

We currently rely and continue to expect to rely on third parties to conduct our future clinical trials. The failure of these third parties to successfully carry out their contractual duties or meet expected deadlines could substantially harm our business because we may not obtain regulatory approval for or commercialize our product candidates in a timely manner or at all.

We plan to rely upon third-party CROs to monitor and manage data for our future clinical programs. We will rely on these parties for execution of our clinical trials, and control only certain aspects of their activities. Nevertheless, we are responsible for ensuring that each of our studies is conducted in accordance with the applicable protocol and legal, regulatory and scientific standards, and our reliance on the CROs does not relieve us of our regulatory responsibilities. We and our CROs are required to comply with current GCPs, which are regulations and guidelines enforced by the FDA, the Competent Authorities of the Member States of the European Economic Area and comparable foreign regulatory authorities for all of our products in clinical development. Regulatory authorities enforce these GCPs through periodic inspections of trial sponsors, principal investigators and trial sites. If we or any of our CROs fail to comply with applicable GCP, the clinical data generated in our clinical trials may be deemed unreliable and the EMA, FDA or comparable regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. We cannot assure you that upon inspection by a given regulatory authority, such regulatory authority will determine that any of our clinical trials comply with GCP requirements. In addition, we must conduct our clinical trials with product produced under cGMP requirements. Failure to comply with these regulations may require us to repeat pre-clinical and clinical trials, which would delay the regulatory approval process.

Our CROs are not our employees, and except for remedies available to us under our agreements with such CROs, we cannot control whether or not they devote sufficient time and resources to our ongoing clinical, nonclinical and pre-clinical programs. These CROs may also have relationships with other commercial entities, including our competitors, for whom they may also be conducting clinical trials or other drug development activities that could harm our competitive position. If necessary, switching or adding CROs involves substantial cost and requires extensive management time and focus. In addition, there is a natural transition period when a new CRO commences work. As a result, delays occur, which can materially impact our ability to meet our desired clinical development timelines. Though we carefully manage our relationships with our CROs, there can be no assurance that we will not encounter similar challenges or delays in the future or that these delays or challenges will not have a material adverse impact on our business, prospects, financial condition and results of operations.

If CROs do not successfully carry out their contractual duties or obligations or meet expected deadlines or if the quality or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our clinical protocols, regulatory requirements or for other reasons, our clinical trials may be extended, delayed or terminated, we may need to conduct additional trials, and we may not be able to obtain regulatory approval for or successfully commercialize our product candidates. As a result, our results of operations and the commercial prospects for our product candidates would be harmed, our costs could increase and our ability to generate revenues could be delayed. To the extent we are unable to successfully identify and manage the performance of third-party service providers in the future, our business may be adversely affected.

We contract with third parties for the manufacturing of our product candidates for pre-clinical and clinical testing and expect to continue to do so for commercialization. This reliance on third parties increases the risk that we will not have sufficient quantities of our product candidates or products, or such quantities at an acceptable cost, which could delay, prevent or impair our development or commercialization efforts.

We do not have any manufacturing facilities. For our product candidates, we rely, and expect to continue to rely, on third parties for the manufacturing of our drug candidates for pre-clinical and clinical testing, as well as for commercial manufacture if any of our drug candidates receive marketing approval. This reliance on third parties increases the risk that we will not have sufficient quantities of our drug candidates or drugs, or such quantities at an acceptable cost or quality, which could delay, prevent or impair our ability to timely conduct our clinical trials or our other development or commercialization efforts.

We also expect to rely on third-party manufacturers or third-party collaborators for the manufacturing of commercial supply of any other drug candidates for which we or our collaborators obtain marketing approval. We may be unable to establish any agreements with third-party manufacturers or to do so on acceptable terms. Even if we are able to establish agreements with third-party manufacturers, reliance on third-party manufacturers entails additional risks, including:

- reliance on the third party for regulatory compliance and quality assurance;
- the possible breach of the manufacturing agreement by the third party;
- the possible misappropriation of our proprietary information, including our trade secrets and know-how;
- disruption and costs associated with changing suppliers, including additional regulatory filings; and
- the possible termination or non-renewal of the agreement by the third party at a time that is costly or inconvenient for us.

Moreover, the facilities used by our contract manufacturers to manufacture our products must be approved by the FDA pursuant to inspections that will be conducted after we submit our marketing application to the FDA. Other national regulatory authorities have comparable powers. While we are ultimately responsible for the manufacture of our product candidates, other than through our contractual arrangements, we do not control the manufacturing process of, and are completely dependent on, our contract manufacturing partners for compliance with cGMP requirements, for manufacture of both active drug substances and finished drug products. If our contract manufacturers cannot successfully manufacture material that conforms to our specifications and the strict regulatory requirements of the FDA or other regulatory authorities, we will not be able to secure and/or maintain regulatory approval for their manufacturing facilities. In addition, other than through our contractual agreements, 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 marketing approval for or market our product candidates, if approved.

Further, our suppliers are subject to regulatory requirements, covering manufacturing, testing, quality control, and record keeping relating to our product candidates, and subject to ongoing inspections by the regulatory agencies. Failure by any of our suppliers to comply with applicable regulations may result in long delays and interruptions to our manufacturing capacity while we seek to secure another supplier that meets all regulatory requirements, as well as market disruption related to any necessary recalls or other corrective actions.

Third-party manufacturers may not be able to comply with cGMP, regulations or similar regulatory requirements outside the United States. Additionally, 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 hold or termination, fines, imprisonment, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures, refusal to allow product import or export, Warning Letters, Untitled Letters, or recalls of drug candidates or drugs, operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supplies of our drugs.

Our drug candidates and any drugs that we may develop may compete with other drug candidates and drugs for access to manufacturing facilities. There are a limited number of manufacturers that operate under cGMP regulations and that might be capable of manufacturing for us. Any performance failure on the part of our existing or future manufacturers could delay clinical development or marketing approval. We do not currently have arrangements in place for redundant supply or a second source for bulk drug substance. If our current contract manufacturers cannot perform as agreed, we may be required to replace such manufacturers and we may incur added costs and delays in identifying and qualifying any such replacement.

Our current and anticipated future dependence upon others for the manufacturing of our drug candidates or drugs may adversely affect our future profit margins and our ability to commercialize any drugs that receive marketing approval on a timely and competitive basis.

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

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

We may engage third party collaborators to market and commercialize our product candidates, who may fail to effectively commercialize our product candidates.

We may utilize strategic partners or contract sales forces, where appropriate, to assist in the commercialization of our product candidates, if approved. We currently possess limited resources and may not be successful in establishing collaborations or co-promotion arrangements on acceptable terms, if at all. We also face competition in our search for collaborators and co-promoters. By entering into strategic collaborations or similar arrangements, we will rely on third parties for financial resources and for development, commercialization, sales and marketing and regulatory expertise. Any collaborators may fail to develop or effectively commercialize our product candidates because they cannot obtain the necessary regulatory approvals, they lack adequate financial or other resources or they decide to focus on other initiatives. Any failure to enter into collaboration or co-promotion arrangements or the failure of our third party collaborators to successfully market and commercialize our product candidates would diminish our revenues and harm our results of operations. In addition, conflicts may arise with our collaborators, such as conflicts concerning the interpretation of clinical data, the achievement of milestones, the interpretation of financial provisions or the ownership of intellectual property. If any conflicts arise with our collaborators, they may act in their self-interest, which may be adverse to our best interest.

We depend on our collaborations with Mitsubishi Tanabe Pharma Corporation, or MTPC, and Janssen Pharmaceutica NV (“Janssen”) and could be seriously harmed if our license agreements with MTPC and Janssen were terminated.

We exclusively license roluperidone and MIN-117 from MTPC, with the rights to develop, sell and import roluperidone and MIN-117 globally, excluding most of Asia.

Our co-development and license agreement with Janssen provides us with European Union commercialization rights for seltorexant and the right to royalties on any sales of seltorexant outside of the European Union. We have assumed strategic control for matters related to the clinical development of seltorexant in insomnia and all financial responsibility for Phase 3 development costs for seltorexant in this indication and will only realize revenues from seltorexant if it is approved and if our license agreement with Janssen is not terminated by Janssen. Janssen may terminate our license agreement following a material breach by us or certain insolvency events, including if we are unable to fund our portion of the development costs. As a result, we may never realize any revenues from the commercialization of seltorexant, even if approved. In addition, at certain development milestones, including the completion of a single dose Phase 1 clinical trial of seltorexant in patients with MDD, Janssen has the right to opt out of its obligation to fund further development, and we may be unable to fund such development without Janssen’s financial support.

Even if we receive revenues on European Union sales or royalties on sales outside of the European Union under the Janssen license agreement, we may not receive revenues that equal or exceed the amount we are obligated to invest in seltorexant’s clinical development under the agreement. As a result, the license agreement for seltorexant may never result in any profits to us and may have a material adverse effect on us or our business prospects.

We disagree with Janssen on certain payment obligations arising out of the co-development and license agreement that we entered into with Janssen on February 13, 2014, and was subsequently amended in June 2017 (the “Agreement”), which disagreement could lead to us incurring significant payment obligations, us becoming involved in legal actions or the termination of the Agreement, any of which could have a material adverse effect on us.

We are currently engaged in a disagreement with Janssen regarding the achievement of a certain development milestone, which is referred to as “Decision Point 4” in the Agreement. As discussed in greater detail in the “Business” section, Janssen has asserted that Decision Point 4 has been reached, which subsequently requires that we share in 40% of the Phase 3 development costs. Janssen has already invoiced us \$3.4 million for our alleged share of the Phase 3 development costs in 2019, and Janssen estimates it will have approximately \$100 million in further Phase 3 development costs in 2020. We have the right to opt-out of the Agreement after Decision Point 4, and if we opt-out, we collect a royalty on worldwide sales of seltorexant in the single digits with no further obligations to Janssen.

If it is determined that we are required to make a significant payment to Janssen, we may not have sufficient cash to make such payment and may be required to incur additional indebtedness or to raise additional funds via an equity financing in order to make such payment to Janssen. We cannot be certain that we will be able to borrow or raise sufficient funds for this purpose under terms acceptable to us, if at all. While we are engaged in ongoing discussions with Janssen concerning the Agreement and our continued business relationship, we cannot assure you that we will be able to resolve this disagreement to our satisfaction, or at all. Although we do not believe Janssen has grounds to terminate the Agreement, we may have to take legal action to preserve our rights under the Agreement. Any such action may be costly and time consuming and there can be no assurance of the outcome. If we are unable to resolve this disagreement to our satisfaction, it may have a material adverse impact on our business.

We may not be successful in establishing new collaborations which could adversely affect our ability to develop future product candidates and commercialize future products.

We are collaborating with Janssen on the development of seltorexant. We may also seek to enter into additional product collaborations in the future, including alliances with other biotechnology or pharmaceutical companies, to enhance and accelerate the development of our future product candidates and the commercialization of any resulting products. We face significant competition in seeking appropriate collaborators and the negotiation process is time-consuming and complex. Moreover, we may not be successful in our efforts to establish collaborations or other alternative arrangements for any future product candidates because our research and development pipeline may be insufficient, our product candidates may be deemed to be at too early of a stage of development for collaboration efforts and/or third parties may view our product candidates as lacking the requisite potential to demonstrate safety and efficacy. As a result, we may have to delay the development of a product candidate and attempt to raise significant additional capital to fund development. Even if we are successful in our efforts to establish collaborations, the terms that we agree upon may not be favorable to us and we may not be able to maintain such collaborations if, for example, development or approval of a product candidate is delayed or sales of an approved product are disappointing.

Risks Related to Intellectual Property

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

Our success depends in significant part on our and our licensors', licensees' or collaborators' ability to establish, maintain and protect patents and other intellectual property rights and operate without infringing the intellectual property rights of others. We have filed numerous patent applications both in the United States and in foreign jurisdictions to obtain patent rights to inventions we have discovered. We have also licensed from third parties rights to patent portfolios. None of these licenses give us the right to prepare, file and prosecute patent applications and maintain patents we have licensed, although we may provide comments on prosecution matters, which our licensors may or may not choose to follow. If our licensors elect to discontinue prosecution or maintenance of our licensed patents, we have the right, at our expense, to pursue and maintain those patents and applications.

The patent prosecution process is expensive and time-consuming, and we and our current or future licensors, licensees or collaborators may not be able to prepare, file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. It is also possible that we or our licensors, licensees or collaborators will fail to identify patentable aspects of inventions made in the course of development and commercialization activities before it is too late to obtain patent protection on them. Moreover, in some circumstances, we may not have the right to control the preparation, filing and prosecution of patent applications, or to maintain the patents, covering technology that we license from or license to third parties and are reliant on our licensors, licensees or collaborators. Therefore, these patents and applications may not be prosecuted and enforced in a manner consistent with the best interests of our business. If our current or future licensors, licensees or collaborators fail to establish, maintain or protect such patents and other intellectual property rights, such rights may be reduced or eliminated. If our licensors, licensees or collaborators are not fully cooperative or disagree with us as to the prosecution, maintenance or enforcement of any patent rights, such patent rights could be compromised. Because the issuance of a patent is not conclusive as to its inventorship, scope, validity or enforceability, issued patents that we own or have licensed from third parties may be challenged in the courts or patent offices in the United States and abroad. Such challenges may result in the loss of patent protection, the narrowing of claims in such patents or the invalidity or unenforceability of such patents, which could limit our ability to stop others from using or commercializing similar or identical technology and products, or limit the duration of the patent protection for our technology and products.

The patent position of biotechnology and pharmaceutical companies generally is highly uncertain, involves complex legal and factual questions and has in recent years been the subject of much litigation. As a result, the issuance, scope, validity, enforceability and commercial value of our and our current or future licensors', licensees' or collaborators' patent rights are highly uncertain. Our and our licensors', licensees' or collaborators' pending and future patent applications may not result in patents being issued that protect our technology or products, in whole or in part, or that effectively prevent others from commercializing competitive technologies and products. The patent examination process may require us or our licensors, licensees or collaborators to narrow the scope of the claims of our or our licensors', licensees' or collaborators' pending and future patent applications, which may limit the scope of patent protection that may be obtained. Our and our licensors', licensees' or collaborators' patent applications cannot be enforced against third parties practicing the technology claimed in such applications unless and until a patent issues from such applications, and then only to the extent the issued claims cover the technology.

One or more of our owned or licensed patents directed to our proprietary products or technologies may expire or have limited commercial life before the proprietary product or technology is approved for marketing in a relevant jurisdiction.

Given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting our product candidates might expire before or shortly after our product candidates obtain regulatory approval, which may subject us to increased competition and reduce or eliminate our ability to recover our development costs. As a result, our owned and licensed patent portfolio may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours. For example, our in-licensed U.S. and European patents covering composition of matter and pharmaceutical compositions of roluperidone, respectively, are expected to expire as soon as 2021. In addition, our in-licensed U.S. and European patents relating to pharmaceutical compositions and uses of MIN-117 to treat depression are expected to expire as soon as 2020. Finally, any patent that grants from our U.S. patent applications relating to methods of using MIN-301 to treat neurologic and psychiatric diseases is expected to expire as early as 2028. Although we expect to seek extensions of patent terms where available, including in the United States under the Drug Price Competition and Patent Term Restoration Act of 1984, which permits a patent term extension of up to five years beyond the expiration of the patent, we cannot be certain that an extension will be granted, or if granted, what the applicable time period or the scope of patent protection afforded during any extended period will be. The applicable authorities, including the EMA, FDA, and any equivalent regulatory authority in other countries, may not agree with our assessment of whether such extensions are available, and may refuse to grant extensions to our patents, or may grant more limited extensions than we request. If this occurs, our competitors may take advantage of our investment in development and trials by referencing our clinical and pre-clinical data and launch their product earlier than might otherwise be the case.

The expiration of composition of matter patent protection with respect to one or more of our product candidates may diminish our ability to maintain a proprietary position for our intended uses of a particular product candidate. Moreover, we cannot be certain that we will be the first applicant to obtain an FDA approval for any indication of one or more of our product candidates and we cannot be certain that it will be entitled to new chemical entity, or NCE, exclusivity. Such diminution of our proprietary position could have a material adverse effect on our business, results of operations and financial condition.

We have in-licensed or acquired a portion of our intellectual property necessary to develop our product candidates, and if we fail to comply with our obligations under any of these arrangements, we could lose such intellectual property rights.

We are a party to and rely on several arrangements with third parties, which give us rights to intellectual property that is necessary for the development of our product candidates. In addition, we may enter into similar arrangements in the future. Our current arrangements impose various development, royalty and other obligations on us. If we materially breach these obligations or if our counterparts fail to adequately perform their respective obligations, these exclusive arrangements could be terminated, which would result in our inability to develop, manufacture and sell products that are covered by such intellectual property.

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

Competitors may infringe our issued patents or other intellectual property. In some cases, it may be difficult or impossible to detect third-party infringement or misappropriation of our intellectual property rights, even in relation to issued patent claims, and proving any such infringement may be even more difficult. Accordingly, for such undetectable infringement or misappropriation our ability to recover damages will be negligible and we could be at a market disadvantage because we may lack the resources of some of our competitors to monitor for and detect infringement. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time consuming. Any claims we assert against perceived infringers could provoke these parties to assert counterclaims against us alleging that we infringe their patents. In addition, in any patent infringement proceeding, a court may decide that a patent of ours is invalid or unenforceable, in whole or in part, construe the patent's claims narrowly or refuse to stop the other party from using the technology at issue on the grounds that our patents do not cover the technology. An adverse result in any litigation proceeding could put one or more of our patents at risk of being invalidated or interpreted narrowly.

We may need to license or acquire additional patents and intellectual property rights.

One or more third parties may hold intellectual property rights, including patent rights, important or necessary to the development of our products. It may be necessary for us to use the patented or proprietary technology of third parties to commercialize our products, in which case we would be required to obtain a license from these third parties on commercially reasonable terms. If we were not able to obtain a license, or were not able to obtain a license on commercially reasonable terms, our business could be harmed, possibly materially.

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

Our commercial success depends upon our ability to develop, manufacture, market and sell our products, and to use our related proprietary technologies. We may become party to, or threatened with, future adversarial proceedings or litigation regarding intellectual property rights with respect to our products, including interference or derivation proceedings before the U.S. Patent and Trademark Office, or the USPTO. Third parties may assert infringement claims against us based on existing patents or patents that may be granted in the future. If we are found to infringe a third party's intellectual property rights, we could be required to obtain a license from such third party to continue commercializing our products. However, we may not be able to obtain any required license on commercially reasonable terms or at all. Under certain circumstances, we could be forced, including by court order, to cease commercializing our products. In addition, in any such proceeding or litigation, we could be found liable for monetary damages. Regardless of the outcome, such claims or litigation may be time-consuming and costly to defend, divert management resources and have other adverse effects on our business.

Restrictions on our patent rights relating to our product candidates may limit our ability to prevent third parties from competing against us.

Our success will depend, in part, on our ability to obtain and maintain patent protection for our product candidates, preserve our trade secrets, prevent third parties from infringing upon our proprietary rights and operate without infringing upon the proprietary rights of others. Composition-of-matter patents on the biological or chemical active pharmaceutical ingredient are generally considered to be the strongest form of intellectual property protection for pharmaceutical products, as such patents provide protection without regard to any method of use. We have filed and in-licensed composition-of-matter patent applications for all of our product candidates. However, we cannot be certain that the claims in our patent applications to inventions covering our product candidates will be considered patentable by the USPTO and courts in the United States or by the patent offices and courts in foreign countries.

In addition to composition-of-matter patents and patent applications, we also have filed method-of-use patent applications. This type of patent protects the use of the product only for the specified method. However, this type of patent does not prevent a competitor from making and marketing a product that is identical to our product for an indication that is outside the scope of the patented method. Moreover, even if these competitors do not actively promote their product for our targeted indication, physicians may prescribe these products "off-label." Although off-label prescriptions may infringe or contribute to the infringement of method-of-use patents, the practice is common and such infringement is difficult to prevent or prosecute.

Patent applications in the United States and most other countries are confidential for a period of time until they are published, and publication of discoveries in scientific or patent literature typically lags actual discoveries by several months or more. As a result, we cannot be certain that we and the inventors of the issued patents and applications that we may in-license were the first to conceive of the inventions covered by such patents and pending patent applications or that we and those inventors were the first to file patent applications covering such inventions. Also, we have a number of issued patents and numerous patent applications pending before the USPTO and foreign patent offices and the patent protection may lapse before we manage to obtain commercial value from them, which might result in increased competition and materially affect our position in the market.

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

As is the case with other biotechnology and pharmaceutical companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biopharmaceutical industry involve technological and legal complexity, and obtaining and enforcing biopharmaceutical patents is costly, time-consuming, and inherently uncertain. The United States Supreme Court has ruled on several patent cases in recent years, either narrowing the scope of patent protection available in certain circumstances or weakening the rights of patent owners in certain situations. In addition to increasing uncertainty with regard to our and our licensors' or collaborators' ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents, once obtained. Depending on decisions by the United States Congress, the federal courts, and the USPTO, the laws and regulations governing patents could change in unpredictable ways that would weaken our and our licensors' or collaborators' ability to obtain new patents or to enforce existing and future patents.

Recent patent reform legislation could increase the uncertainties and costs surrounding the prosecution of our and our licensors' or collaborators' patent applications and the enforcement or defense of our or our licensors' or collaborators' issued patents. For example, the Leahy-Smith America Invents Act, or the America Invents Act, includes provisions that affect the way patent applications are prosecuted and may also affect patent litigation. The USPTO developed new regulations and procedures to govern administration of the America Invents Act, and many of the substantive changes to patent law associated with the America Invents Act, and in particular, the first to file provisions, are now effective. While it is still not clear what, if any, impact the America Invents Act will have on the operation of our business, the America Invents Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our or our licensors' or collaborators' patent applications and the enforcement or defense of our or our licensors' or collaborators' issued patents, all of which could have a material adverse effect on our business and financial condition.

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

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

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents and other intellectual property protection, particularly those relating to biopharmaceuticals, which could make it difficult for us to stop the infringement of our patents or marketing of competing products in violation of our proprietary rights generally. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial cost and divert our efforts and attention from other aspects of 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 and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the patent process. There are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case.

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

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

- Others may be able to make compounds that are similar to our product candidates but that are not covered by the claims of the patents that we own or have exclusively licensed.
- We or our licensors or strategic partners might not have been the first to make the inventions covered by the issued patents or pending patent applications that we own or have exclusively licensed.
- We or our licensors or strategic partners might not have been the first to file patent applications covering certain of our inventions.
- Others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our intellectual property rights.
- It is possible that our pending patent applications will not lead to issued patents.
- Issued patents that we own or have exclusively licensed may not provide us with any competitive advantages, or may be held invalid or unenforceable, as a result of legal challenges by our competitors.
- Our competitors might conduct research and development activities in countries where we do not have patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets.
- We may not develop additional proprietary technologies that are patentable.
- The patents of others may have an adverse effect on our business.

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

We may be subject to claims that we or our employees or consultants have wrongfully used or disclosed alleged trade secrets of our employees' or consultants' former employers or their clients. These claims may be costly to defend and if we do not successfully do so, we may be required to pay monetary damages and may lose valuable intellectual property rights or personnel.

Many of our employees and contractors were previously employed at universities or biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although no claims against us are currently pending, we may be subject to claims that these employees or we have inadvertently or otherwise used or disclosed trade secrets or other proprietary information of their former employers. Litigation may be necessary to defend against these claims. If we fail in defending such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. A loss of key research personnel or their work product could hamper our ability to commercialize, or prevent us from commercializing our product candidates, which could severely harm our business. Even if we are successful in defending against these claims, litigation could result in substantial costs and be a distraction to management.

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

In addition to seeking patents for some of our technology and product candidates, we also rely on trade secrets, including unpatented know-how, technology and other proprietary information, to maintain our competitive position. We seek to protect these trade secrets, in part, by entering into non-disclosure and confidentiality agreements with parties who have access to them, such as our employees, corporate collaborators, outside scientific collaborators, contract manufacturers, consultants, advisors and other third parties. We also enter into invention and patent assignment agreements with our employees and consultants that obligate them to assign their inventions to us. Despite these efforts, any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret is difficult, expensive and time-consuming, and the outcome is unpredictable. In addition, some courts inside and outside the United States are less willing or unwilling to protect trade secrets. If any of our trade secrets were to be lawfully obtained or independently developed by a competitor, we would have no right to prevent them from using that technology or information to compete with us. If any of our trade secrets were to be disclosed to or independently developed by a competitor, our competitive position would be harmed.

Risks Related to Ownership of Our Common Stock

We cannot predict what the market price of our common stock will be and, as a result, it may be difficult for you to sell your shares of our common stock.

An inactive market may impair our ability to raise capital by selling shares of our common stock and may impair our ability to enter into strategic partnerships or acquire companies or products by using our shares of common stock as consideration. We cannot predict the prices at which our common stock will trade. It is possible that in one or more future periods our results of operations may be below the expectations of public market analysts and investors and, as a result of these and other factors, the price of our common stock may fall.

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

The trading price of our common stock is likely to be highly volatile and subject to wide fluctuations in response to various factors, some of which we cannot control. In addition to the factors discussed in this “Risk Factors” section these factors include:

- the success of competitive products or technologies;
- regulatory actions with respect to our products or our competitors’ products;
- actual or anticipated changes in our growth rate relative to our competitors;
- announcements by us or our competitors of significant acquisitions, strategic collaborations, joint ventures, collaborations or capital commitments;
- results of clinical trials of our product candidates or those of our competitors;
- developments or disputes concerning patent applications, issued patents or other proprietary rights;
- the recruitment or departure of key personnel;
- the results of our efforts to in-license or acquire additional product candidates or products;
- actual or anticipated changes in estimates as to financial results, development timelines or recommendations by securities analysts;
- variations in our financial results or those of companies that are perceived to be similar to us;
- share price and volume fluctuations attributable to inconsistent trading volume levels of our shares;
- announcement or expectation of additional financing efforts;
- sales of our common stock by us, our insiders or our other stockholders;
- changes in the structure of healthcare payment systems, including coverage and reimbursement;
- market conditions in the pharmaceutical and biotechnology sectors; and
- general economic, industry and market conditions.

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

To our knowledge, our executive officers, directors, holders of 5% or more of our capital stock and their respective affiliates beneficially own approximately 34% of our voting stock as of December 31, 2019. Accordingly, these stockholders may be able to determine all matters requiring stockholder approval. For example, these stockholders may be able to control elections of directors, amendments of our organizational documents, or approval of any merger, sale of assets or other major corporate transaction. This may prevent or discourage unsolicited acquisition proposals or offers for our common stock that you may feel are in your best interest as one of our stockholders. The interests of this group of stockholders may not always coincide with the interests of other stockholders and they may act in a manner that advances their best interests and not necessarily those of other stockholders, including seeking a premium value for their common stock, and might affect the prevailing market price for our common stock.

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

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

Our management will continue to have broad discretion over the use of the proceeds we received in our public offerings, private placements, warrant exercises and loans and might not apply the proceeds in ways that increase the value of your investment.

Our management will continue to have broad discretion to use the net proceeds from our public offerings, private placements warrant exercises and loans and you will be relying on the judgment of our management regarding the application of these proceeds. Our management might not apply our net proceeds in ways that ultimately increase the value of your investment. Because of the number and variability of factors that will determine our use of the remaining net proceeds from our initial public offering, follow-on public offering and other financing transactions, their ultimate use may vary substantially from their currently intended use. If we do not invest or apply the net proceeds from our public offerings, private placements, warrant exercises and loans in ways that enhance stockholder value, we may fail to achieve the expected financial results, which could cause our stock price to decline.

Future sales and issuances of equity and debt securities could result in additional dilution to our stockholders and could place restrictions on our operations and assets, and such securities could have rights, preferences and privileges senior to those of our common stock.

We expect that significant additional capital will be needed in the future to fund our planned operations, including to complete clinical trials for our product candidates. To raise capital, we may sell common stock, convertible securities or other equity securities in one or more transactions at prices and in a manner we determine from time to time. If we sell common stock, convertible securities or other equity securities, existing stockholders may be materially diluted by subsequent sales, and new investors could gain rights, preferences and privileges senior to the holders of our common stock.

Pursuant to our Amended and Restated 2013 Equity Incentive Plan, our management is authorized to grant up to 9,031,333 stock options or awards to our employees, directors and consultants, and the number of shares of our common stock reserved for future issuance under the plan will be subject to automatic annual increases in accordance with the terms of the plan. To the extent that new options are granted and exercised or we issue additional shares of common stock in the future, our stockholders may experience additional dilution, which could cause our stock price to fall.

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

As a public company listed in the United States, we incur significant additional legal, accounting and other costs. We are subject to the reporting requirements of the Exchange Act, which requires, among other things, that we file with the Securities and Exchange Commission, or the SEC, annual, quarterly and current reports with respect to our business and financial condition. In addition, changing laws, regulations and standards relating to corporate governance and public disclosure, including regulations implemented by the SEC and The Nasdaq Stock Market, may increase legal and financial compliance costs and make some activities more time consuming. These laws, regulations and standards are subject to varying interpretations and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. We invest resources to comply with evolving laws, regulations and standards, and this investment results in increased general and administrative expenses and a diversion of management's time and attention. If we do not comply with new laws, regulations and standards, regulatory authorities may initiate legal proceedings against us and our business may be harmed.

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

We may be subject to securities litigation, which is expensive and could divert management attention.

The market price of our common stock may be volatile, and in the past, companies that have experienced volatility in the market price of their stock have been subject to securities class action litigation. We may be the target of this type of litigation in the future. Securities litigation against us could result in substantial costs and divert our management's attention from other business concerns, which could seriously harm our business.

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

There are provisions in our certificate of incorporation and bylaws that may make it difficult for a third party to acquire, or attempt to acquire, control of our company, even if a change in control was considered favorable by you and other stockholders. For example, our board of directors has the authority to issue up to 100,000,000 shares of preferred stock. The board of directors can fix the price, rights, preferences, privileges and restrictions of the preferred stock without any further vote or action by our stockholders. The issuance of shares of preferred stock may delay or prevent a change in control transaction. As a result, the market price of our common stock and the voting and other rights of our stockholders may be adversely affected. An issuance of shares of preferred stock may result in the loss of voting control to other stockholders.

Our charter documents also contain other provisions that could have an anti-takeover effect, including:

- establishing a classified board of directors such that not all members of the board are elected at one time;
- allowing the authorized number of directors to be changed only by resolution of our board of directors;
- limiting the removal of directors by the stockholders;
- authorizing the issuance of “blank check” preferred stock, the terms of which may be established and shares of which may be issued without stockholder approval;
- prohibiting stockholder action by written consent, thereby requiring all stockholder actions to be taken at a meeting of our stockholders;
- eliminating the ability of stockholders to call a special meeting of stockholders;
- establishing advance notice requirements for nominations for election to the board of directors or for proposing matters than can be acted upon at stockholder meetings; and
- requiring the approval of the holders of at least 66 2/3% of the votes that all of our stockholders would be entitled to cast to amend or repeal our bylaws.

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

If securities or industry analysts cease publishing research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

The trading market for our common stock will depend in part on the research and reports that securities or industry analysts publish about us or our business. If one or more of the analysts who cover us downgrade our stock or publish inaccurate or unfavorable research about our business, our stock price would likely decline. If one or more of these analysts cease coverage of our company or fail to publish reports on us regularly, demand for our stock could decrease, which might cause our stock price and trading volume to decline.

We have never paid dividends on our capital stock, and because we do not anticipate paying any cash dividends in the foreseeable future, capital appreciation, if any, of our common stock will be your sole source of gain on an investment in our common stock.

We have paid no cash dividends on any of our classes of capital stock to date, and we currently intend to retain our future earnings, if any, to fund the development and growth of our business. In addition, the terms of our credit facility limit our ability to pay cash dividends on our capital stock. We do not anticipate paying any cash dividends on our common stock in the foreseeable future. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future. There is no guarantee that shares of our common stock will appreciate in value or even maintain the price at which you purchase shares of our common stock.

ITEM 1B. Unresolved Staff Comments

None.

ITEM 2. Properties

Our principal executive offices are located at 1601 Trapelo Road, Suite 286, Waltham, Massachusetts 02451. We lease this facility, which consists of approximately 5,923 square feet of office space, and the term of our Sublease expires on July 27, 2021. We believe that our existing facility is sufficient for our current needs for the foreseeable future.

ITEM 3. Legal Proceedings

From time to time, we may be subject to various legal proceedings and claims that arise in the ordinary course of our business activities. Although the results of litigation and claims cannot be predicted with certainty, as of the date of this Form 10-K, we do not believe we are party to any claim or litigation, the outcome of which, if determined adversely to us, would individually or in the aggregate be reasonably expected to have a material adverse effect on our business. Regardless of the outcome, litigation can have an adverse impact on us because of defense and settlement costs, diversion of management resources and other factors.

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

Our common stock has been traded on the Nasdaq Global Market under the symbol "NERV" since our initial public offering on July 1, 2014.

At March 5, 2020, there were approximately 131 holders of record of our common stock. We believe that the number of beneficial owners of our common stock at that date was substantially greater.

Our equity plan information required by this Item is incorporated by reference to the information in Part III, Item 12 of this Annual Report on Form 10-K.

Recent Sales of Unregistered Securities

During the year ended December 31, 2019, we did not issue or sell any unregistered securities not previously disclosed in a Quarterly Report on Form 10-Q or in a Current Report on Form 8-K.

Issuer Purchases of Equity Securities

We did not repurchase any securities during the quarter ended December 31, 2019.

ITEM 6. Selected Financial Data

Not applicable.

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

You should read the following discussion and analysis of our financial condition and results of operations together with the financial statements and related notes appearing elsewhere in this Annual Report on Form 10-K. Some of the information in this discussion and analysis contains forward-looking statements reflecting our current expectations and involves risk and uncertainties. For example, statements regarding our expectations as to our plans and strategy for our business, future financial performance, expense levels and liquidity sources are forward-looking statements. Our actual results and the timing of events could differ materially from those discussed in our forward-looking statements as a result of many factors, including those set forth under the "Risk Factors" section and elsewhere in this Annual Report on Form 10-K. Please also see the section entitled "Special Note Regarding Forward-Looking Statements."

Overview

We are a clinical-stage biopharmaceutical company focused on the development and commercialization of a portfolio of product candidates to treat patients suffering from central nervous system, or CNS, diseases. Leveraging our scientific insights and clinical experience, we have acquired or in-licensed three proprietary compounds that are currently in development. We believe these compounds have innovative mechanisms of action and therapeutic profiles that potentially address the unmet needs of patients with these diseases.

Our product portfolio and potential indications include: roluperidone for the treatment of schizophrenia; seltorexant (also known as MIN-202 or JNJ-42847922), which we are co-developing with Janssen Pharmaceutica NV ("Janssen"), for the treatment of insomnia disorder and Major Depressive Disorder ("MDD"); and MIN-301 for the treatment of Parkinson's disease. We believe our product candidates have significant potential to improve the lives of a large number of affected patients and their families who are currently not well-served by available therapies.

In November 2013, Cyrenaic Pharmaceuticals, Inc. ("Cyrenaic"), and Sonkei Pharmaceuticals, Inc. ("Sonkei"), merged, and the combined company was renamed Minerva Neurosciences, Inc. Cyrenaic had been incorporated in 2007 and had exclusively licensed roluperidone from Mitsubishi Tanabe Pharma Corporation ("MTPC"). Sonkei had been incorporated in 2008 and had exclusively licensed MIN-117 from MTPC. We executed the merger as we saw an opportunity to better serve an underserved patient population through combining a portfolio of promising product candidates targeting CNS diseases. As a result of the merger, we have the rights to develop and commercialize roluperidone and MIN-117 globally, excluding most of Asia.

We further expanded our product candidate portfolio in February 2014 by acquiring the shares of Mind-NRG SA ("Mind-NRG"), which had exclusive rights to develop and commercialize MIN-301. In addition, in February 2014 we entered into a co-development and license agreement with Janssen, one of the Janssen Pharmaceutical Companies of Johnson & Johnson, for the co-development of seltorexant. We entered into an amendment to this agreement in June 2017 that took effect on August 29, 2017. Under the amended agreement, we gained global strategic control of the development of seltorexant to treat insomnia, and Janssen waived its right to royalties on seltorexant insomnia sales in the Minerva territory, which includes the European Union, Switzerland, Liechtenstein, Iceland and Norway (the "Minerva Territory"). We retain our rights to seltorexant as adjunctive therapy for MDD, which include an exclusive license in the Minerva Territory with royalties payable by us to Janssen, and royalties on sales payable by Janssen to Minerva elsewhere worldwide. (See Seltorexant – Amendment to Co-Development and License Agreement below.)

We have not received regulatory approvals to commercialize any of our product candidates, and we have not generated any revenue from the sales or license of our product candidates. We have incurred significant operating losses since inception. We expect to incur net losses and negative cash flow from operating activities for the foreseeable future in connection with the clinical development and the potential regulatory approval, infrastructure development and commercialization of our product candidates.

Financial Overview

Revenue

None of our product candidates have been approved for commercialization and we have not received any revenue in connection with the sale or license of our product candidates. As a result of the Amendment to our Co-Development and License Agreement with Janssen, we have Deferred Revenue that will be recognized in future periods, the timing of which is subject to certain future events that will be evaluated in conjunction with the relevant revenue recognition pronouncements.

Research and Development Expenses

Research and development expenses consists of costs incurred in connection with the development of our product candidates, including: fees paid to consultants and clinical research organizations, or CROs, including in connection with our non-clinical and clinical trials, and other related clinical trial fees, such as for investigator grants, patient screening, laboratory work, clinical trial database management, clinical trial material management and statistical compilation and analysis; licensing fees; costs related to acquiring clinical trial materials; costs related to compliance with regulatory requirements; and costs related to salaries, benefits, bonuses and stock-based compensation granted to employees in research and development functions. We expense research and development costs as they are incurred.

The historic direct costs relating to each of our product candidates are summarized as follows (in thousands):

	Year Ended December 31,	
	2019 (1)	2018 (1)
Roluperidone	\$ 26,353	\$ 25,071
MIN-117(2)	29,007	7,081
Seltorexant(3)	—	—
MIN-301	118	480
Total	\$ 55,478	\$ 32,632

- (1) The expense for the years ended December 31, 2019 and 2018 excludes non cash stock-based compensation expense of \$2.646 million and \$2.257 million, respectively.
- (2) The MIN-117 expenses for the year ended December 31, 2019 includes a \$19.0 million expense for the impairment of the MIN-117 in-process research and development asset.
- (3) As a result of the Amendment with Janssen, we did not incur any development expense during the year ended December 31, 2019 or 2018.

Completion dates and completion costs can vary significantly for each product candidate and are difficult to predict. We anticipate we will make determinations as to which programs to pursue and how much funding to direct to each program on an ongoing basis in response to the scientific and clinical success or failure of each product candidate, the estimated costs to continue the development program relative to our available resources, as well as an ongoing assessment as to each product candidate's commercial potential. We will need to raise additional capital or may seek additional product collaborations in the future in order to complete the development and commercialization of our product candidates.

We test goodwill and in-process research and development for impairment annually on November 30 or more frequently if changes in circumstances or the occurrence of events suggest impairment exists. The test for impairment of in-process research and development requires us to make several estimates about fair value, most of which are based on projected future cash flows. Changes in these estimates may result in the recognition of an impairment loss in our results of operations. An impairment analysis is performed whenever events or changes in circumstances indicate that the carrying amount of any individual asset may not be recoverable. For example, if we or our counterparties fail to perform our respective obligations under an agreement, or if we lack sufficient funding to develop our product candidates, an impairment may result. In addition, any significant change in market conditions, estimates or judgments used to determine expected future cash flows that indicate a reduction in carrying value may give rise to impairment in the period that the change becomes known.

General and Administrative Expenses

General and administrative expenses consist principally of costs for functions in executive, finance, legal, auditing and taxes. Our general and administrative expenses include salaries, bonuses, facility and information system costs and professional fees for auditing, accounting, consulting and legal services. General and administrative costs also include non-cash stock-based compensation expense as part of our compensation strategy to attract and retain qualified staff.

We expect to continue to incur general and administrative expenses related to operating as a publicly-traded company, including increased audit and legal fees, costs of compliance with securities, corporate governance and other regulations, investor relations expenses and higher insurance premiums. In addition, we expect to incur additional costs as we hire personnel and enhance our infrastructure to support the anticipated growth of our business.

Foreign Exchange (Losses) Gains

Foreign exchange (losses) gains are comprised primarily of losses and gains of foreign currency transactions related to clinical trial expenses denominated in Euros. Since our current clinical trials are conducted in Europe, we incur certain expenses in Euros and record these expenses in United States Dollars at the time the liability is incurred. Changes in the applicable foreign currency rate between the date an expense is recorded and the payment date is recorded as a foreign currency loss or gain. We expect to continue to incur future expenses denominated in Euros as certain of our planned clinical trials are expected to be conducted in Europe.

Investment Income

Investment income consists of income earned on our cash equivalents and marketable securities.

Interest Expense

Interest expense consists of interest incurred under our former loan with Oxford Finance LLC (“Oxford”), and Silicon Valley Bank (“SVB”). During the year ended December 31, 2019, there was no debt outstanding and no interest expense recorded. During the year ended December 31, 2018, interest expense was related primarily to our loan with Oxford and SVB.

Net Operating Losses and Tax Carryforwards

As of December 31, 2019, we had approximately \$75.9 million of federal net operating loss carryforwards. These federal net operating loss carryforwards will begin to expire at various dates beginning in 2027, if not utilized. As of December 31, 2019, we had approximately \$71.6 million of state net operating loss carryforwards. During the year ended December 31, 2019, no state operating loss carryforwards had expired.

On December 22, 2017, the President signed into law the tax legislation commonly known as the Tax Cuts and Jobs Act. As part of the legislation, net operating losses created after December 31, 2017 will have an indefinite carryforward period. Additionally, these future net operating losses will be limited to 80% of taxable income for any future period in which they might be used. The legislation does not alter the amount or ability to utilize net operating losses created prior to December 31, 2017.

This legislative change regarding the carryforward period of net operating losses impacts our indefinite lived deferred tax liabilities related to our in-process research and development, or IPR&D intangibles. Prior to the change in tax law, our net operating losses could not be used to offset deferred tax liabilities resulting from taxable temporary differences with an indefinite life. After the legislative change, federal net operating loss incurred after December 31, 2017 will have an indefinite life. As a result, our deductible temporary differences will reverse and create unlimited lived deferred tax assets which may be available to offset indefinite lived deferred tax liabilities. Accordingly, we have recognized a tax benefit for the period ending December 31, 2017 to reflect this reversal pattern.

The Internal Revenue Code, or IRC, limits the amounts of net operating loss carryforwards that a company may use in any one year in the event of certain cumulative changes in ownership over a three-year period as described in Section 382 of the IRC. We have not performed a detailed analysis to determine whether an ownership change occurred upon consummation of the merger between us and Sonkei or the acquisition of Mind-NRG. However, as a result of these transactions, our initial public offering and the shares issued to Johnson & Johnson Innovation-JJDC Inc. and shareholders of Mind-NRG as part of the private placements consummated concurrently with our initial public offering, it is likely that an ownership change would occur or has occurred. Such an ownership change could also be triggered by subsequent sales of securities by us or our stockholders. Such a change in ownership would limit the utilization of our net operating losses. As a result, we may not be able to take full advantage of these tax carryforwards for federal tax purposes.

Results of Operations

Comparison of the Years Ended December 31, 2019 and December 31, 2018 (in thousands):

Expenses	Year Ended December 31,	
	2019	2018
Research and development	\$ 58,124	\$ 34,889
General and administrative	17,741	16,841
Total expenses	75,865	51,730
Loss from operations	(75,865)	(51,730)
Foreign exchange losses	(29)	(5)
Investment income	1,456	1,674
Interest expense	—	(110)
Loss before income taxes	(74,438)	(50,171)
Benefit for income taxes	(2,255)	—
Net loss	\$ (72,183)	\$ (50,171)

Research and Development Expenses

Total Research and development expenses were \$58.1 million for the year ended December 31, 2019 compared to \$34.9 million for the same period in 2018, an increase of \$23.2 million. The increase in research and development expenses primarily reflects a \$19.0 million expense for the impairment of the MIN-117 In-process research and development asset and higher development expenses for the Phase 3 clinical trial of roluperidone and the Phase 2b clinical trial of MIN-117.

General and Administrative Expenses

Total general and administrative expenses were \$17.7 million for the year ended December 31, 2019 compared to \$16.8 million for the same period in 2018, an increase of approximately \$0.9 million. This increase in general and administrative expenses was primarily due to an increase in non-cash stock-based compensation expenses and higher professional fees to support pre-commercial activities.

Foreign Exchange Losses

Foreign exchange losses were \$29 thousand for the year ended December 31, 2019 compared to a loss of \$5 thousand for the same period in 2018, an increased loss of \$24 thousand. The loss was primarily due to clinical activities denominated in Euros.

Investment Income

Investment income was \$1.5 million for the year ended December 31, 2019 compared to \$1.7 million for the same period in 2018, a decrease of \$0.2 million. The decrease was due to a decrease in investment income on cash equivalents and marketable securities.

Interest Expense

Interest expense was zero for the year ended December 31, 2019 compared to \$0.1 million for the same period in 2018, a decrease of \$0.1 million. The decrease was due to the repayment of principal on our Term A Loans in 2018.

Benefit for Income Taxes

Benefit for income taxes was \$2.3 million and zero for the years ended December 31, 2019 and 2018, respectively. The \$2.3 million benefit was a result of lowering the deferred tax liability due to the impairment of the MIN-117 IPR&D asset.

Liquidity and Capital Resources

Sources of Liquidity

We have incurred losses and cumulative negative cash flows from operations since our inception in April 2007 and, as of December 31, 2019, we had an accumulated deficit of approximately \$286.7 million. We anticipate that we will continue to incur net losses for the foreseeable future as we continue the development and potential commercialization of our product candidates and to support our operations as a public company. At December 31, 2019, we had approximately \$46.0 million in cash, cash equivalents, restricted cash, and marketable securities. We believe that our existing cash, cash equivalents, restricted cash, and marketable securities will be sufficient to meet our cash commitments for at least the next 12 months after the date that the financial statements are issued. The process of drug development can be costly and the timing and outcomes of clinical trials is uncertain. The assumptions upon which we have based our estimates are routinely evaluated and may be subject to change. The actual amount of our expenditures will vary depending upon a number of factors including but not limited to the design, timing and duration of future clinical trials, the progress of our research and development programs and the level of financial resources available. We have the ability to adjust our operating plan spending levels based on the timing of future clinical trials which will be predicated upon adequate funding to complete the trials.

Sources of Funds

Amendment to Co-Development and License Agreement with Janssen

On August 29, 2017, the European Commission approved the Amendment to our Co-Development and License Agreement with Janssen under which Janssen made an upfront payment to us of \$30 million in August 2017 and agreed to make a \$20 million payment at the start of a Phase 3 insomnia trial for seltorexant and a \$20 million payment when 50% of the patients are enrolled in this trial. Janssen further agreed to waive the remaining payments due from us until the completion of certain Phase 2b trials, including \$11.2 million in previously accrued collaborative expenses. In connection with the Amendment, we also repurchased all of the approximately 3.9 million shares of our stock previously owned by Johnson & Johnson Innovation-JJDC Inc. at a per share price of \$0.0001, for an aggregate purchase price of approximately \$389.

Public Offering of Common Stock

On July 5, 2017, we closed a public offering of common stock, in which we issued and sold 5,750,000 shares of our common stock, including 750,000 shares sold pursuant to the underwriters' full exercise of their option to purchase additional shares, at a public offering price of \$7.75, for aggregate gross proceeds to us of \$44.6 million. All of the shares issued and sold in this public offering were registered under the Securities Act pursuant to a registration statement on Form S-3 (File No. 333-205764) and a related prospectus and prospectus supplement, in each case filed with the Securities and Exchange Commission. We incurred \$3.0 million in underwriting discounts and commissions and transaction costs, which will be included as a component of additional paid-in capital, resulting in net proceeds of approximately \$41.6 million.

Uses of Funds

To date, we have not generated any revenue. We do not know when, or if, we will generate any revenue from sales of our products or royalty payments from our collaboration with Janssen. We do not expect to generate significant revenue from product sales unless and until we obtain regulatory approval of and commercialize any of our product candidates. At the same time, we expect our expenses to increase in connection with our ongoing development activities, particularly as we continue the research, development and clinical trials of, and seek regulatory approval for, our product candidates. We also expect to continue to incur costs associated with operating as a public company. In addition, subject to obtaining regulatory approval of any of our product candidates, we expect to incur significant commercialization expenses for product sales, marketing, manufacturing and distribution.

If it is determined that we are required to make a significant payment to Janssen, we may not have sufficient cash to make such payment and may be required to incur additional indebtedness or to raise additional funds via an equity financing in order to make such payment to Janssen. We cannot be certain that we will be able to borrow or raise sufficient funds for this purpose under terms acceptable to us, if at all. While we are engaged in ongoing discussions with Janssen concerning the Agreement and our continued business relationship, there can be no assurance that we will be able to resolve this disagreement to our satisfaction, or at all.

Until such time, if ever, as we can generate substantial revenue from product sales, we expect to finance our cash needs through a combination of equity offerings, debt financings, government or other third-party funding, commercialization, marketing and distribution arrangements and other collaborations, strategic alliances and licensing arrangements. To the extent that we raise additional capital through the sale of equity or convertible debt securities, the ownership interests of our common stockholders will be

diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our common stockholders. Additional debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through government or other third-party funding, commercialization, marketing and distribution arrangements or other collaborations, strategic alliances or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or product candidates or to grant licenses on terms that may not be favorable to us. There can be no assurance that such additional funding, if available, can be obtained on terms acceptable to us. If we are unable to obtain additional financing, future operations would need to be scaled back or discontinued. We believe that our existing cash, cash equivalents, restricted cash, and marketable securities will be sufficient to meet our cash commitments for at least the next 12 months after the date that the financial statements are issued. The timing of future capital requirements depends upon many factors including the size and timing of future clinical trials, the timing and scope of any strategic partnering activity and the progress of other research and development activities.

Cash Flows

The tables below set forth our significant sources and uses of cash for the periods set forth below.

	Year Ended December 31,	
	2019	2018
	(dollars in millions)	
Net cash (used in) provided by:		
Operating activities	\$ (43.4)	\$ (41.9)
Investing activities	14.1	69.5
Financing activities	0.5	(3.3)
Net increase (decrease) in cash	\$ (28.8)	\$ 24.3

Net Cash Used in Operating Activities

Net cash used in operating activities of approximately \$43.4 million during the year ended December 31, 2019 was primarily due to our net loss of \$72.2 million, a decrease of \$2.2 million in deferred taxes, and amortization of investments of \$0.8 million, partially offset by an impairment expense of in-process research and development assets of \$19.0 million, stock-based compensation expense of \$9.2 million, an increase in accrued expenses \$2.3 million, a decrease in prepaid expenses of \$0.7 million, and an increase in accounts payable of \$0.6 million.

Net cash used in operating activities of approximately \$41.9 million during the year ended December 31, 2018 was primarily due to our net loss of \$50.2 million, an increase in prepaid expenses of \$0.6 million and amortization of investments of \$0.1 million, partially offset by stock-based compensation expense of \$8.2 million, an increase in accounts payable of \$0.4 million and an increase in accrued expenses \$0.4 million.

Net Cash Provided by Investing Activities

Net cash provided by investing activities of approximately \$14.1 million during the year ended December 31, 2019 was primarily due to the maturity and redemption of marketable securities of \$75.2 million, partially offset by the purchase of marketable securities of \$61.1 million.

Net cash provided by investing activities of approximately \$69.5 million during the year ended December 31, 2018 was primarily due to the maturity and redemption of marketable securities of \$110.2 million, partially offset by the purchase of marketable securities of \$40.7 million.

Net Cash Provided by (Used In) Financing Activities

Net cash provided by financing activities of \$0.5 million during the year ended December 31, 2019 was due to the proceeds from the exercise of common stock options of \$0.5 million.

Net cash used in financing activities of \$3.4 million during the year ended December 31, 2018 was due to principal repayments and payment of an end of term fee under the Term A Loans of \$4.0 million, partially offset by the proceeds from the exercise of common stock options of \$0.6 million.

Off-Balance Sheet Arrangements

We did not have during the periods presented, and we do not currently have, any off-balance sheet arrangements as defined under SEC rules.

Critical Accounting Policies and Estimates

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

While our significant accounting policies are more fully described in Note 2 to our financial statements appearing elsewhere in this Form 10-K, we believe that the following accounting policies are the most critical for fully understanding and evaluating our financial condition and results of operations.

Research and Development Costs

Costs incurred in connection with research and development activities are expensed as incurred. These costs include licensing fees to use certain technology in our research and development projects as well as fees paid to consultants and various entities that perform certain research and testing on our behalf and costs related to salaries, benefits, bonuses and stock-based compensation granted to employees in research and development functions. We determine our expenses related to clinical studies based on our estimates of the services received and efforts expended pursuant to contracts with multiple research institutions and contract research organizations that conduct and manage clinical studies on our behalf. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. Payments under some of these contracts depend on factors such as the successful enrollment of patients and the completion of clinical trial milestones. In accruing service fees, we estimate the time period over which services will be performed and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from our estimate, we adjust the accrual accordingly. The expenses for some trials may be recognized on a straight-line basis if the anticipated costs are expected to be incurred ratably during the period. Payments for these activities are based on the terms of the individual arrangements, which may differ from the pattern of costs incurred, and are reflected in the condensed consolidated financial statements as prepaid or accrued expenses.

We make estimates of our accrued research and development expenses as of each balance sheet date in our financial statements based on facts and circumstances known at that time. Although we do not expect that our estimates will be materially different from amounts actually incurred, our understanding of status and timing of services performed relative to the actual status and timing of services performed may vary and may result in our reporting amounts that are too high or too low for any particular period. There had been no material adjustments to our prior period estimates of accrued expenses for clinical trials. However, due to the nature of estimates, we cannot assure you that we will not make changes to our estimates in the future as we become aware of additional information about the status or conduct of our clinical trials.

In-process Research and Development

In-process research and development, or IPR&D, assets represent capitalized incomplete research projects that we acquired through business combinations. Such assets are initially measured at their acquisition date fair values. The initial fair value of the research projects is recorded as intangible assets on the balance sheet, rather than expensed, regardless of whether these assets have an alternative future use.

The amounts capitalized are being accounted for as indefinite-lived intangible assets, subject to impairment testing, until completion or abandonment of research and development efforts associated with the project. An IPR&D asset is considered abandoned when it ceases to be used (that is, research and development efforts associated with the asset have ceased, and there are no plans to sell or license the asset or derive defensive value from the asset). At that point, the asset is considered to be disposed of and is written off. Upon successful completion of each project, we will make a determination about the then remaining useful life of the intangible asset and begin amortization. We test our indefinite-lived intangibles, IPR&D assets, for impairment annually on November 30 and more frequently if events or changes in circumstances indicate that it is more likely than not that the asset is impaired. In estimating the fair value of IPR&D, an income approach was used with a discounted cash flow analysis. Many assumptions and estimates are included in this analysis including revenue and expense projections, probability of success factors, expected product launch date and a weighted average cost of capital of 20.0%.

Potential triggering events that could indicate whether an impairment to the IPR&D may have occurred include: clinical trial results where the compound under investigation did not meet pre-established criteria or clinical endpoints, failure to obtain regulatory approval, the inability to fund future clinical trials, failure to obtain patent protection, adverse changes in the regulatory environment, the approval of competing therapies or compounds, adverse changes in applicable laws or regulations and a variety of other circumstances. The impairment of IPR&D could have a material adverse impact on our financial condition. In order to determine whether an impairment has occurred, management must evaluate the events and incorporate multiple assumptions including: costs associated with continuing the development program, competing therapies or compounds, potential market size, estimated future cash flows and other factors. When testing indefinite-lived intangibles for impairment, we may assess qualitative factors for our indefinite-lived intangibles to determine whether it is more likely than not (that is, a likelihood of more than 50 percent) that the asset is impaired. Alternatively, we may bypass this qualitative assessment for some or all of our indefinite-lived intangibles and perform the quantitative impairment test that compares the fair value of the indefinite-lived intangible asset with the asset's carrying amount. We test our IPR&D for impairment as of November 30. There was no impairment of the Mind-NRG IPR&D asset for the years ended December 31, 2019 or 2018.

Impairment of MIN-117 In-process Research and Development Asset.

As a result of our Phase 2b trial of MIN-117 in adult patients suffering from moderate to severe MDD not meeting its primary and key secondary endpoints and our decision not to further the clinical development of MIN-117 in MDD, we determined that the MIN-117 IPR&D is fully impaired and recognized a \$19.0 million expense, which was included as a component of research and development expense, during the year ended December 31, 2019. There was no impairment of the MIN-117 IPR&D for the year ended December 31, 2018.

Goodwill

We test our goodwill for impairment annually, or whenever events or changes in circumstances indicate an impairment may have occurred, by comparing our reporting unit's carrying value to its fair value. Impairment may result from, among other things, deterioration in the performance of the acquired business, adverse market conditions, adverse changes in applicable laws or regulations and a variety of other circumstances. If we determine that an impairment has occurred, we are required to record a write-down of the carrying value and charge the impairment as an operating expense in the period the determination is made. In evaluating the recoverability of the carrying value of goodwill, we must make assumptions regarding estimated future cash flows and other factors to determine the fair value of the acquired assets. Changes in strategy or market conditions could significantly impact those judgments in the future and require an adjustment to the recorded balances. We test our goodwill for impairment as of November 30. There was no impairment of goodwill for the years ended December 31, 2019 or 2018.

Income Taxes

Deferred tax assets and liabilities are determined based on differences between financial reporting and tax reporting bases of assets and liabilities and are measured using enacted tax rates and laws that are expected to be in effect when the differences are expected to reverse. Uncertain tax positions are evaluated and if appropriate, the amount of unrecognized tax benefits are recorded within deferred tax assets. Deferred tax assets are evaluated for realization based on a more-likely-than-not criterion in determining if a valuation allowance should be provided. Valuation allowances are established when necessary to reduce deferred tax assets to the amounts expected to be realized.

We use a recognition threshold and measurement attribute for the financial statement recognition and measurement of a tax position taken, or expected to be taken, in a tax return. We have elected to treat interest and penalties, to the extent they arise, as a component of income taxes. There was no interest or penalties related to income taxes for the years ended December 31, 2019 or 2018. Income tax years beginning in 2012 for federal and state purposes are generally subject to examination by taxing authorities, although net operating losses from all prior years are subject to examinations and adjustments for at least three years following the year in which the tax attributes are utilized.

Recent Accounting Pronouncements

From time to time, new accounting pronouncements are issued by Financial Accounting Standards Board ("FASB") and are adopted by us as of the specified effective date. Unless otherwise disclosed in the notes to the financial statements appearing elsewhere in this Form 10-K, we believe that the impact of other recently issued, but not yet adopted, accounting pronouncements will not have a material impact on the financial position, results of operations or cash flows, or do not apply to our operations.

ITEM 7A. Quantitative and Qualitative Disclosures about Market Risk

Not applicable.

ITEM 8. Financial Statements and Supplementary Data

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the shareholders and the Board of Directors of Minerva Neurosciences, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Minerva Neurosciences, Inc. and subsidiaries (the "Company") as of December 31, 2019 and 2018, the related consolidated statements of operations, shareholders' equity, and cash flows, for each of the two years in the period ended December 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 as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2019, in conformity with accounting principles generally accepted in the United States of America.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated March 9, 2020, expressed an unqualified opinion on the Company's internal control over financial reporting.

Disagreement with Co-Development and License Agreement Counterparty

As discussed in Note 9 to the financial statements, the Company is in a dispute with the counterparty to its co-development and license agreement as to whether amounts are owed to that counterparty under the terms of the agreement. Our opinion is not modified with respect to this matter.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ DELOITTE & TOUCHE LLP

Boston, Massachusetts
March 9, 2020

We have served as the Company's auditor since 2013.

MINERVA NEUROSCIENCES, INC.
Consolidated Balance Sheets

	December 31, 2019	December 31, 2018
Assets		
Current assets		
Cash and cash equivalents	\$ 21,412,623	\$ 50,234,871
Marketable securities	24,441,520	37,762,439
Restricted cash	100,000	100,000
Prepaid expenses and other current assets	1,182,483	1,921,050
Total current assets	47,136,626	90,018,360
Equipment, net	16,011	33,478
Other noncurrent assets	14,808	14,808
Operating lease right-of-use assets	261,952	—
In-process research and development	15,200,000	34,200,000
Goodwill	14,869,399	14,869,399
Total assets	\$ 77,498,796	\$ 139,136,045
Liabilities and Stockholders' Equity		
Current liabilities		
Accounts payable	\$ 2,317,004	\$ 1,799,666
Accrued expenses and other current liabilities	4,139,163	1,809,532
Operating leases	172,901	—
Total current liabilities	6,629,068	3,609,198
Deferred taxes	1,803,356	4,057,488
Deferred revenue	41,175,600	41,175,600
Noncurrent operating leases	111,229	—
Other noncurrent liabilities	—	28,990
Total liabilities	49,719,253	48,871,276
Commitments and contingencies (Note 9)		
Stockholders' equity		
Preferred stock; \$.0001 par value; 100,000,000 shares authorized; none issued or outstanding as of December 31, 2019 and 2018, respectively	—	—
Common stock; \$.0001 par value; 125,000,000 shares authorized; 39,084,121 and 38,937,971 shares issued and outstanding as of December 31, 2019 and 2018, respectively	3,908	3,894
Additional paid-in capital	314,511,853	304,813,603
Accumulated deficit	(286,736,218)	(214,552,728)
Total stockholders' equity	27,779,543	90,264,769
Total liabilities and stockholders' equity	\$ 77,498,796	\$ 139,136,045

See accompanying notes to the consolidated financial statements.

MINERVA NEUROSCIENCES, INC.
Consolidated Statements of Operations

	Year Ended December 31,	
	2019	2018
Expenses		
Research and development	\$ 58,124,354	\$ 34,888,574
General and administrative	17,740,742	16,841,308
Total expenses	75,865,096	51,729,882
Loss from operations	(75,865,096)	(51,729,882)
Foreign exchange losses	(28,545)	(4,847)
Investment income	1,456,019	1,673,890
Interest expense	—	(110,448)
Loss before income taxes	(74,437,622)	(50,171,287)
Benefit for income taxes	(2,254,132)	—
Net loss	\$ (72,183,490)	\$ (50,171,287)
Net loss per share, basic and diluted	\$ (1.85)	\$ (1.29)
Weighted average shares outstanding, basic and diluted	39,014,302	38,792,581

See accompanying notes to the consolidated financial statements.

MINERVA NEUROSCIENCES, INC.
Consolidated Statements of Stockholders' Equity

	Common Stock		Additional Paid-In Capital	Accumulated Deficit	Total
	Shares	Amount			
Balances at January 1, 2018	38,749,343	\$ 3,875	\$ 295,975,010	\$ (164,381,441)	\$ 131,597,444
Exercise of stock options	129,978	13	655,921	—	655,934
Vesting of restricted stock units	58,650	6	(6)	—	—
Stock-based compensation	—	—	8,182,678	—	8,182,678
Net loss	—	—	—	(50,171,287)	(50,171,287)
Balances at December 31, 2018	38,937,971	\$ 3,894	\$ 304,813,603	\$ (214,552,728)	\$ 90,264,769
Exercise of stock options	87,500	8	524,991	—	524,999
Vesting of restricted stock units	58,650	6	(6)	—	—
Stock-based compensation	—	—	9,173,265	—	9,173,265
Net loss	—	—	—	(72,183,490)	(72,183,490)
Balances at December 31, 2019	39,084,121	\$ 3,908	\$ 314,511,853	\$ (286,736,218)	\$ 27,779,543

See accompanying notes to the consolidated financial statements.

MINERVA NEUROSCIENCES, INC.
Consolidated Statements of Cash Flows

	<u>Year Ended December 31,</u>	
	<u>2019</u>	<u>2018</u>
Cash flows from operating activities:		
Net loss	\$ (72,183,490)	\$ (50,171,287)
Adjustments to reconcile net loss to net cash used in operating activities:		
Impairment of in-process research and development	19,000,000	—
Depreciation and amortization	17,467	17,467
Amortization of debt discount recorded as interest expense	—	38,040
Accretion of marketable securities premium	(764,057)	(119,614)
Amortization of right-of-use assets	144,040	—
Stock-based compensation expense	9,173,265	8,182,678
Deferred taxes	(2,254,132)	—
Changes in operating assets and liabilities		
Prepaid expenses and other current assets	723,266	(621,866)
Accounts payable	517,338	364,030
Accrued expenses and other current liabilities	2,329,631	369,684
Operating lease liabilities, current	37,351	—
Other noncurrent liabilities	—	(888)
Operating lease liabilities, noncurrent	(172,902)	—
Net cash used in operating activities	<u>(43,432,223)</u>	<u>(41,941,756)</u>
Cash flows from investing activities:		
Purchases of marketable securities	(61,094,024)	(40,661,424)
Proceeds from the maturity and redemption of marketable securities	75,179,000	110,151,000
Net cash provided by investing activities	<u>14,084,976</u>	<u>69,489,576</u>
Cash flows from financing activities:		
Proceeds from exercise of stock options	524,999	655,934
Repayments of notes payable	—	(4,000,704)
Net cash provided by (used in) financing activities	<u>524,999</u>	<u>(3,344,770)</u>
Net (decrease) increase in cash, cash equivalents, and restricted cash	<u>(28,822,248)</u>	<u>24,203,050</u>
Cash, cash equivalents, and restricted cash		
Beginning of period	50,334,871	26,131,821
End of period	<u>\$ 21,512,623</u>	<u>\$ 50,334,871</u>
Supplemental disclosure of cash flow information		
Cash paid for interest	<u>\$ —</u>	<u>\$ 92,916</u>
Reconciliation of the Condensed Consolidated Statements of Cash Flows to the Condensed Consolidated Balance Sheets		
Cash and cash equivalents	\$ 21,412,623	\$ 50,234,871
Restricted cash	\$ 100,000	\$ 100,000
Total cash, cash equivalents, and restricted cash	<u>\$ 21,512,623</u>	<u>\$ 50,334,871</u>

See accompanying notes to the consolidated financial statements.

NOTE 1 — NATURE OF OPERATIONS AND LIQUIDITY

Nature of Operations

Minerva Neurosciences, Inc. (“Minerva” or the “Company”) is a clinical-stage biopharmaceutical company focused on the development and commercialization of a portfolio of product candidates to treat patients suffering from central nervous system diseases. The Company has acquired or in-licensed four development-stage proprietary compounds that it believes have innovative mechanisms of action and therapeutic profiles that may potentially address the unmet needs of patients with these diseases. The Company’s lead product candidate is roluperidone (also known as MIN-101), a compound the Company is developing for the treatment of schizophrenia. In addition, the Company’s portfolio includes seltorexant (also known as MIN-202 or JNJ-42847922), a compound the Company is co-developing with Janssen Pharmaceutica NV (“Janssen”) for the treatment of insomnia disorder and major depressive disorder (“MDD”); MIN-117, a compound the Company is developing for the treatment of MDD; and MIN-301, a compound the Company is developing for the treatment of Parkinson’s disease.

In November 2013, the Company merged with Sonkei Pharmaceuticals Inc. (“Sonkei”), a clinical-stage biopharmaceutical company and, in February 2014, the Company acquired Mind-NRG, a pre-clinical-stage biopharmaceutical company. The Company refers to these transactions as the Sonkei Merger and Mind-NRG Acquisition, respectively. The Company holds licenses to roluperidone and MIN-117 from Mitsubishi Tanabe Pharma Corporation (“MTPC”) with the rights to develop, sell and import roluperidone and MIN-117 globally, excluding most of Asia. With the acquisition of Mind-NRG, the Company obtained exclusive rights to develop and commercialize MIN-301. The Company has also entered into a co-development and license agreement with Janssen, for the exclusive right to commercialize, and the co-exclusive right (with Janssen and its affiliates) to use and develop, seltorexant in the European Union, Switzerland, Liechtenstein, Iceland and Norway (the “Minerva Territory”), subject to certain royalty payments to Janssen, and royalty rights for any sales outside the Minerva Territory.

Liquidity

The accompanying financial statements have been prepared as though the Company will continue as a going concern, which contemplates the realization of assets and satisfaction of liabilities in the normal course of business. The Company has limited capital resources and has incurred recurring operating losses and negative cash flows from operations since inception. As of December 31, 2019, the Company has an accumulated deficit of approximately \$286.7 million and net cash used in operating activities was approximately \$43.4 million during the year ended December 31, 2019. The Company’s management team expects to continue to incur operating losses and negative cash flows from operations. The Company has financed its operations to date from proceeds from the sale of common stock, warrants, loans and convertible promissory notes.

As of December 31, 2019, the Company had cash, cash equivalents, restricted cash, and marketable securities of \$46.0 million. The Company believes that its existing cash, cash equivalents, restricted cash, and marketable securities will be sufficient to meet its cash commitments for at least the next 12 months after the date that the financial statements are issued. The process of drug development can be costly and the timing and outcomes of clinical trials is uncertain. The assumptions upon which the Company has based its estimates are routinely evaluated and may be subject to change. The actual amount of the Company’s expenditures will vary depending upon a number of factors including but not limited to the design, timing and duration of future clinical trials, the progress of the Company’s research and development programs, the resolution of the Company’s dispute with Janssen as described in Notes 5 and 9, the infrastructure to support a commercial enterprise, the cost of a commercial product launch, and the level of financial resources available. If it is determined that we are required to make a significant payment to Janssen, we may not have sufficient cash to make such payment and may be required to incur additional indebtedness or to raise additional funds via an equity financing in order to make such payment to Janssen. The Company has the ability to adjust its operating plan spending levels based on the timing of future clinical trials which will be predicated upon adequate funding to complete the trials.

The Company will need to raise additional capital in order to continue to fund operations and fully fund later stage clinical development programs. The Company believes that it will be able to obtain additional working capital through equity financings or other arrangements to fund future operations; however, there can be no assurance that such additional financing, if available, can be obtained on terms acceptable to the Company. If the Company is unable to obtain such additional financing, future operations would need to be scaled back or discontinued.

NOTE 2 — SIGNIFICANT ACCOUNTING POLICIES

Basis of presentation

The financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America (“GAAP”), and include all adjustments necessary for the fair presentation of the Company’s financial position for the periods presented. From its inception, the Company has devoted substantially all of its efforts to business planning, engaging regulatory, manufacturing and other technical consultants, planning and executing clinical trials and raising capital.

Consolidation

The accompanying consolidated financial statements include the results of the Company and its wholly-owned subsidiaries, Mind-NRG Sarl and Minerva Neurosciences Securities Corporation. Intercompany transactions have been eliminated.

Significant risks and uncertainties

The Company’s operations are subject to a number of factors that can affect its operating results and financial condition. Such factors include, but are not limited to: the results of clinical testing and trial activities of the Company’s products, the Company’s ability to obtain regulatory approval to market its products, competition from products manufactured and sold or being developed by other companies, the price of, and demand for, Company products, the Company’s ability to negotiate favorable licensing or other manufacturing and marketing agreements for its products, and the Company’s ability to raise capital.

The Company currently has no commercially approved products and there can be no assurance that the Company’s research and development will be successfully commercialized. Developing and commercializing a product requires significant time and capital and is subject to regulatory review and approval as well as competition from other biotechnology and pharmaceutical companies. The Company operates in an environment of rapid change and is dependent upon the continued services of its employees and consultants and obtaining and protecting intellectual property.

Use of estimates

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosures of contingent assets and liabilities at the date of the financial statements and the reported amounts of expenses during the reporting period. Actual results could differ from those estimates.

Cash and cash equivalents

Cash equivalents include short-term, highly-liquid instruments, consisting of money market accounts and short-term investments with maturities from the date of purchase of 90 days or less. The majority of cash and cash equivalents are maintained with major financial institutions in North America. Deposits with these financial institutions may exceed the amount of insurance provided on such deposits. These deposits may be redeemed upon demand which reduces counterparty performance risk.

Restricted cash

Cash accounts with any type of restriction are classified as restricted. The Company maintained restricted cash balances as collateral for corporate credit cards in the amount of \$0.1 million at December 31, 2019 and 2018.

Marketable securities

Marketable securities consists of corporate and U.S. government debt securities maturing in four months or less. Based on the Company's intentions regarding its marketable securities, all marketable securities are classified as held-to-maturity and are carried under the amortized cost approach. The Company's investments in marketable securities are classified as Level 2 within the fair value hierarchy. As of December 31, 2019, remaining final maturities of marketable securities ranged from January 2020 to April 2020, with a weighted average remaining maturity of approximately 1.83 months. The following tables provide the amortized cost basis, aggregate fair value, unrealized gains/losses and the net carrying value of investments in held-to-maturity securities as of December 31, 2019 and 2018:

	December 31, 2019				
	Amortized Cost	Aggregate Fair Value	Unrealized Gains	Unrealized Losses Outstanding Less Than One Year	Net Carrying Value
Marketable securities:					
Corporate bonds/notes	\$ 2,701,114	\$ 2,700,678	\$ 436	\$ —	\$ 2,701,114
Commercial paper	19,245,921	19,245,921	—	—	19,245,921
U.S. government agency securities	2,494,485	2,495,675	—	(1,190)	2,494,485
Marketable securities total	<u>\$ 24,441,520</u>	<u>\$ 24,442,274</u>	<u>\$ 436</u>	<u>\$ (1,190)</u>	<u>\$ 24,441,520</u>
	December 31, 2018				
	Amortized Cost	Aggregate Fair Value	Unrealized Gains	Unrealized Losses Outstanding Less Than One Year	Net Carrying Value
Marketable securities current:					
Corporate bonds/notes	\$ 16,054,071	\$ 16,050,462	\$ 3,609	\$ —	\$ 16,054,071
Commercial paper	17,756,394	17,756,394	—	—	17,756,394
U.S. government agency securities	3,951,974	3,951,040	934	—	3,951,974
Marketable securities total	<u>\$ 37,762,439</u>	<u>\$ 37,757,896</u>	<u>\$ 4,543</u>	<u>\$ —</u>	<u>\$ 37,762,439</u>

Research and development costs

Costs incurred in connection with research and development activities are expensed as incurred. These costs include licensing fees to use certain technology in the Company's research and development projects as well as fees paid to consultants and various entities that perform certain research and testing on behalf of the Company and costs related to salaries, benefits, bonuses and stock-based compensation granted to employees in research and development functions. The Company determines expenses related to clinical studies based on estimates of the services received and efforts expended pursuant to contracts with multiple research institutions and contract research organizations that conduct and manage clinical studies on its behalf. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. Payments under some of these contracts depend on factors such as the successful enrollment of patients and the completion of clinical trial milestones. In accruing service fees, the Company estimates the time period over which services will be performed and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from the estimate, the accrual is adjusted accordingly. The expenses for some trials may be recognized on a straight-line basis if the anticipated costs are expected to be incurred ratably during the period. Payments for these activities are based on the terms of the individual arrangements, which may differ from the pattern of costs incurred, and are reflected in the consolidated financial statements as prepaid or accrued expenses.

In-process research and development

In-process research and development ("IPR&D") assets represent capitalized incomplete research projects that the Company acquired through business combinations. Such assets are initially measured at their acquisition date fair values. The initial fair value of the research projects are recorded as intangible assets on the balance sheet, rather than expensed, regardless of whether these assets have an alternative future use.

The amounts capitalized are being accounted for as indefinite-lived intangible assets, subject to impairment testing, until completion or abandonment of research and development efforts associated with the project. An IPR&D asset is considered abandoned when it ceases to be used (that is, research and development efforts associated with the asset have ceased, and there are no plans to sell or license the asset or derive defensive value from the asset). At that point, the asset is considered to be disposed of and is written off. Upon successful completion of each project, the Company will make a determination about the then remaining useful life of the intangible asset and begin amortization. The Company tests its indefinite-lived intangibles, IPR&D assets, for impairment annually on

November 30 and more frequently if events or changes in circumstances indicate that it is more likely than not that the asset is impaired. When testing indefinite-lived intangibles for impairment, the Company may assess qualitative factors for its indefinite-lived intangibles to determine whether it is more likely than not (that is, a likelihood of more than 50 percent) that the asset is impaired. Alternatively, the Company may bypass this qualitative assessment for some or all of its indefinite-lived intangibles and perform the quantitative impairment test that compares the fair value of the indefinite-lived intangible asset with the asset's carrying amount. There was no impairment of Mind-NRG IPR&D asset for the years ended December 31, 2019 or 2018.

Impairment of MIN-117 In-process Research and Development Asset.

As a result of the Company's Phase 2b trial of MIN-117 in adult patients suffering from moderate to severe major depressive disorder ("MDD") not meeting its primary and key secondary endpoints and the Company's decision not to further the clinical development of MIN-117 in MDD, the Company determined that the MIN-117 IPR&D is fully impaired and recognized a \$19.0 million expense, which was included as a component of research and development expense, during the year ended December 31, 2019. There was no impairment of the MIN-117 IPR&D for the year ended December 31, 2018.

Stock-based compensation

The Company recognizes compensation cost relating to stock-based payment transactions using a fair-value measurement method, which requires all stock-based payments to employees, including grants of employee stock options, to be recognized in operating results as compensation expense based on fair value over the requisite service period of the awards. The Company determines the fair value of stock-based awards using the Black-Scholes option-pricing model which uses both historical and current market data to estimate fair value. The method incorporates various assumptions such as the risk-free interest rate, expected volatility, expected dividend yield, and expected life of the options. Forfeitures are recorded as they occur instead of estimating forfeitures that are expected to occur. The fair value of restricted stock units ("RSUs") is equal to the closing price of the Company's common stock on the date of grant.

An accounting policy change was made by the Company related to the accounting for non-employee awards on January 1, 2019 as a result of the adoption of ASU No. 2018-07, *Stock Compensation (Topic 718): Improvements to Nonemployee Share-Based Payment Accounting* for which the Company now accounts for non-employee awards in the same manner as employee awards.

The date of expense recognition for grants to non-employees is the earlier of the date at which a commitment for performance by the counterparty to earn the equity instrument is reached or the date at which the counterparty's performance is complete. The Company determines the fair value of stock-based awards granted to non-employees similar to the way fair value of awards are determined for employees except that certain assumptions used in the Black-Scholes option-pricing model, such as expected life of the option, may be different.

Foreign currency transactions

The Company's functional currency is the U.S. Dollar. The Company pays certain vendor invoices in the respective foreign currency. The Company records an expense in U.S. Dollars at the time the liability is incurred. Changes in the applicable foreign currency rate between the date an expense is recorded and the payment date is recorded as a foreign currency gain or loss.

Loss per share

Basic loss per share is computed by dividing net loss by the weighted-average number of shares of common stock outstanding for the period. Diluted loss per share reflects the potential dilution that could occur if securities or other contracts to issue common stock were exercised or converted into common stock or resulted in the issuance of common stock that shared in the earnings of the entity. The treasury stock method is used to determine the dilutive effect of the Company's stock options and warrants. The Company had a net loss in all periods presented thus the inclusion of stock options and warrants would be anti-dilutive to net loss per share.

Income taxes

Deferred tax assets and liabilities are determined based on differences between financial reporting and tax reporting bases of assets and liabilities and are measured using enacted tax rates and laws that are expected to be in effect when the differences are expected to reverse. Uncertain tax positions are evaluated and if appropriate, the amount of unrecognized tax benefits are recorded within deferred tax assets. Deferred tax assets are evaluated for realization based on a more-likely-than-not criterion in determining if a valuation allowance should be provided. Valuation allowances are established when necessary to reduce deferred tax assets to the amounts expected to be realized.

The Company uses a recognition threshold and measurement attribute for the financial statement recognition and measurement of a tax position taken, or expected to be taken, in a tax return. The Company has elected to treat interest and penalties, to the extent they arise, as a component of income tax expense. There was no interest or penalties related to income taxes for the years ended December 31, 2019 or 2018. Income tax years beginning in 2012 for federal and state purposes are generally subject to examination by taxing authorities, although net operating losses from all prior years are subject to examinations and adjustments for at least three years following the year in which the tax attributes are utilized.

Concentration of credit risk

Financial instruments that potentially subject the Company to concentrations of credit risk are primarily cash, cash equivalents and marketable securities. The Company maintains its cash and cash equivalent balances in the form of business checking accounts and money market accounts, the balances of which, at times, may exceed federally insured limits. Exposure to cash and cash equivalents credit risk is reduced by placing such deposits with major financial institutions and monitoring their credit ratings. Marketable securities consist primarily of corporate bonds, with fixed interest rates. Exposure to credit risk of marketable securities is reduced by maintaining a diverse portfolio and monitoring their credit ratings.

Equipment

Equipment is stated at cost less accumulated depreciation. Equipment is depreciated on the straight-line basis over their estimated useful lives of three years. Expenditures for maintenance and repairs are charged to expense as incurred.

Leases

Effective January 1, 2019, the Company adopted Financial Accounting Standards Board (“FASB”) Accounting Standards Codification (“ASC”) Topic 842, *Leases* (“ASC 842”), using the required modified retrospective approach and utilizing the effective date as its date of initial application, for which prior periods are presented in accordance with the previous guidance in ASC 840, *Leases* (“ASC 840”).

At the inception of an arrangement, the Company determines whether the arrangement is or contains a lease based on the unique facts and circumstances present in the arrangement. Most leases with a term greater than one year are recognized on the balance sheet as right-of-use assets and short-term and long-term lease liabilities, as applicable. The Company has elected not to recognize on the balance sheet leases with terms of 12 months or less. The Company typically only includes an initial lease term in its assessment of a lease arrangement. Options to renew a lease are not included in the Company’s assessment unless there is reasonable certainty that the Company will renew. The Company monitors its plans to renew its material leases on a quarterly basis.

Operating lease liabilities and their corresponding right-of-use assets are recorded based on the present value of lease payments over the expected remaining lease term. Certain adjustments to the right-of-use asset may be required for items such as incentives received. The interest rate implicit in the Company’s leases is typically not readily determinable. As a result, the Company utilizes its incremental borrowing rate, which reflects the fixed rate at which the Company could borrow on a collateralized basis the amount of the lease payments in the same currency, for a similar term and in a similar economic environment. In transition to ASC 842, the Company utilized the remaining lease term of its leases in determining the appropriate incremental borrowing rates.

In accordance with ASC 842, components of a lease should be allocated between lease components (e.g., land, building, etc.) and non-lease components (e.g., common area maintenance, consumables, etc.). The fixed and in-substance fixed contract consideration (including any consideration related to non-components) must be allocated based on the respective relative fair values to the lease components and non-lease components.

Although separation of lease and non-lease components is required, certain expedients are available. Entities may elect the practical expedient to not separate lease and non-lease components by class of underlying asset where entities would account for each lease component and the related non-lease component together as a single component. For new and amended leases beginning in 2019 and after, the Company has elected to account for the lease and non-lease components for leases for classes of all underlying assets and allocate all of the contract consideration to the lease component only.

Long-lived assets

The Company reviews the recoverability of all long-lived assets, including the related useful lives, whenever events or changes in circumstances indicate that the carrying amount of a long-lived asset might not be recoverable. If required, the Company compares the estimated undiscounted future net cash flows to the related asset's carrying value to determine whether there has been an impairment. If an asset is considered impaired, the asset is written down to fair value, which is based either on discounted cash flows or appraised values in the period the impairment becomes known. The Company believes that all long-lived assets are recoverable, and no impairment was deemed necessary at December 31, 2019 and 2018.

Goodwill

The Company tests its goodwill for impairment annually, or whenever events or changes in circumstances indicate an impairment may have occurred, by comparing its reporting unit's carrying value to its fair value. Impairment may result from, among other things, deterioration in the performance of the acquired business, adverse market conditions, adverse changes in applicable laws or regulations and a variety of other circumstances. If the Company determines that an impairment has occurred, it is required to record a write-down of the carrying value and charge the impairment as an operating expense in the period the determination is made. In evaluating the recoverability of the carrying value of goodwill, the Company must make assumptions regarding estimated future cash flows and other factors to determine the fair value of the acquired assets. Changes in strategy or market conditions could significantly impact those judgments in the future and require an adjustment to the recorded balances. The Company tested its goodwill for impairment as of November 30. There was no impairment of goodwill for the years ended December 31, 2019 or 2018.

Fair value of financial instruments

The Company provides disclosure of financial assets and financial liabilities that are carried at fair value based on the price that would be received upon sale of an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Fair value measurements may be classified based on the amount of subjectivity associated with the inputs to fair valuation of these assets and liabilities using the following three levels:

Level 1 — Inputs are unadjusted quoted prices in active markets for identical assets or liabilities that the Company has the ability to access at the measurement date.

Level 2 — Inputs include quoted prices for similar assets and liabilities in active markets, quoted prices for identical or similar assets or liabilities in markets that are not active, inputs other than quoted prices that are observable for the asset or liability (i.e., interest rates, yield curves, etc.) and inputs that are derived principally from or corroborated by observable market data by correlation or other means (market corroborated inputs).

Level 3 — Unobservable inputs that reflect the Company's estimates of the assumptions that market participants would use in pricing the asset or liability. The Company develops these inputs based on the best information available, including its own data.

The following tables present information about the Company's cash equivalents and marketable securities as of December 31, 2019 and 2018, measured at fair value on a recurring basis and indicates the fair value hierarchy of the valuation techniques the Company utilized to determine such fair value:

	December 31, 2019			
	Total	Level 1	Level 2	Level 3
Cash equivalents	\$ 17,385,141	\$ 16,187,361	\$ 1,197,780	\$ —
Marketable securities	24,442,274	—	24,442,274	—
Total fair value	\$ 41,827,415	\$ 16,187,361	\$ 25,640,054	\$ —

	December 31, 2018			
	Total	Level 1	Level 2	Level 3
Cash equivalents	\$ 42,575,645	\$ 36,600,836	\$ 5,974,809	\$ —
Marketable securities	37,757,896	—	37,757,896	—
Total fair value	\$ 80,333,541	\$ 36,600,836	\$ 43,732,705	\$ —

Cash equivalents include short-term, highly-liquid instruments, consisting of money market accounts and short-term investments with maturities from the date of purchase of 90 days or less. The majority of cash and cash equivalents are maintained with major financial institutions in North America. Deposits with these financial institutions may exceed the amount of insurance provided on such deposits. These deposits may be redeemed upon demand which reduces counterparty performance risk.

Marketable securities consists of corporate and U.S. government debt securities maturing in four months or less. Based on the Company's intentions regarding its marketable securities, all marketable securities are classified as held-to-maturity and are carried under the amortized cost approach. Marketable securities are valued using models or other valuation methodologies that use Level 2 inputs. These models are primarily industry-standard models that consider various assumptions, including time value, yield curve, volatility factors, default rates, current market and contractual prices for the underlying financial instruments, as well as other relevant economic measures. Substantially all of these assumptions are observable in the marketplace, can be derived from observable data or are supported by observable levels at which transactions are executed in the marketplace.

The carrying amounts of cash, restricted cash, accounts payable, and accrued liabilities approximate fair value because of their short-term nature.

Revenue recognition

The Company applies the revenue recognition guidance in accordance with ASC 606, *Revenue from Contracts with Customers*. Revenue is recognized when persuasive evidence of an arrangement exists, delivery has occurred and title has passed, the price is fixed or determinable, and collectability is reasonably assured. The Company is a development stage company and has had no revenues from product sales to date.

When the Company enters into an arrangement that meets the definition of a collaboration under ASC 808, *Collaborative Arrangements*, the Company recognizes revenue as research and development is performed and its respective share of the expenses are incurred. The Company assesses whether the arrangement contains multiple elements or deliverables, which may include (1) licenses to the Company's technology, (2) research and development activities performed for the collaboration partner, and (3) participation on joint steering committees. Payments may include non-refundable, upfront payments, milestone payments upon achieving significant development events, and royalties on future sales. Each required deliverable is evaluated to determine whether it qualifies as a separate unit of accounting based on whether the deliverable has "stand-alone value" to the customer. The arrangement's consideration is then allocated to each separate unit of accounting based on the relative selling price of each deliverable. The estimated selling price of each deliverable is determined using the following hierarchy of values: (i) vendor-specific objective evidence of fair value, (ii) third-party evidence of selling price, and (iii) best estimate of selling price. The best estimate of selling price reflects the Company's best estimate of what the selling price would be if the deliverable was regularly sold by the Company on a stand-alone basis. The consideration allocated to each unit of accounting is then recognized as the related goods or services are delivered, limited to the consideration that is not contingent upon future deliverables. Supply or service transactions may involve the charge of a nonrefundable initial fee with subsequent periodic payments for future products or services. The up-front fees, even if nonrefundable, are recognized as revenue as the products and/or services are delivered and performed over the term of the arrangement.

Deferred revenue

The Company applies the revenue recognition guidance in accordance with ASC 606. Using ASC 606, revenue that is unearned is deferred. Deferred revenue that is expected to be recognized as revenue more than one year subsequent to the balance sheet date is classified as long-term deferred revenue.

Segment information

Operating segments are defined as components of an enterprise (business activity from which it earns revenue and incurs expenses) about which discrete financial information is available and regularly reviewed by the chief operating decision maker in deciding how to allocate resources and in assessing performance. The Company's chief decision maker, who is the Chief Executive Officer, reviews operating results to make decisions about allocating resources and assessing performance for the entire Company. The Company views its operations and manages its business as one operating segment.

Comprehensive loss

The Company had no items of comprehensive loss other than its net loss for each period presented.

Recent accounting pronouncements

From time to time, new accounting pronouncements are issued by the FASB and are adopted by the Company as of the specified effective date.

Recently adopted accounting pronouncements

In March 2017, the FASB issued ASU No. 2017-08, *Receivables—Nonrefundable Fees and Other Costs (Subtopic 310-20) Premium Amortization on Purchased Callable Debt Securities*. The new standard is intended to enhance the accounting for the amortization of premiums for purchased callable debt securities. This update is effective for annual periods beginning after December 15, 2018, and interim periods within those fiscal years, with early adoption permitted, including adoption in an interim period. The Company adopted the new standard on January 1, 2019.

Accounting pronouncements not yet adopted

In November 2018, the FASB issued ASU 2018-18, *Collaborative Arrangements (Topic 808): Clarifying the Interaction between Topic 808 and Topic 606*. This update is intended to clarify that certain transactions between collaborative arrangement participants should be accounted for as revenue under Topic 606. This update is effective for annual periods beginning after December 15, 2019, and interim periods within those fiscal years, with early adoption permitted. The Company is currently evaluating the impact of the pending adoption of the new standard on the Company's consolidated financial statements.

In January 2017, the FASB issued ASU No. 2017-04, *Intangibles — Goodwill and Other (Topic 350)*. The new standard simplifies the test for goodwill impairment. This update is effective for annual periods beginning after December 15, 2019, and interim periods within those fiscal years, with early adoption permitted, including adoption in an interim period. The Company is currently evaluating the impact of the pending adoption of the new standard on the Company's consolidated financial statements.

NOTE 3 — ACCRUED EXPENSES AND OTHER LIABILITIES

Accrued expenses and other liabilities consist of the following:

	<u>December 31, 2019</u>	<u>December 31, 2018</u>
Research and development costs and other accrued expenses	\$ 3,824,950	\$ 1,353,987
Professional fees	314,213	455,545
	<u>\$ 4,139,163</u>	<u>\$ 1,809,532</u>

NOTE 4 — NET LOSS PER SHARE OF COMMON STOCK

Diluted loss per share is the same as basic loss per share for all periods presented as the effects of potentially dilutive items were anti-dilutive given the Company's net loss. Basic loss per share is computed by dividing net loss by the weighted-average number of common shares outstanding.

The following table sets forth the computation of basic and diluted loss per share for common stockholders:

	<u>Year Ended December 31,</u>	
	<u>2019</u>	<u>2018</u>
Net loss	\$ (72,183,490)	\$ (50,171,287)
Weighted average shares of common stock outstanding	39,014,302	38,792,581
Net loss per share of common stock – basic and diluted	\$ (1.85)	\$ (1.29)

The following securities outstanding at December 31, 2019 and 2018 have been excluded from the calculation of weighted average shares outstanding as their effect on the calculation of loss per share is antidilutive:

	<u>Year Ended December 31,</u>	
	<u>2019</u>	<u>2018</u>
Common stock options	9,040,328	8,498,047
Restricted stock units	68,650	127,300
Common stock warrants	40,790	40,790

NOTE 5 — CO-DEVELOPMENT AND LICENSE AGREEMENT

On February 13, 2014, the Company signed a co-development and license agreement (the “Agreement”) with Janssen, which became effective upon completion of the Company’s initial public offering and provided for the payment of a \$22.0 million license fee by the Company. Under the Agreement, Janssen, the licensor, granted the Company an exclusive license, with the right to sublicense, in the Minerva Territory, under (i) certain patent and patent applications to sell products containing any orexin 2 compound, controlled by the licensor and claimed in a licensor patent right as an active ingredient, and (ii) seltorexant for any use in humans. In addition, upon regulatory approval in the Minerva Territory (and earlier if certain default events occur), the Company will have rights to manufacture seltorexant (also known as JNJ-42847922). The Company has granted to the licensor an exclusive license, with the right to sublicense, under all patent rights and know-how controlled by the Company covering selective antagonists of orexin-2 receptors, including seltorexant, to sell those compounds outside the Minerva Territory. In consideration of the licenses granted on July 7, 2014, the Company made a license fee payment of \$22.0 million, which was included as a component of research and development expense in 2014.

The Company accounts for the Agreement as a joint risk-sharing collaboration in accordance with ASC 808, *Collaborative Arrangements*. Payments between the Company and the licensor with respect to each party’s share of seltorexant development costs that have been incurred pursuant to the joint development plan are recorded within research and development expenses or general and administrative expenses, as applicable, in the accompanying consolidated statements of operations due to the joint risk-sharing nature of the activities.

On July 6, 2016, the Company and Janssen agreed that “Decision Point 2” had been reached as defined under the Agreement. As neither party exercised their right to withdraw from the Agreement, the Company paid Janssen \$3.5 million and has incurred direct expenses of \$0.3 million related to development activities under the current phase of development. During the year ended December 31, 2019 and 2018, the Company recorded an expense of zero for certain development activities in accordance with the terms of the Agreement.

In June 2017, the Company entered into an amendment (“the Amendment”) to the Agreement. The effectiveness of the Amendment was contingent upon approval of its terms by the European Commission and the closing of the acquisition of Actelion Ltd. by affiliates of Janssen. These conditions were subsequently met, and the Amendment became effective on August 29, 2017. Under the Amendment, Janssen has waived its right to royalties on seltorexant insomnia sales in the Minerva Territory. The Company retains all of its rights to seltorexant, including commercialization of the molecule for the treatment of insomnia and as an adjunctive therapy for MDD, which include an exclusive license in the Minerva Territory, with royalties payable by the Company to Janssen on seltorexant sales outside of the insomnia indication. Royalties on sales outside of the Minerva Territory are payable by Janssen to the Company. Janssen made an upfront payment to the Company of \$30 million upon the effectiveness of the Amendment and agreed to make a \$20 million payment at the start of a Phase 3 insomnia trial for seltorexant and a \$20 million payment when 50% of the patients are enrolled in this trial. Janssen further agreed to waive development payments from the Company until completion of the Phase 2b development milestone, which is referred to as “Decision Point 4”. Top-line results have been reported from three Phase 2b trials and one Phase 1b trial with seltorexant. The \$30 million payment and \$11.2 million in previously accrued collaborative expenses, which were forgiven upon the effective date of the Amendment, are earned and recognized as revenue as the services are performed from the commencement of Phase 3 development to the completion of the development activities using the proportional performance method. The \$30 million payment along with the \$11.2 million in previously accrued collaborative expenses have been included under deferred revenue on the Company’s balance sheet at December 31, 2019 and 2018. If we opt out of the program, then any remaining deferred revenue would be recognized at the time of the opt out. In connection with the Amendment, the Company repurchased all of the approximately 3.9 million shares of its common stock previously owned by Johnson & Johnson Innovation-JJDC Inc. at a per share price of \$0.0001, for an aggregate purchase price of approximately \$389.

As a result of the Amendment, the Company assumed strategic control of matters relating to the clinical development of seltorexant for insomnia and has no further financial obligations until after Decision Point 4. After Decision Point 4, both the Company and Janssen have the right to opt-out of the Agreement.

If both parties elect to continue past Decision Point 4 into Phase 3, the Company would be obligated to fund the clinical trials related to insomnia, receive up to \$40 million in milestone payments from Janssen, and be responsible for 40% of all costs incurred in the Phase 3 MDD program.

After reviewing the data from the Phase 2b trials already conducted, the Company is not in agreement with Janssen that Decision Point 4 under the Agreement has been reached. Under the Agreement, the Company's cost-sharing obligations do not begin until Decision Point 4 has been reached. The Company has the right to opt-out of the Agreement at any time after Decision Point 4, and if it opts-out, the Company will collect a royalty on worldwide sales of seltorexant in the mid-single digits with no further obligations to Janssen. If Janssen opts-out, the Minerva Territory would be expanded to include North America and the Company would pay Janssen single digit royalties on sales of seltorexant outside of the insomnia indication. In January 2020, Janssen invoiced the Company \$3.4 million, representing the Company's 40% portion of the Phase 3 development costs through December 31, 2019. Janssen estimates it will spend approximately \$100 million in Phase 3 development costs in 2020. The Company has been conducting discussions with Janssen regarding this disagreement and the Company has not accrued any Phase 3 development costs incurred by Janssen (See Note 9).

The Company determined that the license under the Amendment is not considered to be a separate deliverable as it contains no value without the development activities performed under the Agreement. The participation in the joint steering committee under the Amendment is considered to be not separable from the development activities and therefore the two deliverables are combined into a single unit of account. The Company concluded that the milestone payments are related to future performance obligations and will be recognized as those performance obligations are performed by the Company. Similarly, the Company will recognize royalty revenues in the periods of the sale of the related products, provided that no future performance obligations exist and revenue recognition is limited to amounts for which it is probable that a significant reversal will not occur.

NOTE 6 — STOCKHOLDERS' EQUITY

Term Loan Warrants

In connection with the Company's former Loan and Security Agreement with Oxford Finance LLC and Silicon Valley Bank (the "Lenders"), which provided for term loans to the Company in an aggregate principal amount of up to \$15 million in two tranches on January 15, 2016, the Company issued the Lenders warrants to purchase 40,790 shares of common stock at a per share exercise price of \$5.516. The warrants are immediately exercisable upon issuance, and other than in connection with certain mergers or acquisitions, will expire on the ten-year anniversary of the date of issuance. The fair value of the warrants was estimated at \$0.2 million using a Black-Scholes model and assuming: (i) expected volatility of 100.8%, (ii) risk free interest rate of 1.83%, (iii) an expected life of 10 years and (iv) no dividend payments. The fair value of the warrants was included as a discount to the term loans drawn at such time and also as a component of additional paid-in capital and were amortized to interest expense over the term of the loan. Although the term loans were repaid in August 2018, all related warrants were outstanding and exercisable as of December 31, 2019.

NOTE 7 — STOCK AWARD PLAN AND STOCK-BASED COMPENSATION

In December 2013, the Company adopted the 2013 Equity Incentive Plan (as subsequently amended and restated, the “Plan”), which provides for the issuance of options, stock appreciation rights, stock awards and stock units. On January 1, 2018, in accordance with the terms of the Plan, the total shares authorized for issuance under the plan increased by 750,000 to 6,531,333. This increase represents the lesser of 750,000 shares or 4% of the total shares outstanding calculated as of the end of the most recent fiscal year. The exercise price per share shall not be less than the fair value of the Company’s underlying common stock on the grant date and no option may have a term in excess of ten years. Further, pursuant to Nasdaq listing rules, the Company issued inducement awards in December 2017 to the Company’s President outside of the Plan in the form of an option to purchase 775,000 shares of the Company’s common stock and a restricted stock unit award to purchase 40,000 shares of the Company’s common stock. In June 2018, the Company increased the aggregate number of shares of common stock authorized for issuance under the Plan by 2,500,000 shares. Stock option activity for employees and non-employees for the year ended December 31, 2019 is as follows:

	Shares Issuable Pursuant to Stock Options	Weighted- Average Exercise Price	Weighted- Average Remaining Contractual Terms (years)	Total Intrinsic Value (in thousands)
Outstanding January 1, 2019	8,498,047	\$ 6.99	8.1	\$ 5,214
Granted	671,656	\$ 6.69		
Exercised	(87,500)	\$ 6.00		
Forfeited	(41,875)	\$ 6.49		
Outstanding December 31, 2019	9,040,328	\$ 6.98	7.3	\$ 7,420
Exercisable December 31, 2019	5,493,050	\$ 6.68	6.4	\$ 6,039
Available for future grant	139,998			

The weighted average grant-date fair value of stock options outstanding on December 31, 2019 was \$5.04 per share. Total unrecognized compensation costs related to non-vested stock options at December 31, 2019 were approximately \$17.9 million and are expected to be recognized within future operating results over a weighted-average period of 2.59 years. The total intrinsic value of the options exercised during the years ended December 31, 2019 and 2018 was approximately \$0.2 million and \$0.8 million, respectively.

The expected term of the employee-related options was estimated using the “simplified” method as defined by the SEC’s Staff Accounting Bulletin No. 107, *Share-Based Payment*. The volatility assumption was determined by examining the historical volatilities for industry peer companies, as the Company did not have sufficient trading history for its common stock. The risk-free interest rate assumption is based on the U.S. Treasury instruments, the term of which consistent with the expected term of the options. The dividend assumption is based on the Company’s history and expectation of dividend payouts. The Company has never paid dividends on its common stock and does not anticipate paying dividends on its common stock in the foreseeable future. Accordingly, the Company has assumed no dividend yield for purposes of estimating the fair value of the options.

The Company uses the Black-Scholes model to estimate the fair value of stock options granted. For stock options granted to employees during the years ended December 31, 2019 and 2018, the Company utilized the following assumptions:

	Year Ended December 31,	
	2019	2018
Expected term (years)	5.5-6.25	5.5-6.25
Risk free interest rate	1.78%-1.96%	2.33-3.01%
Volatility	69%-78%	76-83%
Dividend yield	0%	0%
Weighted average grant date fair value per share of common stock	\$ 4.21	\$ 5.57

The Company from time to time grants options to purchase common stock to non-employees for services rendered and records expense ratably over the vesting period of each award. The Company estimates the fair value of the stock options using the Black-Scholes valuation model at each reporting date. The Company granted 37,216 stock options to non-employees and recorded stock-based compensation expense of \$0.7 million during the year ended December 31, 2019. The Company granted 215,000 stock options to non-employees and recorded stock-based compensation expense of \$1.0 million during the year ended December 31, 2018.

For stock options granted to non-employees, the Company utilized the following assumptions:

	Year Ended December 31,	
	2019	2018
Expected term (years)	6.25	0.3-9.9
Risk free interest rate	1.78%	2.39-2.89%
Volatility	69%	75-109%
Dividend yield	0%	0%
Weighted average reporting date fair value per share of common stock	\$ 4.48	\$ 5.91

RSU activity under the Plan for the year ended December 31, 2019 is as follows:

	RSUs	Weighted-
		Average Grant Date Fair Value
Unvested January 1, 2019	127,300	\$ 11.71
Granted	—	\$ —
Vested	(58,650)	\$ 12.19
Forfeited	—	\$ —
Unvested December 31, 2019	68,650	\$ 11.29

RSUs awarded to employees generally vest one-fourth per year over four years from the anniversary of the date of grant, provided the employee remains continuously employed with the Company. Shares of the Company's stock are delivered to the employee upon vesting, subject to payment of applicable withholding taxes. The fair value of RSUs is equal to the closing price of the Company's common stock on the date of grant. Total unrecognized compensation costs related to non-vested RSUs at December 31, 2019 was approximately \$0.7 million and is expected to be recognized within future operating results over a period of 1.11 years. The total fair value of shares vested during the years ended December 31, 2019 and 2018 was approximately \$0.4 million and \$0.5 million, respectively.

The following table presents stock-based compensation expense included in the Company's consolidated statements of operations:

	Year Ended December 31,	
	2019	2018
Research and development	\$ 2,646,210	\$ 2,257,102
General and administrative	6,527,055	5,925,576
Total	\$ 9,173,265	\$ 8,182,678

NOTE 8 — INCOME TAXES

The provision for federal, foreign and state income taxes for the years ended December 31, 2019 and 2018 are as follows:

	Year Ended December 31,	
	2019	2018 (1)
Current income tax provision (benefit)		
Federal	\$ —	\$ —
Foreign	—	—
State	—	—
Deferred income tax provision (benefit)		
Federal	(2,119,709)	—
Foreign	—	—
State	(134,423)	—
Total income tax provision (benefit)	\$ (2,254,132)	\$ —

(1) There was no tax provision for income taxes for the year ended December 31, 2018.

Net deferred tax assets (liabilities) as of December 31, 2019 and 2018 consist of the following:

	Year Ended December 31,	
	2019	2018
Deferred tax assets:		
Net operating loss carryforwards	\$ 20,988,129	\$ 15,049,549
Research and development tax credits	145,115	145,115
Capitalized research and development costs	29,446,106	22,072,598
Stock-based compensation	7,518,780	5,532,341
Deferred start-up and license costs	5,327,213	5,929,901
Deferred revenue	11,249,174	11,249,174
Other	2,319	—
Total deferred tax assets	74,676,836	59,978,678
Deferred tax asset valuation allowance	(72,324,255)	(54,687,950)
Net deferred tax assets	2,352,581	5,290,728
Deferred tax liabilities:		
In-process research and development	(4,152,640)	(9,343,440)
Other	(3,297)	(4,776)
Total deferred tax liabilities	(4,155,937)	(9,348,216)
Total	\$ (1,803,356)	\$ (4,057,488)

A reconciliation between the Company's effective tax rate and the federal statutory rate for the years ended December 31, 2019 and 2018 are as follows:

	Year Ended December 31,	
	2019	2018
Federal statutory rate	(21.00%)	(21.00%)
Permanent differences	(0.37%)	0.38%
State income taxes	0.00%	0.00%
Valuation allowance	24.39%	20.62%
Effective tax rate	3.03%	0.00%

In assessing the realizability of deferred tax assets, management considers whether it is more likely than not that some portion or all of the deferred tax assets will not be realized. The ultimate realization of the deferred tax assets is dependent upon the generation of future taxable income during the periods in which those temporary differences become deductible. Management considers the scheduled reversal of deferred tax liabilities, projected future taxable income, and tax planning strategies in making this assessment. Based upon the level of historical losses and the uncertainty of future taxable income over the periods which the Company will realize the benefits of its net deferred tax assets, management believes it is more likely than not that the Company will not realize the benefits on the balance of its net deferred tax asset and, accordingly, the Company has established a full valuation allowance on its net deferred tax assets. The valuation allowance increased by approximately \$17.6 million and increased by \$12.8 million during the years ended December 31, 2019 and 2018.

As of December 31, 2019, the Company had approximately \$75.9 million of Federal net operating losses that will begin to expire in 2027. As of December 31, 2019, the Company's wholly owned subsidiary had approximately \$1.7 million of operating losses in Switzerland which will expire in 2020. As of December 31, 2019, the Company had approximately \$7.7 million of New Jersey and approximately \$63.9 million of Massachusetts operating losses that will begin to expire in 2029 and 2033, respectively. As of December 31, 2019, the Company had approximately \$0.2 million of federal research and development credits that will begin to expire in 2027. The Internal Revenue Code ("IRC") limits the amounts of net operating loss carryforwards that a company may use in any one year in the event of certain cumulative changes in ownership over a three-year period as described in Section 382 of the IRS. The Company has not performed a detailed analysis to determine whether an ownership change has occurred as of December 31, 2019.

On December 22, 2017, the United States enacted tax reform legislation commonly known as the Tax Cuts and Jobs Act (the "Act"), resulting in significant modifications to existing law. The Company completed the accounting for the effects of the Act during 2017. The Company's financial statements for the year ended December 31, 2017 reflected the effects of the Act which included a reduction in the corporate tax rate from 34% to 21%. Accordingly, the Company's deferred tax assets and liabilities were revalued at the enacted rates expected to be effective in 2018 and in future years; the reduction in federal rate from 34% to 21% resulted in no impact to total

income tax expense. In addition to the federal rate change impact, the Company accounted for the impact of legislation on the timing of deferred tax positions and overall financial statement presentation, resulting in a total income tax benefit of \$9.4 million related to future implications of indefinite lived deferred tax positions in 2017. As the accounting for the effects was complete during 2017, no further changes impacted tax positions during the period ending December 31, 2019 and 2018.

The Company files tax returns as prescribed by the tax laws of the jurisdictions in which it operates. In the normal course of business, the Company is subject to examination by federal and state jurisdictions, where applicable. There are currently no pending income tax examinations. The Company's tax years are still open under statute from 2012 to the present.

As of December 31, 2019 and 2018, the Company had no liability recorded for unrecognized tax benefits. The Company classifies penalties and interest expense related to income tax liabilities as an income tax expense. There were no interest and penalties recognized in the statements of operations for the years ended December 31, 2019 and 2018, or accrued on the balance sheets as of December 31, 2019 and 2018.

NOTE 9 — COMMITMENTS AND CONTINGENCIES

From time to time, the Company may be subject to various legal proceedings and claims that arise in the ordinary course of the Company's business activities. While the outcome of these claims cannot be predicted with certainty, management does not believe that the outcome of any of these other legal matters will have a material adverse effect on the Company's consolidated financial statements.

Disagreement with Janssen

After reviewing the data from the Phase 2b trials already conducted, the Company is not in agreement with Janssen that Decision Point 4 under the Agreement has been reached. Under the Agreement, the Company's cost-sharing obligations do not begin until Decision Point 4 has been reached. Following occurrence of Decision Point 4, Janssen is responsible for 60% of the cost of Phase 3 development in all indications except insomnia and the Company is responsible for 40%. The Company has the right to opt-out of the Agreement at any time after Decision Point 4, and if it opts-out, the Company will collect a royalty on worldwide sales of seltorexant in the mid-single digits with no further obligations to Janssen. In January 2020, Janssen invoiced the Company \$3.4 million, representing the Company's 40% portion of the Phase 3 development costs through December 31, 2019. Janssen estimates it will spend approximately \$100 million in Phase 3 development costs in 2020. The Company has been conducting discussions with Janssen regarding this disagreement and the Company has not accrued any Phase 3 development costs incurred by Janssen.

Refer to Note 10 – Leases, for the Company's current lease commitments.

NOTE 10 — LEASES

On October 2, 2017, the Company entered into an office sublease agreement (the "Sublease") with Profitect, Inc. (the "Sublandlord") to sublease approximately 5,923 rentable square feet of office space located at 1601 Trapelo Road, Waltham, MA 02451 (the "Premises"). The term of the Sublease began on November 1, 2017 and will expire on July 31, 2021 (the "Term"), with a monthly rental rate starting at \$14,808 and escalating to a maximum monthly rental rate of \$16,288 in the final 12 months of the Term. The Sublandlord provided the Premises to the Company free of charge for the first two months of the Term. The Company will recognize the remaining expense in accordance with ASC 842.

Throughout the Term, the Company is responsible for paying certain costs and expenses, in addition to the rent, as specified in the Sublease, including a proportionate share of applicable taxes, operating expenses and utilities. In applying the ASC 842 transition guidance, the Company retained the classification of this Sublease as operating and recorded a lease liability and a right-of-use asset on the ASC 842 effective date.

The following table contains a summary of the Sublease costs recognized under ASC 842 and other information pertaining to the Company's operating Sublease for the years ended December 31, 2019:

	Year Ended December 31, 2019
Sublease cost	
Operating Sublease cost	\$ 179,269
Total Sublease cost	\$ 179,269
Other information	
Operating cash flows used for operating Sublease	\$ 170,780
Weighted average remaining Sublease term	1.6 years
Weighted average discount rate	10%

Future minimum Sublease payments under the Company's non-cancelable operating Sublease as of December 31, 2019 and December 31, 2018, are as follows:

	Year Ended December 31, 2019
Future Operating Sublease Payments	
2020	\$ 192,004
2021	114,018
Thereafter	—
Total Sublease payments	\$ 306,022
Less: imputed interest	(21,892)
Total operating Sublease liabilities at December 31, 2019	\$ 284,130

	Year Ended December 31, 2018
Future Operating Sublease Payments	
2019	\$ 170,780
2020	192,004
2021	114,018
Thereafter	—
Total Sublease payments	\$ 476,802
Less: imputed interest	(57,122)
Total operating Sublease liabilities at December 31, 2018	\$ 419,680

NOTE 11 — RELATED PARTY TRANSACTIONS

In January 2016, the Company entered into a services agreement with V-Watch SA ("V-Watch"), for approximately \$105 thousand for the use of V-Watch's SomnoArt device for monitoring sleep in the roluperidone Phase 2b and MIN-117 Phase 2a trials. The Company's Chief Executive Officer is the chairman of the board of directors of V-Watch. Funds affiliated with Index Ventures, a stockholder of the Company, hold greater than 10% of the outstanding capital stock of V-Watch.

Also refer to Note 5 – Co-Development and License Agreement for additional related party transactions.

NOTE 12 — QUARTERLY RESULTS (Unaudited)

	Three Months Ended			
	March 31, 2019	June 30, 2019	September 30, 2019	December 31, 2019
	(in thousands, except per share data)			
Total revenues	\$ —	\$ —	\$ —	\$ —
Operating loss	(16,312)	(12,904)	(14,282)	(32,367)
Net loss	(15,827)	(12,476)	(13,962)	(29,918)
Loss per share, basic and diluted	\$ (0.41)	\$ (0.32)	\$ (0.36)	\$ (0.77)

	Three Months Ended			
	March 31, 2018	June 30, 2018	September 30, 2018	December 31, 2018
	(in thousands, except per share data)			
Total revenues	\$ —	\$ —	\$ —	\$ —
Operating loss	(12,744)	(12,935)	(12,424)	(13,627)
Net loss	(12,418)	(12,529)	(12,021)	(13,203)
Loss per share, basic and diluted	\$ (0.32)	\$ (0.32)	\$ (0.31)	\$ (0.34)

NOTE 13 — SUBSEQUENT EVENTS

None.

ITEM 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

ITEM 9A. Controls and Procedures**Evaluation of Disclosure Controls and Procedures**

We maintain “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, or the Exchange Act, that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC’s rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to our management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure.

Our management, with the participation of our Chief Executive Officer (principal executive officer) and Chief Financial Officer (principal financial officer), evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2019. Based on the evaluation of our disclosure controls and procedures as of December 31, 2019, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at a reasonable assurance level.

Management 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 Rule 13a-15(f). Internal control over financial reporting is a process designed under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with accounting principles generally accepted in the United States of America.

As of December 31, 2019, our management assessed the effectiveness of our internal control over financial reporting using the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission in Internal Control-Integrated Framework (2013 Framework). Based on this assessment, our management concluded that, as of December 31, 2019, our internal control over financial reporting was effective based on those criteria. All internal control systems, no matter how well designed, have inherent limitations. Therefore, even those systems determined to be effective can provide only reasonable assurance with respect to financial statement preparation and presentation.

Changes in Internal Control over Financial Reporting

There were no changes in internal control over financial reporting during the fourth quarter that would have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the shareholders and the Board of Directors of Minerva Neurosciences, Inc.

Opinion on Internal Control over Financial Reporting

We have audited the internal control over financial reporting of Minerva Neurosciences, Inc. and subsidiaries (the “Company”) as of December 31, 2019, based on criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control — Integrated Framework (2013)* issued by COSO.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated financial statements as of and for the year ended December 31, 2019, of the Company and our report dated March 9, 2020, expressed an unqualified opinion on those financial statements and included an explanatory paragraph related to the Company’s dispute with the counterparty to its co-development and license agreement.

Basis for Opinion

The Company’s management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the Company’s internal control over financial reporting based on our audit. We are a public accounting firm registered with the 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 audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control over Financial Reporting

A company’s internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company’s internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company’s assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of 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 policies or procedures may deteriorate.

/s/ DELOITTE & TOUCHE LLP

Boston, Massachusetts
March 9, 2020

ITEM 9B. Other Information

None.

ITEM 10. Directors, Executive Officers and Corporate Governance

The information required by this Item 10 will be contained in the sections entitled “Election of Directors,” “Corporate Governance” and “Section 16(a) Beneficial Ownership Reporting Compliance” appearing in the definitive proxy statement we will file in connection with our 2020 Annual Meeting of Stockholders and is incorporated by reference herein. The information required by this item relating to executive officers may be found in Part I, Item 1 of this report under the heading “Business—Executive Officers” and is incorporated herein by reference.

ITEM 11. Executive Compensation

The information required by this Item 11 will be contained in the sections entitled “Executive and Director Compensation,” “Executive and Director Compensation—Compensation Committee Interlocks and Insider Participation” and “Executive and Director Compensation—Compensation Committee Report” appearing in the definitive proxy statement we will file in connection with our 2020 Annual Meeting of Stockholders and is incorporated by reference herein.

ITEM 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information required by this Item 12 will be contained in the sections entitled “Ownership of Our Common Stock” and “Executive and Director Compensation—Equity Compensation Plan Information” appearing in the definitive proxy statement we will file in connection with our 2020 Annual Meeting of Stockholders and is incorporated by reference herein.

ITEM 13. Certain Relationships and Related Person Transactions, and Director Independence

The information required by this Item 13 will be contained in the sections entitled “Certain Relationships and Related Person Transactions” appearing in the definitive proxy statement we will file in connection with our 2020 Annual Meeting of Stockholders and is incorporated by reference herein.

ITEM 14. Principal Accounting Fees and Services

The information required by this Item 14 will be contained in the section entitled “Corporate Governance—Principal Accountant Fees and Services” appearing in the definitive proxy statement we will file in connection with our 2020 Annual Meeting of Stockholders and is incorporated by reference herein.

ITEM 15. Exhibits and Financial Statement Schedules

(a) Documents filed as part of Form 10-K.

(1) Financial Statements

Report of Independent Registered Public Accounting Firm

Consolidated Balance Sheets as of December 31, 2019 and 2018

Consolidated Statements of Operations for the Years Ended December 31, 2019 and 2018

Consolidated Statements of Stockholders' Equity for the Years Ended December 31, 2019 and 2018

Consolidated Statements of Cash Flows for the Years Ended December 31, 2019 and 2018

Notes to Consolidated Financial Statements

(2) Schedules

Schedules have been omitted as all required information has been disclosed in the financial statements and related footnotes.

(3) Exhibits

The following exhibits are filed as part of this Annual Report on Form 10-K or are incorporated herein by reference.

<u>Exhibit No.</u>	<u>Description of Exhibit</u>	<u>Form</u>	<u>File No.</u>	<u>Exhibit</u>	<u>Filing Date</u>	<u>Filed Herewith</u>
2.1	Agreement and Plan of Merger of Sonkei Pharmaceuticals, Inc. with and into Cyrenaic Pharmaceuticals, Inc., dated as of November 12, 2013	S-1	333-195169	10.11	April 9, 2014	
2.2	Certificate of Merger Merging Sonkei Pharmaceuticals, Inc. with and into Cyrenaic Pharmaceuticals, Inc., dated as of November 12, 2013	S-1/A	333-195169	3.3	June 10, 2014	
3.1	Amended and Restated Certificate of Incorporation of the Registrant	S-1/A	333-195169	3.1	June 10, 2014	
3.2	Amended and Restated Bylaws of the Registrant	10-Q	001-36517	3.2	November 4, 2019	
4.1	Form of Common Stock Certificate	S-1/A	333-195169	4.1	June 10, 2014	
4.2	Investor Rights Agreement among the Registrant f/k/a Cyrenaic Pharmaceuticals, Inc. and certain of its security holders, dated as of August 29, 2007	S-1/A	333-195169	4.2	June 10, 2014	
4.3	Amendment No. 1 to Investor Rights Agreement among the Registrant and certain of its security holders, dated as of December 20, 2013	S-1/A	333-195169	4.3	June 10, 2014	
4.4	Description of Securities Registered Pursuant to Section 12 of the Securities Exchange Act of 1934.					X
10.1	Share Purchase Agreement between the Registrant, Mind-NRG SA and Various Shareholders dated as of February 11, 2014	S-1	333-195169	10.13	April 9, 2014	
10.2	Common Stock Purchase Agreement between Johnson & Johnson Development Corporation and the Registrant, dated as of February 13, 2014	S-1	333-195169	10.14	April 9, 2014	
10.3	Loan Agreement by and among certain stockholders and their affiliates and the Registrant, dated as of April 30, 2014	S-1/A	333-195169	10.26	June 10, 2014	
10.4	Loan Agreement by and among certain stockholders and their affiliates and the Registrant, dated as of May 23, 2014	S-1/A	333-195169	10.27	June 10, 2014	
10.5	Stock Purchase Agreement between Care Capital Investments III LP, Index Ventures III L.P. and the Registrant f/k/a Cyrenaic Pharmaceuticals, Inc., dated as of August 29, 2007	S-1	333-195169	10.19	April 9, 2014	
10.6	Amendment No. 1 to Stock Purchase Agreement between Care Capital Investments III LP, Index Ventures III L.P. and the Registrant and various Shareholders, dated as of March 28, 2014	S-1	333-195169	10.20	April 9, 2014	
10.7†	Employment Agreement between Remy Luthringer and Mind-NRG SA, the Registrant's subsidiary, dated as of April 8, 2014	S-1	333-195169	10.22	April 9, 2014	
10.8†	Employment Agreement between Geoff Race and Mind-NRG SA, the Registrant's subsidiary, dated as of April 8, 2014	S-1	333-195169	10.23	April 9, 2014	
10.9†	Form of Indemnification Agreement between the Registrant and each of its directors and executive officers	S-1/A	333-195169	10.1	June 10, 2014	

Exhibit No.	Description of Exhibit	Form	File No.	Exhibit	Filing Date	Filed Herewith
10.10*	License Agreement between Mitsubishi Pharma Corporation and the Registrant f/k/a Cyrenaic Pharmaceuticals, Inc., dated as of August 30, 2007	S-1/A	333-195169	10.2	June 10, 2014	
10.11*	Amendment to License Agreement between Mitsubishi Tanabe Pharma Corporation and the Registrant f/k/a Cyrenaic Pharmaceuticals, Inc., dated as of June 16, 2011	S-1/A	333-195169	10.3	June 10, 2014	
10.12*	Second Amendment to License Agreement between Mitsubishi Tanabe Pharma Corporation and the Registrant, dated as of January 20, 2014	S-1/A	333-195169	10.4	June 10, 2014	
10.13*	License Agreement between Mitsubishi Tanabe Pharma Corporation and the Registrant as successor in interest to Sonkei Pharmaceuticals, Inc., dated as of September 1, 2008	S-1/A	333-195169	10.5	June 10, 2014	
10.14*	Amendment to License Agreement between Mitsubishi Tanabe Pharma Corporation and the Registrant, dated as of January 20, 2014	S-1/A	333-195169	10.6	June 10, 2014	
10.15*	Co-Development and License Agreement between Janssen Pharmaceutica, N.V. and the Registrant, dated as of February 13, 2014	S-1/A	333-195169	10.7	June 10, 2014	
10.16†	Employment Agreement between Joseph Reilly and the Registrant, dated as of December 23, 2013	S-1/A	333-195169	10.9	June 10, 2014	
10.17†	Amended and Restated 2013 Equity Incentive Plan of the Registrant	8-K	001-36517	99.1	June 11, 2018	
10.18	Form of Securities Purchase Agreement between certain investors referenced therein and the Registrant, dated as of March 13, 2015	8-K	001-36517	10.1	March 18, 2015	
10.19	Form of Registration Rights Agreement between certain investors referenced therein and the Registrant, dated as of March 13, 2015	8-K	001-36517	10.3	March 18, 2015	
10.20	Second Amendment to License Agreement between Mitsubishi Tanabe Pharma Corporation and the Registrant, dated as of April 21, 2015	10-Q	001-36517	10.5	May 7, 2015	
10.21†	Amended and Restated Non-Employee Director Compensation Plan	10-Q	001-36517	10.2	August 2, 2018	
10.22†	Employment Agreement between Fred Ahlholm and the Registrant, dated as of May 30, 2014	10-Q	001-36517	10.2	November 5, 2015	
10.23	Common Stock Purchase Agreement, dated March 17, 2016, by and between David Kupfer and the Registrant	8-K	001-36517	10.1	March 18, 2016	
10.24†	Employment Agreement, dated as of August 1, 2016, by and between Mind-NRG SARL and Dr. Remy Luthringer	10-Q	001-36517	10.1	August 4, 2016	
10.25†	Employment Agreement, dated as of August 1, 2016, by and between Mind-NRG SARL and Geoffrey Race	10-Q	001-36517	10.2	August 4, 2016	
10.26†	Employment Agreement, dated as of August 1, 2016, by and between the Registrant and Frederick Ahlholm	10-Q	001-36517	10.3	August 4, 2016	
10.27†	Employment Agreement, dated as of August 1, 2016, by and between the Registrant and Mark S. Levine	10-Q	001-36517	10.4	August 4, 2016	

Exhibit No.	Description of Exhibit	Form	File No.	Exhibit	Filing Date	Filed Herewith
10.28†	Employment Agreement, dated as of August 1, 2016, by and between the Registrant and Joseph Reilly.	10-Q	001-36517	10.5	August 4, 2016	
10.29†	Form of Restricted Stock Unit Agreement under the Amended and Restated 2013 Equity Incentive Plan of the Registrant	8-K	001-36517	10.1	December 16, 2016	
10.30†	Form of Option Grant Agreement under the Amended and Restated 2013 Equity Incentive Plan	10-K	001-36517	10.36	March 13, 2017	
10.31	Sublease Agreement dated October 2, 2017 by and between the Registrant and Profitect, Inc. NV	10-Q	001-36517	10.1	November 6, 2017	
10.32	Amendment No. 1 to Co-Development and License Agreement dated June 13, 2017, by and between the Registrant and Janssen Pharmaceutica NV	8-K	001-36517	10.1	June 14, 2017	
10.33	Stock Repurchase Agreement dated June 13, 2017 by and between the Registrant and Johnson & Johnson Innovation-JJDC Inc.	8-K	001-36517	10.2	June 14, 2017	
10.34†	Offer Letter by and between the Registrant and Rick Russell, dated December 11, 2017.	8-K	001-36517	10.1	December 11, 2017	
10.35†	New Hire Inducement Stock Option Grant by and between the Registrant and Rick Russell, dated December 11, 2017.	8-K	001-36517	10.2	December 11, 2017	
10.36†	New Hire Inducement Restricted Stock Unit Grant by and between the Registrant and Rick Russell, dated December 11, 2017.	8-K	001-36517	10.3	December 11, 2017	
10.37*	Commercial Supply Agreement by and between the Registrant and Catalent Germany Schorndorf GmbH, dated September 18, 2019	10-Q	001-36517	10.1	November 4, 2019	
21.1	List of Subsidiaries					X
23.1	Consent of Deloitte & Touche, LLP, independent registered public accounting firm					X
24.1	Power of Attorney (included on the Signature page of this Annual Report on Form 10-K)					X
31.1	Certification of Chief Executive Officer (Principal Executive Officer) pursuant to Section 302 of Sarbanes-Oxley Act of 2002					X
31.2	Certification of Chief Financial Officer (Principal Financial Officer) pursuant to Section 302 of Sarbanes-Oxley Act of 2002					X
32.1**	Certification of Chief Executive Officer (Principal Executive Officer) and Chief Financial Officer (Principal Financial Officer) pursuant to Section 906 of Sarbanes-Oxley Act of 2002					X
101.INS	XBRL Instance Document					X
101.SCH	XBRL Taxonomy Extension Schema Document					X
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document					X
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document					X
101.LAB	XBRL Taxonomy Extension Label Linkbase Document					X

Exhibit No.	Description of Exhibit	Form	File No.	Exhibit	Filing Date	Filed Herewith
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document					X

† Indicates management contract or compensatory plan or arrangement.

* Confidential treatment has been granted by the Securities and Exchange Commission as to certain portions of this document.

** These certifications are being furnished solely to accompany this annual report pursuant to 18 U.S.C. Section 1350, and are not being filed for purposes of Section 18 of the Securities Exchange Act of 1934 and are not to be incorporated by reference into any filing of the registrant, whether made before or after the date hereof, regardless of any general incorporation language in such filing.

ITEM 16. Form 10-K Summary

Not applicable.

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.

MINERVA NEUROSCIENCES, INC.

By:

/s/ Remy Luthringer, Ph.D.
Remy Luthringer, Ph.D.
Chief Executive Officer
(Principal Executive Officer)

Date: March 9, 2020

POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Remy Luthringer, Ph.D. and Geoffrey Race, and each of them, his true and lawful attorneys-in-fact and agents, with full power of substitution and resubstitution, for him and in his name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this report, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or either of them, or their or his substitutes or substitute, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Remy Luthringer, Ph.D.</u> Remy Luthringer, Ph.D.	Chief Executive Officer and Chairman of the Board of Directors (Principal Executive Officer)	March 9, 2020
<u>/s/ Geoffrey Race</u> Geoffrey Race	Chief Financial Officer (Principal Financial Officer)	March 9, 2020
<u>/s/ Frederick Ahlholm</u> Frederick Ahlholm	Chief Accounting Officer (Principal Accounting Officer)	March 9, 2020
<u>/s/ William F. Doyle</u> William F. Doyle	Member of the Board of Directors	March 9, 2020
<u>/s/ Hans Peter Hasler</u> Hans Peter Hasler	Member of the Board of Directors	March 9, 2020
<u>/s/ Jeryl Hilleman</u> Jeryl Hilleman	Member of the Board of Directors	March 9, 2020
<u>/s/ David Kupfer, MD</u> David Kupfer, MD	Member of the Board of Directors	March 9, 2020
<u>/s/ Fouzia Laghrissi-Thode, MD</u> Fouzia Laghrissi-Thode, MD	Member of the Board of Directors	March 9, 2020
<u>/s/ Jan van Heek</u> Jan van Heek	Member of the Board of Directors	March 9, 2020

**DESCRIPTION OF THE REGISTRANT'S SECURITIES
REGISTERED PURSUANT TO SECTION 12 OF THE
SECURITIES EXCHANGE ACT OF 1934**

As of March 5, 2020, Minerva Neurosciences, Inc. (the "Company") has one class of securities registered under Section 12 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"): our common stock.

The following description of our common stock is a summary, does not purport to be complete and is subject to, and is qualified in its entirety by reference to, the applicable provisions of Delaware law and our amended and restated certificate of incorporation and our amended and restated bylaws, copies of which are incorporated by reference as an exhibit to the Annual Report on Form 10-K of which this Exhibit 4.4 is a part. We encourage you to read our certificate of incorporation, our bylaws and the applicable provisions of Delaware law for additional information.

Authorized Capital Stock

Our authorized capital stock consists of 125,000,000 shares of common stock, \$0.0001 par value per share, and 100,000,000 shares of preferred stock, \$0.0001 par value per share.

Common stock

Voting rights. Each holder of our common stock is entitled to one vote for each share of common stock on all matters submitted to a vote of the stockholders, including the election of directors. The holders of our common stock do not have cumulative voting rights. Because of this, the holders of a majority of the shares of common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they should so choose.

Dividend rights. Subject to preferences that may be applicable to any then outstanding preferred stock, holders of our common stock are entitled to receive ratably such dividends, if any, as may be declared from time to time by our board of directors out of legally available funds.

Liquidation. In the event of our liquidation, dissolution or winding up, holders of our common stock will be entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of our debts and other liabilities and the satisfaction of any liquidation preference granted to the holders of any then outstanding shares of preferred stock.

Rights and Preferences. Holders of our common stock have no preemptive, conversion, subscription or other rights, and there are no redemption or sinking fund provisions applicable to our common stock. The outstanding shares of our common stock are fully paid and nonassessable.

Preferred stock

Under our amended and restated certificate of incorporation, our board of directors has the authority, without further action by our stockholders, to issue up to 100,000,000 shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences, sinking fund terms and the number of shares constituting any series or the designation of such series, any or all of which may be greater than the rights of common stock. The issuance of our preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change of control of our company or other corporate action.

Anti-takeover Provisions

Certificate of Incorporation and Bylaws. Our amended and restated certificate of incorporation provides for our board of directors to be divided into three classes, with staggered three-year terms. Only one class of directors will be elected at each annual meeting of our stockholders, with the other classes continuing for the remainder of their respective three-year terms. Because our stockholders do not have cumulative voting rights, our stockholders holding a majority of the shares of common stock outstanding will be able to elect all of our directors. Our amended and restated certificate of incorporation and amended and restated bylaws provide that all stockholder action must be effected at a duly called meeting of stockholders and not by a consent in writing, and that only our board of directors or chairman of the board may call a special meeting of stockholders.

Our amended and restated certificate of incorporation requires a 66²/₃% stockholder vote for the amendment, repeal or modification of certain provisions of our amended and restated certificate of incorporation and amended and restated bylaws relating to the classification of our board of directors, the requirement that stockholder actions be effected at a duly called meeting, and the designated parties entitled to call a special meeting of the stockholders. The combination of the classification of our board of directors, the lack of cumulative voting and the 66²/₃% stockholder voting requirements will make it more difficult for our existing stockholders to replace our board of directors as well as for another party to obtain control of us by replacing our board of directors. Since our board of directors has the power to retain and discharge our officers, these provisions could also make it more difficult for existing stockholders or another party to effect a change in management. In addition, the authorization of undesignated preferred stock makes it possible for our board of directors to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change control of our company.

These provisions may have the effect of deterring hostile takeovers or delaying changes in control of our company or management. These provisions are intended to enhance the likelihood of continued stability in the composition of our board of directors and its policies and to discourage certain types of transactions that may involve an actual or threatened acquisition of us. These provisions are designed to reduce our vulnerability to an unsolicited acquisition proposal. The provisions also are intended to discourage certain tactics that may be used in proxy fights. However, such provisions could have the effect of discouraging others from making tender offers for our shares and, as a consequence, they also may inhibit fluctuations in the market price of our shares that could result from actual or rumored takeover attempts. Such provisions may also have the effect of preventing changes in our management.

Forum. Our amended and restated certificate of incorporation and our amended and restated bylaws provide that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for any derivative action or proceeding brought on our behalf, any action asserting a claim of breach of a fiduciary duty owed by any current or former director, officer or other employee or stockholder of the Company to us or our stockholders, any action asserting a claim arising pursuant to any provision of the Delaware General Corporation Law, our amended and restated certificate of incorporation or our amended and restated bylaws or as to which the Delaware General Corporation Law confers jurisdiction on the Court of Chancery of the State of Delaware, or any action asserting a claim governed by the internal affairs doctrine. Our amended and restated certificate of incorporation and our amended and restated bylaws further provide that any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock is deemed to have notice of and consented to the foregoing provision. Although our amended and restated certificate of incorporation and our amended and restated bylaws include these provisions, it is possible that a court could rule that such provisions are inapplicable or unenforceable.

Delaware Anti-takeover Law

The Company is subject to Section 203 of the Delaware General Corporation Law (“Section 203”), an anti-takeover law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a business combination with an interested stockholder for a period of three years following the date such person became an interested stockholder, unless the business combination or the transaction in which such person became an interested stockholder is approved in a prescribed manner. Generally, a “business combination” includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. Generally, an “interested stockholder” is a person that, together with affiliates and associates, owns, or within three years prior to the determination of interested stockholder status did own, 15% or more of a corporation’s voting stock. The existence of this provision may have an anti-takeover effect with respect to transactions not approved in advance by the Board, including discouraging attempts that might result in a premium over the market price for the shares of common stock.

Listing on the Nasdaq Global Market

Our common stock is listed on the Nasdaq Global Market under the symbol “NERV”.

Subsidiaries of Minerva Neurosciences, Inc.

Name	Jurisdiction of Incorporation
Mind-NRG Sarl	Switzerland
Minerva Neurosciences Securities Corporation	Massachusetts

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in Registration Statement Nos. 333-205764 and 333-226783 on Form S-3 and Nos. 333-225672, 333-223593, 333-222368, 333-216637, 333-210147, 333-203738, and 333-198753 on Form S-8 of our reports dated March 9, 2020, relating to the consolidated financial statements of Minerva Neurosciences, Inc. and the effectiveness of Minerva Neurosciences, Inc.'s internal control over financial reporting appearing in this Annual Report on Form 10-K for the year ended December 31, 2019.

/s/ DELOITTE & TOUCHE LLP

Boston, Massachusetts
March 9, 2020

CERTIFICATIONS

I, Remy Luthringer, certify that:

1. I have reviewed this annual report on Form 10-K of Minerva Neurosciences, Inc.;
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 this 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 15d-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.

Date: March 9, 2020

/s/ Remy Luthringer, Ph.D.
Remy Luthringer, Ph.D.
Chief Executive Officer and
Chairman of the Board of Directors
(Principal Executive Officer)

CERTIFICATIONS

I, Geoffrey Race, certify that:

1. I have reviewed this annual report on Form 10-K of Minerva Neurosciences, Inc.;
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 this 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 15d-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.

Date: March 9, 2020

/s/ Geoffrey Race
Geoffrey Race
Chief Financial Officer
(Principal Financial Officer)

CERTIFICATIONS PURSUANT TO 18 U.S.C. SECTION 1350 AS ADOPTED PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

Pursuant to the requirement set forth in Rule 13a-14(b) of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), and Section 1350 of Chapter 63 of Title 18 of the United States Code (18 U.S.C. §1350), Remy Luthringer, Chief Executive Officer of Minerva Neurosciences, Inc. (the “Company”), and Geoff Race, Chief Financial Officer of the Company, each hereby certifies that, to the best of his knowledge:

1. The Company’s Annual Report on Form 10-K for the period ended December 31, 2019, to which this Certification is attached as Exhibit 32.1 (the “Annual Report”) fully complies with the requirements of Section 13(a) or Section 15(d) of the Exchange Act, and
2. The information contained in the Annual Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 9, 2020

/s/ Remy Luthringer, Ph.D.

Remy Luthringer, Ph.D.
Chief Executive Officer and
Chairman of the Board of Directors

/s/ Geoffrey Race

Geoffrey Race
Chief Financial Officer

This certification accompanies the Form 10-K to which it relates, is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of Minerva Neurosciences, Inc. under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended (whether made before or after the date of the Form 10-K), irrespective of any general incorporation language contained in such filing.