Table of Contents

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

☐ **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 001-39011

EXICURE, INC.

(Exact name of registrant as specified in its charter)

Delaware	**81-5333008**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**

8045 Lamon Avenue
Suite 410
Skokie, IL 60077
(Address of principal executive offices and Zip Code)
(847) 673-1700
(Registrant's telephone number, including area code)

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

Common Stock, par value $0.0001 per share	**XCUR**	**The Nasdaq Stock Market LLC**
(Title of each class)	**(Trading symbol(s))**	**(Name of each exchange on which registered)**

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 Section 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, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

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

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

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

Based on the closing price of the registrant's common stock on the last business day of the registrant's most recently completed second fiscal quarter, which was June 28, 2019, the aggregate market value of its shares (based on a closing price of $2.80 per share) held by non-affiliates was approximately $71.5 million. Shares of the registrant's common stock held by each executive officer and director and by each entity or person that owned five percent or more of the registrant's outstanding common stock were excluded in that such persons may be deemed to be affiliates. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

As of March 5, 2020, the registrant had 87,150,447 shares of common stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive Proxy Statement for the 2020 Annual Meeting of Stockholders, to be filed with the Securities and Exchange Commission pursuant to Regulation 14A not later than 120 days after the end of the fiscal year covered by this Form 10-K, are incorporated by reference in Part III, Items 10-14 of this Form 10-K. Except for the portions of the Proxy Statement specifically incorporated by reference in this Form 10-K, the Proxy Statement shall not be deemed to be filed as part hereof.

EXICURE, INC.

ANNUAL REPORT ON FORM 10-K

TABLE OF CONTENTS

CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K, including the sections entitled "Business," "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations," contains express or implied "forward-looking statements" within the meaning of Section 27A of the Securities Act of 1933, as amended (the "Securities Act"), and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). All statements other than statements of historical fact contained in this Annual Report on Form 10-K are forward-looking statements. In some cases, you can identify forward-looking statements by terminology such as "may," "could," "will," "would," "should," "expect," "plan,", "anticipate," "believe," "estimate," "intend," "predict," "seek," "contemplate," "project," "continue," "potential," "ongoing" or the negative of these terms or other comparable terminology. Forward-looking statements also include the assumptions underlying or relating to such statements.

Although we believe that the expectations reflected in the forward-looking statements contained herein are reasonable, such expectations or any of the forward-looking statements may prove to be incorrect and actual results could differ materially from those projected or assumed in the forward-looking statements. Our future financial condition and results of operations, as well as any forward-looking statements, are subject to inherent risks and uncertainties, including, but not limited to, the risk factors set forth in Part I, Item 1A "Risk Factors" below and for the reasons described elsewhere in this Annual Report on Form 10-K. All forward-looking statements and reasons why results may differ included in this report are made as of the date hereof and we do not intend to update any forward-looking statements except as required by law or applicable regulations.

- the initiation, timing, progress and results of our research and development programs, preclinical studies, clinical trials and Investigational New Drug, or IND, application, Investigational Medicinal Product Dossier, or IMPD, Clinical Trial Application, or CTA, New Drug Application, or NDA, or other regulatory submissions;
- our dependence on current and future collaborators for developing, obtaining regulatory approval for and commercializing therapeutic candidates in the collaboration;
- our receipt and timing of any milestone payments or royalties under any current or future research collaboration and license agreements or arrangements;
- our ability to identify and develop therapeutic candidates for treatment of additional disease indications;
- our or a current or future collaborator's ability to obtain and maintain regulatory approval of any of our therapeutic candidates;
- the rate and degree of market acceptance of any approved therapeutic candidates;
- the commercialization of any approved therapeutic candidates;
- our ability to establish and maintain collaborations and retain commercial rights for our therapeutic candidates in the collaborations;
- the implementation of our business model and strategic plans for our business, technologies and therapeutic candidates;
- our estimates of our expenses, ongoing losses, future revenue and capital requirements, including our expectations relating to our needs for additional financing;
- our ability to obtain additional funds for our operations;

- our ability to obtain and maintain intellectual property protection for our technologies and therapeutic candidates and our ability to operate our business without infringing the intellectual property rights of others;
- our reliance on third parties to conduct our preclinical studies and clinical trials;
- our reliance on third party supply and manufacturing partners to supply the materials and components for, and manufacture, our research and development, preclinical and clinical trial supplies;
- our ability to attract and retain qualified key management and technical personnel;
- our expectations regarding the time during which we will be an emerging growth company under the Jumpstart Our Business Startups Act of 2012, or the JOBS Act;
- statements regarding our internal controls;
- our financial performance;
- the impact of government regulation and developments relating to our competitors or our industry; and
- other risks and uncertainties, including those listed in Part I, Item 1A of this Annual Report on Form 10-K under the caption "Risk Factors."

These statements relate to future events or our future operational or financial performance, and involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by these forward-looking statements. Factors that may cause actual results to differ materially from current expectations include, among other things, those listed in Part I, Item 1A of this Annual Report on Form 10-K under the section titled "Risk Factors" and elsewhere in this Annual Report on Form 10-K.

Any forward-looking statement in this Annual Report on Form 10-K reflects our current view with respect to future events and is subject to these and other risks, uncertainties and assumptions relating to our business, results of operations, industry and future growth. Given these uncertainties, you should not place undue reliance on these forward-looking statements. No forward-looking statement is a guarantee of future performance. You should read this Annual Report on Form 10-K and the documents that we reference herein and have filed with the SEC as exhibits thereto completely and with the understanding that our actual future results may be materially different from any future results expressed or implied by these forward-looking statements. Except as required by law, we assume no, and specifically decline any, obligation to update or revise these forward-looking statements for any reason, even if new information becomes available in the future.

This Annual Report on Form 10-K also contains or may contain estimates, projections and other information concerning our industry, our business and the markets for certain therapeutics, including data regarding the estimated size of those markets, their projected growth rates and the incidence of certain medical conditions. Information that is based on estimates, forecasts, projections or similar methodologies is inherently subject to uncertainties and actual events or circumstances may differ materially from events and circumstances reflected in this information. Unless otherwise expressly stated, we obtained these industry, business, market and other data from reports, research surveys, studies and similar data prepared by third parties, industry, medical and general publications, government data and similar sources. In some cases, we do not expressly refer to the sources from which these data are derived.

Except where the context otherwise requires, in this Annual Report on Form 10-K, the "Company," "Exicure," "we," "us" and "our" refers to Exicure, Inc., a Delaware corporation, and, where appropriate, its subsidiary.

TRADEMARKS

All trademarks, service marks and trade names appearing in this Annual Report on Form 10-K are the property of their respective holders. Use or display by us of other parties' trademarks, trade dress, or products in this prospectus is not intended to, and does not, imply a relationship with, or endorsements or sponsorship of, us by the trademark or trade dress owners.

PART I

Unless otherwise stated or the context otherwise indicates, references to "Exicure," the "Company," "we," "our," "us," or similar terms refer to Exicure, Inc. and our wholly-owned subsidiary, Exicure Operating Company. Exicure Operating Company, which we refer to as "Exicure OpCo," holds all material assets and conducts all business activities and operations of the Company.

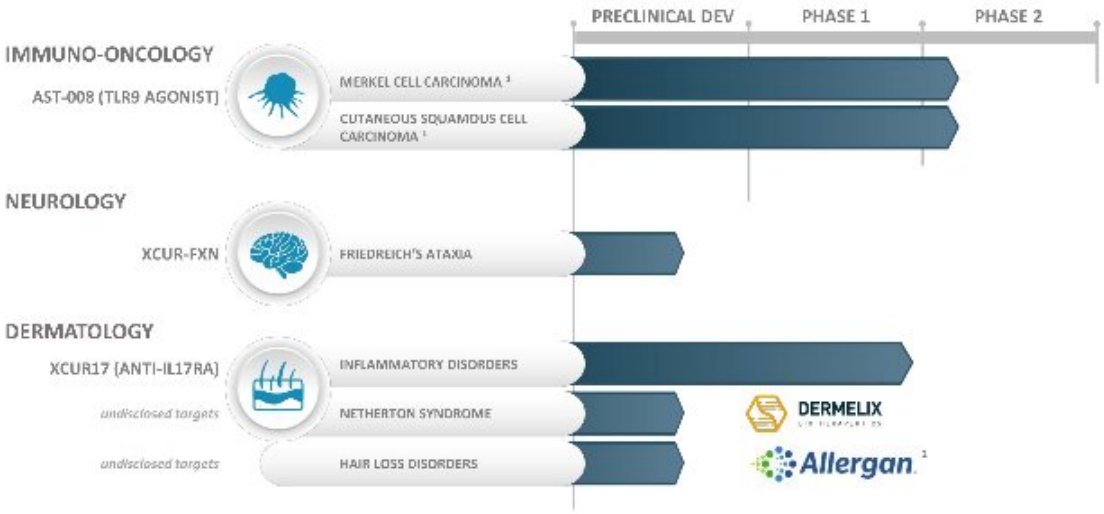
Item 1. Business.

Overview

We are a clinical-stage biotechnology company developing therapeutics for immuno-oncology, genetic disorders and other indications based on our proprietary Spherical Nucleic Acid, or SNA, technology. SNAs are nanoscale constructs consisting of densely packed synthetic nucleic acid sequences that are radially arranged in three dimensions. We believe the design of our SNAs gives rise to distinct chemical and biological properties that may provide advantages over other nucleic acid therapeutics and enable therapeutic activity outside of the liver. We are working to advance our SNA therapeutic candidates through multiple clinical trials, including the ongoing Phase 1b/2 trial of AST-008 in cancer patients.

We believe that one of the key strengths of our proprietary SNAs is that they have the potential to enter a number of different cells and organs. We have shown in preclinical studies that SNAs may have therapeutic potential in neurology, ophthalmology, pulmonology, and gastroenterology. As a consequence, we have expanded our pipeline into neurology, and are conducting early stage research activities in ophthalmology, pulmonology, and gastroenterology.

The table below sets forth the stage of development of our SNA therapeutic candidates as of March 5, 2020:



(1) In combination with checkpoint inhibitors.

(2) On October 14, 2019, the shareholders of Allergan plc voted to approve the acquisition of Allergan by AbbVie Inc., which is subject to customary regulatory approvals and other customary closing conditions.

Immuno-oncology, AST-008

AST-008 is an SNA consisting of toll-like receptor 9, or TLR9, agonists designed for immuno-oncology applications. TLR9 agonists bind to and activate TLR9 receptors. We believe AST-008 may be used for immuno-oncology applications in combination with checkpoint inhibitors.

During the first half of 2019, we opened five clinical trial sites and began recruiting and dosing patients for the Phase 1b/2 trial. The Phase 1b/2 is an open-label, multi-center trial designed to evaluate the safety, tolerability, pharmacokinetics, pharmacodynamics and preliminary efficacy of intratumoral AST-008 injections alone and in combination with intravenous pembrolizumab in patients with advanced solid tumors. We are recruiting patients with advanced or metastatic Merkel cell carcinoma, head and neck squamous cell carcinoma, cutaneous squamous cell carcinoma, and melanoma. The primary outcome measure is the safety and tolerability of AST-008 alone and in combination with pembrolizumab. Secondary outcomes include the recommended Phase 2 dose and disease assessment with RECIST 1.1. As of January 31, 2020, we have dosed 17 patients in the Phase 1b stage of the clinical trial. We have observed no treatment related serious adverse events, or SAEs, nor have we observed any dose-limiting toxicity, or DLT, among the treated subjects. The most common reported adverse event was injection site reactions. In December 2019, we received preliminary results from the Phase 1b/2 stage of the clinical trial showing potential signs of anti-tumor activity in patients with Merkel cell carcinoma. See "Recent Developments" section below for more information regarding these preliminary results. In the second quarter of 2020, we plan to initiate a Phase 2 dose expansion for intratumoral AST-008 in combination with approved checkpoint inhibitor to treat two cohorts of patients with advanced or metastatic Merkel cell carcinoma or cutaneous squamous cell carcinoma. Each cohort is expected to enroll up to 29 patients who have failed anti-PD-1/PD-L1, or programmed cell death protein 1/programmed death-ligand 1, therapy. We expect to open a total of up to 15 sites in the United States.

Neurology

We are investigating the utility of our SNA technology for the treatment of neurological conditions and have ongoing research programs underway. In the fall of 2018, we completed a biodistribution study in rats comparing nusinersen to nusinersen in SNA format. Nusinersen, marketed by Biogen Inc., as Spinraza® is a linear nucleic acid therapeutic approved by the FDA in late 2016 for the treatment of spinal muscular atrophy, or SMA. We found that more nusinersen in SNA format was retained in the rats' brain and spinal cord compared to nusinersen retained in the rats' brain and spinal cord at 24, 72 and 168 hours.

On June 26, 2019, we announced data from a preclinical study evaluating the biodistribution of SNAs in the non-human primate central nervous system. In our study, 7 mg of radio-labeled SNAs were injected intrathecally into cynomolgus monkeys. The biodistribution of the SNAs was followed for 14 days by PET/CT scans. SNAs were observed throughout the entire brain and were found both in the brain stem as well as inside the brain. High content of SNA was observed in all 46 regions of the brain examined. These key data indicate that the SNA platform may be well-suited for development of new therapeutics directed towards diseases of the central nervous system.

Friedreich's ataxia

We are developing XCUR-FXN, an SNA-based therapeutic candidate for the treatment of Friedreich's ataxia, or FA. FA is an autosomal recessive, neurodegenerative disease characterized by progressively impaired muscle coordination caused by the degeneration of neurons in the cerebellum and dorsal root ganglia in the spinal cord. FA patients may also experience impairment of visual, auditory and speech functions. FA patients also commonly suffer from life-threatening heart conditions such as hypertrophic cardiomyopathy, myocardial fibrosis and heart failure. The typical age of onset for FA is between 5 and 15 years. An estimated 5,000 patients in the US and 15,000 patients worldwide are affected by FA. There are no FDA-approved treatments for FA.

We have conducted extensive preclinical research evaluating the suitability of our SNA technology for genetically defined neurological diseases, including efficacy studies in animal models, and biodistribution in rodent and non-human primates. Based on the results, we believe we can target FA at the genetic source and meet an important unmet medical need for FA patients. FA is driven by expansion of guanine-adenine-adenine bases of the DNA sequence, or GAA, triplet repeats in the first intron of frataxin, or FXN, gene. The expanded repeat of FXN forms an intramolecular triple-helix, which impairs transcription and reduces levels of frataxin protein. Our strategy

will be to use a genetically-targeted SNA therapy to increase FXN protein. Our FA program, XCUR-FXN, will be designed and developed with guidance from and in collaboration with the Friedreich's Ataxia Research Alliance, or FARA, the non-profit, charitable organization dedicated to accelerating research leading to treatments and a cure for FA. We expect to initiate IND-enabling studies for XCUR-FXN in late 2020.

Other neurological indications

We are building on our proof-of-concept work with nusinersen and our therapeutic candidate XCUR-FXN to further explore new therapeutic applications of our SNA technology in neurology. We aim to address indications with great unmet medical need and where we believe the attributes of our SNA technology would lead to therapeutic and commercial advantages. In order to select new therapeutic indications, we expect to analyze a variety of attributes including: (i) indications where there is a known genetic basis for the disorder, (ii) disorders where we can target multiple genes, (iii) the existence of a patient registry or a patient advocacy group that can work with us for easier trial enrollment, (iv) the competitive therapeutic landscape including disorders not easily addressable by small molecules or antibodies, (v) indications with no approved therapies, and (vi) indications amenable to localized therapeutic administration. Based on these and other criteria, we are currently exploring additional neurological conditions, including spinocerebellar ataxia, Batten disease, amyotrophic lateral sclerosis (ALS), and Huntington's disease.

Dermatology

XCUR17

XCUR17 is an SNA that targets the mRNA that encodes interleukin 17 receptor alpha, or IL-17RA, a protein that is considered essential in the initiation and maintenance of psoriasis. Although the availability of inhibitors of TNF revolutionized the systemic treatment of severe psoriasis, studies of disease pathogenesis have shifted attention to the IL-17 pathway in which IL-17RA is a key driver of psoriasis. Our strategy is to reduce the levels of IL-17RA in the skin by topically applying XCUR17.

We filed a clinical trial authorization, or CTA, for a Phase 1 clinical trial of XCUR17 in patients with psoriasis in Germany in the third quarter of 2017, and we began dosing patients in April 2018. The Phase 1 clinical trial, which had final patient visits in the fourth quarter of 2018, was a randomized, double-blinded, placebo-controlled trial in 21 patients with mild to moderate chronic plaque psoriasis designed to assess the safety of XCUR17 formulated as a topical gel, and to evaluate early signs of efficacy. All patients received three strengths of XCUR17 gel, a vehicle gel, and an active comparator (Daivonex® cream), which were all applied on different areas of psoriatic skin within each individual patient.

In the fourth quarter of 2018, we reported results from the Phase 1 trial of XCUR17. In the case of XCUR17, of the 21 treated patients, 11 treated with the highest strength XCUR17 gel were observed to have a reduction in redness and improvement in healing as determined by blinded physician assessments. Further, the highest strength XCUR17 gel showed a statistically significant improvement in psoriasis symptoms versus the vehicle gel. By comparison, 17 of the 21 patients treated with the active comparator showed a clinical response, while four patients treated with the placebo vehicle had a clinical response.

We have observed no adverse safety events related to treatment with XCUR17 in the Phase 1 clinical trial to date. In addition to the safety, tolerability and clinical assessments, the trial measured psoriatic infiltrate thickness over the 26-day treatment period. No relevant changes in mean psoriatic infiltrate thickness were observed for the three XCUR17 gels or the active ingredient-free vehicle gel.

In October 2019, at the 15th Annual Meeting of the Oligonucleotide Therapeutics Society, we disclosed biomarker results from the skin biopsies collected from the 21 patients treated with XCUR17 in the Phase 1 trial. Clinical findings, correlated with psoriasis-related markers and histological changes from biopsies provided by the patients, showed that XCUR17:

- Resulted in a decrease in the levels of psoriasis and inflammation markers downstream of XCUR17's target, IL-17RA;

- Produced a statistically significant reduction in keratin 16 expression, a key marker of psoriasis (p=0.002);
- Resulted in reductions in the major inflammatory markers beta defensin 4A, interleukin 19, and interleukin 36A versus psoriatic skin at baseline; and
- Revealed clinical improvements that matched reductions in keratin 16 protein and epidermal thickness.

We believe these findings suggest that SNA-based drugs, such as XCUR17, may address clinical symptoms in patients with inflammatory diseases, such as psoriasis. We currently are not conducting additional clinical activities for XCUR17 and we seek to out-license the XCUR17 program.

Ophthalmology

We believe that the eye may be an attractive organ for locally-applied SNAs because (i) it is a small and immune-privileged organ, (ii) there are established and non-invasive clinical assessment procedures, and (iii) effective trials can be designed by using a contralateral control eye. We believe that our preclinical data using SNA technology may provide proof-of-concept for expansion of our research and development activities into ophthalmological genetic disorders. Our preclinical data indicated that SNAs distributed to both posterior (retinal) and anterior (cornea) ocular structures, exhibited higher distribution and persisted longer compared to linear oligonucleotides, and did not cause inflammation in the eye.

We believe SNAs may possess key potential advantages over gene therapy in the eye. These key potential advantages include: (i) delivery via intravitreal injections which are safer and easier than subretinal injections, (ii) tunable and reversible control of target expression, and (iii) the ability to treat toxic gain-of-function diseases and target large genes. We believe, based on our internal analysis, that there are approximately 250 rare ophthalmological diseases with known genetic targets, such as CLN3 for Batten disease, BEST1 for vitelliform macular dystrophy, and USH2A for usher syndrome type 2A. As such, we intend to expand our preclinical research and development activities in ophthalmology in 2020 and beyond.

Collaboration Programs

Allergan Collaboration Agreement

On November 13, 2019, we entered into a Collaboration, Option and License Agreement, or the Allergan Collaboration Agreement, with a wholly-owned subsidiary of Allergan plc, Allergan Pharmaceuticals International Limited, or Allergan. Pursuant to the Allergan Collaboration Agreement, we granted to Allergan exclusive access and options to license SNA based therapeutics arising from two collaboration programs related to the treatment of hair loss disorders. Under each such license, we grant to Allergan exclusive, royalty-bearing, sublicenseable, nontransferable, worldwide rights to develop, manufacture, use and commercialize such SNA therapeutics.

Under the terms of the Allergan Collaboration Agreement, we received an upfront payment of $25 million, and, if Allergan exercises any of its option rights under the agreement, Allergan will pay us an option exercise fee equal to $10 million for each exercised option, if such option is exercised during the initial option exercise period. Allergan may extend an option exercise period beyond the applicable initial exercise period for a particular program for an additional fee.

If Allergan exercises an option for a program, we are eligible to receive up to an aggregate of $55 million for development milestone payments and $132.5 million for product approval and launch milestones, per program. We are also eligible to receive up to $175 million in sales milestone payments, on a program by program basis, associated with aggregate worldwide sales. In the event a therapeutic candidate subject to the collaboration results in commercial sales, we are eligible to receive tiered royalties at percentages ranging from the mid-single digits to the mid-teens on future net product sales of such commercialized therapeutic candidates. A percentage of the aforementioned payments will be due to Northwestern University, or Northwestern, upon receipt, pursuant to our existing license agreements with Northwestern.

Dermelix Collaboration Agreement

On February 17, 2019, we entered into a License and Development Agreement, or the Dermelix License Agreement, with DERMELIX, LLC, d/b/a Dermelix Biotherapeutics. Under the terms of agreement, Dermelix licensed worldwide rights to research, develop, and commercialize Exicure's technology for the treatment of Netherton Syndrome, or NS, and, at Dermelix's option, up to five additional rare skin indications.

Dermelix will initially develop a targeted therapy for the treatment of NS. NS is a rare and severe autosomal recessive disorder caused by loss-of-function mutations in the *SPINK5* gene, which encodes the serine protease inhibitor LEKTI involved in skin barrier function. NS affects approximately one in 200,000 children born each year, and is characterized by severely inflamed, red, scaled, itchy skin, and patients are at increased risk of mortality in the first year of life due to recurrent infections and dehydration as a result of the impaired skin barrier. Currently, there are no approved treatments for NS patients and off-label use of standard of care treatments are of limited utility.

Under the terms of the Dermelix License Agreement, Exicure received an upfront payment of $1 million at closing of the transaction and will receive an additional $1 million upon the exercise of each of the five options granted to Dermelix. Exicure will be responsible for conducting the early-stage development for each indication up to IND enabling toxicology studies. Dermelix will assume subsequent development, commercial activities and financial responsibility for such indications. Dermelix will pay the costs and expenses of development and commercialization of any licensed products under the Dermelix License Agreement, including our expenses incurred in connection with development activities and in accordance with the development budget. For each of NS as well as any additional licensed product for which Dermelix exercises one of its options, Exicure is eligible to receive potential payments totaling up to $13.5 million upon achievement of certain development and regulatory milestones and up to $152.5 million upon achievement of certain sales milestones per indication in each of six indications. In addition, Exicure will receive low double-digit royalties on annual net sales for SNA therapeutics developed.

Purdue Collaboration Agreement

AST-005

AST-005 is an SNA targeting TNF for the treatment of mild to moderate psoriasis. In a completed Phase 1 clinical trial, AST-005, when topically administered, resulted in no drug associated adverse events, and demonstrated a reduction of TNF mRNA. The TNF mRNA reduction elicited by the highest strength of AST-005 gel was statistically significant when compared to the effects of the vehicle.

In 2016, we entered into a research collaboration, option and license agreement with Purdue Pharma L.P., under which a Phase 1b clinical trial evaluated the effect of AST-005 gel in patients with chronic plaque psoriasis. The trial demonstrated that AST-005 is safe and tolerable in patients at higher doses than previously studied, but did not result in a statistically significant decrease in echo lucent band thickness, one of the key indicators of efficacy. In 2018, Purdue declined to exercise its option to develop AST-005 at that time, but indicated its intent to retain rights relating to the TNF target and reserved its right to continue joint development, with Exicure, of new anti-TNF drug candidates and to retain its exclusivity and other rights in AST-005.

In 2019, Purdue, while re-asserting its right to develop new anti-TNF therapeutic candidates, indicated it will not select any collaboration targets. As a result, we will not receive any research, regulatory and commercial sales milestones contingent upon successful development of such collaboration targets. At this time, there are no active development activities underway for a new anti-TNF therapeutic candidate. As a consequence, we also believe that it is highly unlikely that we will receive any research, regulatory and commercial sales milestones from Purdue for any anti-TNF therapeutic candidates.

Intellectual property

We believe that we have a strong intellectual property, or IP, position in the field of SNA therapeutics. As of December 31, 2019, our patent portfolio consists of over 85 issued patents and allowed patent applications and over 125 pending patent applications. We have licensed IP from Northwestern University and have also independently filed patents to protect our IP. Our license from Northwestern University is for exclusive worldwide rights to the use of SNA technology for therapeutic applications. Any patents arising from applications covering AST-008 would expire between 2034 and 2037. Patents arising from applications covering XCUR17 and AST-005 would expire by 2037 and 2035, respectively.

Our Strategy

We intend to build a leading nucleic acid therapeutics company based on our proprietary SNA technology. The key elements of our strategy are:

- **Rapidly advance AST-008 through clinical development for select cancer indications.** AST-008 is our most advanced therapeutic candidate. We are conducting a Phase 1b/2 trial to evaluate the safety, tolerability, pharmacokinetics, pharmacodynamics and preliminary efficacy of intratumoral AST-008 injections alone and in combination with intravenous pembrolizumab in patients with advanced solid tumors. As of January 31, 2020, we have dosed 17 patients in the Phase 1b stage of the clinical trial. We have observed no treatment related serious adverse events, or SAEs, nor have we observed any dose-limiting toxicity, or DLT, among the treated subjects. The most common reported adverse event was injection site reactions. In December 2019, we received preliminary results from the Phase 1b/2 stage of the clinical trial showing potential signs of anti-tumor activity in patients with Merkel cell carcinoma. See "Recent Developments" section below for more information on these preliminary results. In the second quarter of 2020, we plan to initiate Phase 2 dose expansion for intratumoral AST-008 in combination with an approved checkpoint inhibitor for two cohorts of patients with advanced or metastatic Merkel cell carcinoma or cutaneous squamous cell carcinoma. Each cohort is expected to enroll up to 29 patients who have failed anti-PD-1/PD-L1, or programmed cell death protein 1/programmed death-ligand 1, therapy. We expect to open a total of up to 15 sites in the United States.

- **Prioritize neurological disorders for near-term development efforts, proof-of-concept and commercialization.** In June 2018, it was observed in a preclinical study that nusinersen in SNA format prolonged survival by four-fold as well as doubled the levels of healthy full-length SMN2 mRNA and protein in SMA patient fibroblasts when compared to nusinersen. Subsequently, in the fall of 2018, we completed a bio-distribution study comparing nusinersen to nusinersen in SNA format in rats. The concentration of nusinersen in the kidneys was significantly increased in comparison to nusinersen in SNA format while more nusinersen in SNA format was retained in the CNS (brain and spinal cord) compared to nusinersen at 24, 72 and 168 hours. Based on these results, we believe the attributes of our SNA technology may potentially lead to therapeutic and commercial advantages in neurological conditions. In December 2019, we announced Friedreich's ataxia (FA) as the therapeutic indication for the company's first neurology development program. We are working in collaboration with Friedreich's Ataxia Research Alliance, or FARA, to develop XCUR-FXN, our FA therapeutic candidate. We expect to initiate IND-enabling studies for XCUR-FXN in late 2020. We are also evaluating the application of our SNA technology in additional neurological conditions with unmet medical needs, including spinocerebellar ataxia, Batten disease, amyotrophic lateral sclerosis (ALS), and Huntington's disease.

- **Use our proprietary SNA technology to develop additional therapeutic candidates.** We have demonstrated in preclinical studies that in certain applications, SNAs exhibit superior biodistribution properties compared to linear oligonucleotides being both more persistent and more stable in the tissue or organ of interest. As a consequence, SNAs may have potential applications in a variety of additional organs, including the eye, gastrointestinal tract and lungs. We believe that we have the opportunity to enhance the therapeutic potential of known oligonucleotides of clinical utility by incorporating them in our SNA platform. In addition, we may be able to develop novel therapeutic candidates targeting validated therapeutic targets. We are conducting early stage research activities in ophthalmology, pulmonology, and gastroenterology.

- **Advance SNA platform in dermatological indications with suitable partners.** In the fourth quarter of 2018 we reported results from the Phase 1 trial of XCUR17, an SNA for the treatment of mild to moderate psoriasis.

Of the twenty-one patients, eleven treated with the highest strength XCUR17 gel were observed to have a reduction in redness and improvement in healing as determined by blinded physician assessments. Informed by these results, on February 17, 2019, we entered into a License and Development Agreement with Dermelix. Under the terms of agreement, Dermelix licensed worldwide rights to research, develop, and commercialize Exicure's technology for the treatment of Netherton Syndrome and up to five additional rare skin indications. Additionally, in November 2019, we entered into the Allergan Collaboration Agreement, pursuant to which we, in collaboration with Allergan, are developing SNA-based treatments for hair loss disorders.

- **Enter into additional partnerships to accelerate development and commercialization of our SNA therapeutic candidates.** We believe our proprietary SNA technology lends itself to license agreements or development partnerships with pharmaceutical companies that have development or commercial expertise in a particular therapeutic area of interest where it would be uneconomical or impractical for us to develop SNA therapeutics independently.

- **Continue to expand our core capabilities in high throughput screening and automated analyses.** We believe there may be a number of therapeutic areas where our SNA technology can be applied to bring first-in-class or best-in-class medicines to patients. Our goal is to identify and advance to clinical development therapeutic candidates for multiple different genetically-defined disorders in parallel, either on our own or with strategic collaborators. We continue to invest in critical infrastructure and know-how to execute on this goal.

- **Build, enhance and protect our proprietary SNA intellectual property.** We believe the three-dimensional structure of our SNAs provides novel technological and commercial opportunities. We have licensed IP from Northwestern University and have also filed patents independently to protect our IP. Our license from Northwestern University is for exclusive worldwide rights to the use of SNA technology for therapeutic applications. We will continue to protect our IP and innovations arising from our research and development efforts, and prudently in-license technologies where appropriate for protection of our therapeutic pipeline and the broader SNA technology. Any patents arising from applications covering AST-008 would expire between 2034 and 2037. Patents arising from applications covering XCUR17 and AST-005 would expire by 2037 and 2035, respectively.

Introduction to Nucleic Acid Therapeutics

Overview of nucleic acids as a therapeutic modality

Historically, therapeutic development has been focused on small molecules and biologics, or protein-based therapeutics, including antibodies. Development of small molecule therapeutics often involves screening thousands of compounds, sometimes without a known protein structure or active site to which the small molecule can bind and affect its disease-related function. Protein-based therapeutics are also subject to limitations. For example, the choice of targets that antibodies can address is typically limited to extracellular protein targets. However, the majority of protein targets are located inside the cell, making them undruggable by antibodies.

Nucleic acid therapeutics represent a treatment approach differing in many important ways from small molecules and biologics. Nucleic acid therapeutics are based on the well-established scientific understanding that DNA in the nucleus of cells is converted into an intermediate molecule, called messenger RNA, or mRNA, that serves as the template for making proteins. Therapeutic gene regulation is the use of nucleic acid therapeutics to modulate the production of target proteins by changing the amount of mRNA that is converted to protein, thereby providing an approach to treating diseases at their genetic origin. Our SNAs are a type of nucleic acid therapeutic.

We believe the development timeline for nucleic acid therapeutic candidates will be shorter than that of small molecules and antibodies. Nucleic acid therapeutics can be directed against most mRNA, including the mRNA of proteins that cannot be targeted by small molecules or antibodies. Due to the detailed knowledge of mRNA sequences in humans, nucleic acid therapeutics can be engineered to be specific to a region of an mRNA sequence while interacting minimally with all other mRNA sequences. Moreover, due to the well-defined length and composition of mRNA sequences, a relatively small set of rationally designed therapeutic candidates, usually hundreds, can be synthesized and tested for activity against an mRNA target. This is in contrast to the small molecule drug development process that requires a much larger number of candidates to be screened.

Challenges in developing nucleic acid therapeutics

Significant progress has been made in the development of nucleic acid therapeutics. However, we believe there are ongoing technical challenges in the nucleic acid therapeutics field. Nucleic acids are molecules that, when administered without proper formulation, encounter a number of barriers to their bioavailability, biodistribution, and desired biological activity. These challenges have often been met by chemically modifying the oligonucleotide and by encapsulating or complexing it with a lipid or polymer carrier. Despite these advances in the delivery of oligonucleotides, the biodistribution of these molecules remains a challenge since oligonucleotides typically accumulate in the liver after subcutaneous or intravenous administration, thereby limiting their primary application to diseases of the liver. In an array of experiments, we have demonstrated that SNAs, administered locally without encapsulation or complexation, enter cells and organs. We believe the local administration of our gene regulatory SNAs will potentially enable safe and efficacious therapeutic applications to organs beyond the liver.

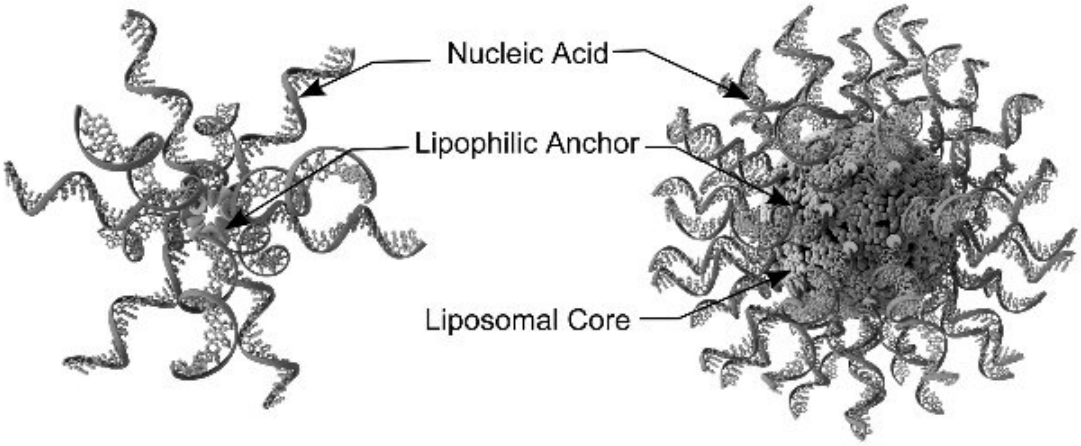
Our Proprietary Technology: Spherical Nucleic Acids

Our therapeutic discovery and development efforts rely on our proprietary SNA technology. SNAs are nanoscale constructs consisting of densely packed synthetic nucleic acid molecules that are radially arranged in three dimensions. We refer to these synthetic nucleic acid molecules in our SNAs as oligonucleotides and the radial orientation of the oligonucleotides without lipid or polymer encapsulation as our “inside out” or “3-D” approach. Our SNAs, unlike many other nucleic acid therapeutics, do not require lipid or polymer encapsulation or complexation in order to be delivered. Encapsulation is the process of confining the nucleic acids inside the cavities of larger structures, typically liposomes, whereas complexation is the process of creating an assembly of nucleic acids bound together with other molecules, typically lipids or polymers.

This arrangement of oligonucleotides allows our proprietary SNAs to enter cells through class A scavenger receptors. Class A scavenger receptors are commonly found on the surface of cells throughout the body, which we believe provides a ubiquitous mechanism of cellular entry for the local administration of our SNA therapeutic candidates. This mechanism of cellular entry is different from many other nucleic acid therapeutics that typically bind to receptors found only in the liver.

The broad tissue penetration and biodistribution properties of SNAs potentially enable three distinct therapeutic approaches. SNAs may be designed to reduce target protein levels by reducing corresponding mRNA levels in cytoplasm. SNAs may also be designed to modulate splicing of pre-mRNA in the nucleus to enhance or alter the product of a target protein and mitigate a genetic defect. Finally, SNAs may be designed to potentially elicit an anti-tumor immune response by agonizing toll like receptors in the endosomes.

Examples of our proprietary SNA constructs



All of our SNAs contain oligonucleotides that are densely packed and radially oriented.

We believe the key advantages of our proprietary SNAs include:

- **SNAs cross certain biological barriers to deliver nucleic acid therapeutics.** Local delivery of nucleic acid therapeutics through biological barriers, such as the skin, has been a significant technical challenge. In a Phase 1 clinical trial of XCUR17 in patients with mild to moderate psoriasis, eleven of the twenty-one patients treated with the highest strength XCUR17 gel were observed to have a reduction in redness and improvement in healing as determined by blinded physician assessments. Further, in preclinical studies, we have demonstrated delivery and activity of our SNAs in the central nervous system, eye, lung, and gastrointestinal tract.

- **SNAs potentially exhibit superior biodistribution properties compared to linear oligonucleotides.** In the fall of 2018, we completed a biodistribution study in rats comparing nusinersen to nusinersen in SNA format. We found that more nusinersen in SNA format was retained in the rats' brain and spinal cord compared to nusinersen retained in the rats' brain and spinal cord at 24, 72 and 168 hours. We believe that we have the opportunity to enhance the therapeutic potential of known oligonucleotides of clinical utility by incorporating them in our SNA platform. In addition, we may be able to develop novel therapeutic candidates using our SNA platform.

- **SNAs can potentially target multiple genes with a single therapeutic candidate.** In collaboration with Dr. Amy Paller, one of our scientific advisors, at the 2019 meeting of the Society for Investigative Dermatology, we presented data demonstrating the application of our SNA technology for concurrently targeting two different genes in a single SNA compound. Further, we believe we can concurrently target three or more genes with a single SNA compound. This feature potentially allows us to identify novel therapeutic candidates to treat multiple variants of a given genetic disorder or multiple genetic targets for a single disorder with one therapeutic candidate.

- **SNAs we have administered to date have been well-tolerated.** In each of the Phase 1 clinical trials of AST-005 and XCUR17, we observed no drug associated adverse events when the SNA therapeutic candidate was applied topically to the skin of patients with mild to moderate psoriasis. No serious adverse events were observed in our Phase 1 trial after injecting AST-008 subcutaneously into healthy volunteers. There are three key elements to our safety strategy. First, by administering SNAs locally, we expect to minimize systemic exposure thereby decreasing safety risk. Second, because SNAs enter cells and tissues without lipid or polymer encapsulation or complexation, we expect to avoid the toxicity risks associated with these delivery systems. Finally, due to the nuclease resistance attributable to the architecture of the SNA, we use fewer chemical modifications than are customary in nucleic acid therapeutic development.

- **SNAs can be administered locally into a number of different cell and tissue types.** SNAs enter cells through class A scavenger receptors, which are present on the surface of many cell types. We believe that by accessing this mechanism, our SNAs could have therapeutic applications in organs beyond the liver, such as the brain, eye, gastrointestinal tract, lung, and skin. In preclinical studies, more than 50 cell lines and primary cells have been shown to internalize SNAs.

- **Immuno-oncology SNAs may produce a powerful immune response against tumors.** In its Phase 1 trial, AST-008 was shown to elicit high levels of certain cytokines as well as activate important effector cells of the immune system, including T cells and natural killer cells which are the main drivers of an anti-tumor response. In preclinical studies, SNAs localized to endosomes and stimulated the immune system via TLRs. We have also observed in preclinical studies that SNAs can generate a cancer-specific adaptive immune response. In addition, in preclinical studies in a variety of cancer models, SNAs, in combination with certain checkpoint inhibitors, exhibited a greater anti-tumor response and increased survival than did such checkpoint inhibitors alone. Moreover, when administered as a monotherapy, AST-008 exhibited anti-tumor activity in mouse cancer models.

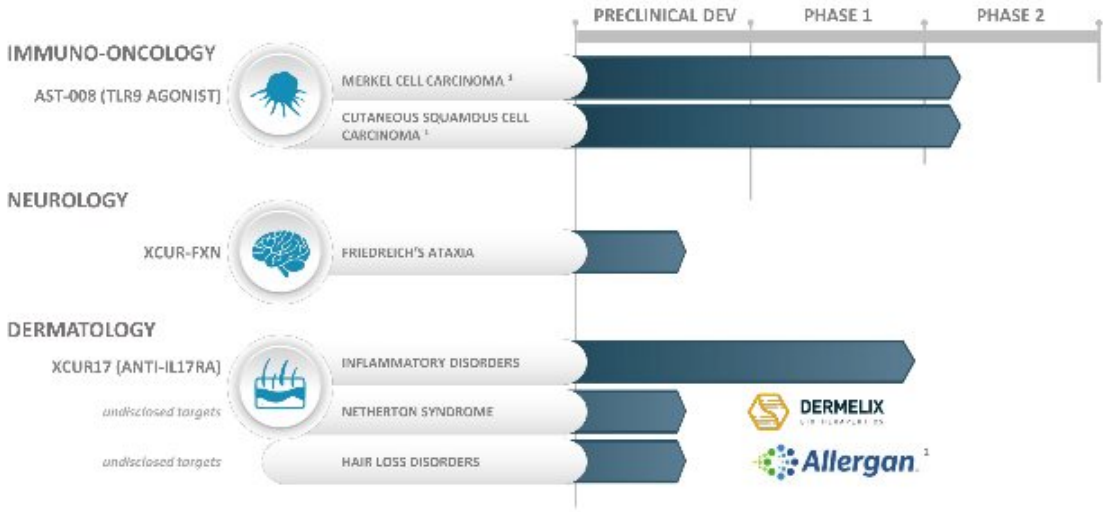
- **SNAs have shown greater resistance to nuclease degradation.** Nucleases are proteins that degrade oligonucleotides. In preclinical studies, SNAs have been shown to have an increased nuclease resistance compared to linear oligonucleotides. We believe this is a result of our 3-D approach, and as a consequence, we believe that smaller amounts of SNAs may be required to achieve therapeutic efficacy compared to linear oligonucleotides.

- **SNAs can be manufactured at commercial scale.** Based on our manufacturing work to date, we believe SNAs can be made in a low cost, high-throughput, scalable, and reproducible manner using current Good Manufacturing Practices, or cGMPs.

Our Therapeutic Development Programs

Our therapeutic development programs include the development of AST-008 to address unmet medical needs in the treatment of Merkel cell carcinoma and squamous cell carcinoma and one SNA therapeutic candidate to address unmet medical needs in inflammatory disorders. We are developing a therapeutic candidate for the treatment of Friedreich's ataxia and multiple other genetically-defined neurological disorders. We are also conducting early stage research activities in ophthalmology, respiratory and gastrointestinal applications. These early stage research activities are described in more detail in the sections entitled "—Preclinical research programs."

The table below sets forth the stage of development of our SNA therapeutic candidates as of March 5, 2020:



_____

(1) In combination with checkpoint inhibitors.

(2) On October 14, 2019, the shareholders of Allergan plc voted to approve the acquisition of Allergan by AbbVie Inc., which is subject to customary regulatory approvals and other customary closing conditions.

SNAs for immuno-oncology

Overview of immuno-oncology as a therapeutic modality

In healthy individuals, the immune system fights off pathogens, such as bacteria and viruses. The immune system should also recognize cancer cells as foreign and eliminate them. However, cancers present a challenge because they have developed strategies to resist detection and clearance by the immune system. Immuno-oncology approaches help the patient's immune system identify a cancer as foreign and stimulate a tumor-clearing immune response. One of the greatest benefits of the immuno-oncology approach is the continuous, durable anti-tumor response that can be achieved long after discontinuation of treatment.

Current immuno-oncology therapeutic approaches generally fall into three broad categories. First, there are approaches that stimulate the immune system to detect and eliminate tumors. Examples include cytokines and toll-like receptor, or TLR, agonists. Second, some therapeutics make a cancer more readily visible to the immune system. These therapeutics include checkpoint inhibitors, such as those that target CTLA4, or cytotoxic T-lymphocyte-associated protein 4, PD-1, and PD-L1, or programmed death-ligand 1. Third, there are adoptive cell transfer therapies, including dendritic cell vaccines and chimeric antigen receptor T-cells, or CAR-Ts, that direct the immune system to target a specific type of cancer.

The knowledge of the TLR activation pathway is central to the understanding of how the immune system is stimulated to target cancer. TLRs are membrane- and endosome-bound receptors found on a number of cell types, including specialized immune cells. TLRs recognize specific molecular patterns ordinarily presented by pathogens. When cells recognize pathogens, they produce and release protein signals called cytokines that mobilize the immune system to fight invading pathogens. In addition, they activate antigen presenting cell and helper T-cells, which then coordinate the longer-term pathogen specific adaptive immune response, and as a result, confer long-term immunity to the host.

Checkpoint proteins, such as CTLA4 and PD-1, are expressed on the surface of T-cells and inhibit the function of activated T-cells. Cancers are difficult to treat because they have developed mechanisms to take advantage of these checkpoint proteins thereby evading detection and clearance by the immune system. Inhibiting these checkpoint proteins, especially PD-1 and PD-L1, has proven to be a highly effective anti-cancer therapy in some patients. Nevertheless, checkpoint inhibitors targeting the PD-1 pathway have limited clinical efficacy as monotherapy, with response rates of 20% or less in many common types of cancers, including breast and colon cancers. Emerging evidence suggests that checkpoint inhibitors are effective primarily in patients whose tumors already have pre-existent CD8 T-cell infiltrate, i.e. immune system is already capable of recognizing the tumors. We believe the challenge in the field is to increase the efficacy of checkpoint inhibitors in a broader cancer patient population by converting tumors that are non-T-cell inflamed to T-cell inflamed.

AST-008—an SNA for immuno-oncology

AST-008 is an SNA consisting of toll-like receptor 9, or TLR9, agonists designed for immuno-oncology applications. TLR9 agonists bind to and activate TLR9 receptors. We believe AST-008 may be used for immuno-oncology applications in combination with checkpoint inhibitors. We have observed that, in preclinical studies in a variety of tumor models, AST-008, applied in combination with certain checkpoint inhibitors, exhibited anti-tumor responses and survival rates that were greater than those demonstrated by checkpoint inhibitors alone. We have also demonstrated that AST-008 was active when administered subcutaneously, intratumorally or intravenously, in both prevention and established mouse tumor models. The administration of AST-008 also produced localized as well as abscopal anti-tumor activity in mouse cancer models. Additionally, the administration of AST-008 in combination with certain checkpoint inhibitors conferred adaptive immunity in breast and colon cancer mouse models. In mouse tumor models, administration of AST-008 with anti-PD-1 antibodies suppresses regulatory T-cells, or Tregs, and

myeloid-derived suppressor cells, or MDSCs, and increases the levels of CD8 effector T-cells. We believe these important results suggest that the combination of immuno-oncology SNAs and checkpoint inhibitors could potentially treat a larger proportion of cancer patients than checkpoint inhibitors alone.

Phase 1b/2 clinical development of AST-008

During the first half of 2019, we opened five clinical trial sites and began recruiting and dosing patients for the Phase 1b/2 trial. The Phase 1b/2 is an open-label, multi-center trial designed to evaluate the safety, tolerability, pharmacokinetics, pharmacodynamics and preliminary efficacy of intratumoral AST-008 injections alone and in combination with intravenous pembrolizumab in patients with advanced solid tumors. We are recruiting patients with advanced or metastatic Merkel cell carcinoma, head and neck squamous cell carcinoma, cutaneous squamous cell carcinoma, and melanoma. The primary outcome measure is the safety and tolerability of AST-008 alone and in combination with pembrolizumab. Secondary outcomes include the recommended Phase 2 dose and disease assessment with RECIST 1.1. As of January 31, 2020, we have dosed 17 patients in the Phase 1b stage of the clinical trial. We have observed no treatment related serious adverse events, or SAEs, nor have we observed any dose-limiting toxicity, or DLT, among the treated subjects. The most common reported adverse event was injection site reactions. In December 2019, we received preliminary results from the Phase 1b/2 stage of the clinical trial showing potential signs of anti-tumor activity in patients with Merkel cell carcinoma. See "Recent Developments" section below for more information regarding these preliminary results. In the second quarter of 2020, we plan to initiate a Phase 2 dose expansion for intratumoral AST-008 in combination with approved checkpoint inhibitor to treat two cohorts of patients with advanced or metastatic Merkel cell carcinoma or cutaneous squamous cell carcinoma. Each cohort is expected to enroll up to 29 patients who have failed anti-PD-1/PD-L1, or programmed cell death protein 1/programmed death-ligand 1, therapy. We expect to open a total of up to 15 sites in the United States.

Phase 1 clinical development of AST-008

The Phase 1 clinical trial was a first-in-human clinical trial of AST-008 evaluating the safety, tolerability, pharmacokinetics, and pharmacodynamics of AST-008 in healthy volunteers. The trial was a randomized, single ascending dose, or SAD, trial. Sixteen healthy subjects were recruited and organized into four SAD cohorts. We began subject dosing in the fourth quarter of 2017 and announced our initial analyses of the results of the trial on September 20, 2018.

Based on our initial analyses of the Phase 1 clinical trial results, AST-008 was shown to be safe and tolerable in all subjects, with no serious adverse events and no dose limiting toxicity. AST-008 was well tolerated and all AST-008-related adverse events were of short duration, reversible and consistent with TLR9 activation. Such adverse events included flu-like symptoms, injections site reactions, and non-clinically significant lymphopenia and neutropenia.

In addition to the principal safety and tolerability endpoint, the trial screened for levels of select cytokines and markers of immune cell activation. AST-008 was shown to elicit high levels of certain cytokines as well as activate important effector cells of the immune system including T cells and natural killer cells.

For the four subjects receiving the trial's top dose of about 20 μg/kg of AST-008, initial analyses suggest that the average fold-increase above baseline for these cytokines is approximately as follows: IFN-gamma: 3 fold; IL-6: 57 fold; IL-12: 2 fold; IP-10: 32 fold; and MCP-1: 4 fold.

We believe that such cytokine induction has clinical importance because these cytokines play an important role in immune system activity. IL-12, is an important T cell-stimulating factor, involved in the differentiation of naive T cells into Th1 cells. IP-10, also known as CXCL10, acts as a chemo-attractant for macrophages, T cells, NK cells, and dendritic cells and in antitumor activity. IL-6 is a key player in the activation, proliferation and survival of lymphocytes during active immune responses and supports shifting the immune system from a suppressive to a responsive state that can effectively act against tumors. MCP-1, or CCL2, is a small cytokine which helps recruiting monocytes, memory T cells, and dendritic cells.

In addition to the cytokine response, AST-008 was shown to activate important effector cells of the immune system, including natural killer cells or NK cells which are cytotoxic lymphocytes critical to the innate immune

system, and T cells which are key effector cells of the adaptive immune system. At the trial's top dose of about 20 µg/kg, AST-008 elicited 9.5 fold and 3.5 fold increases in the fraction of activated T cells and natural killer cells, respectively, compared to baseline. NK cells continually scan the body for abnormal cells to attack. T cells form the basis of a targeted and durable immune response and immunological memory. We believe that activation by AST-008 of the key effectors cells of both the innate and adaptive immune system makes AST-008 suitable for combination with checkpoint inhibitors.

Historical TLR9 Agonist Healthy Volunteer Data

In 2015, Mologen AG published results (European Journal of Cancer, 2015, volume 51, supplement 1, page S12) from a healthy volunteer trial. In a single cohort, 13 subjects each received one 60 mg dose (equivalent to 923 µg/kg for a 65 kg subject) of lefitolimod subcutaneously. On average, across the cohort, there was a 7 fold-increase in IP-10 expression above baseline. No cell activation data were reported. Lefitolimod is currently in a Phase 3 clinical trial.

In 2004, Coley Pharmaceutical Group (now Pfizer, Inc.) published results (Journal of Immunotherapy, 2004, Volume 27, pages 460-471) from a single ascending dose healthy volunteer trial. In that trial, their TLR9 agonist, PF-03512676, was administered subcutaneously to six subjects per dose level. For the 20 µg/kg dose level, the average fold-increase above baseline for these cytokines is as follows: IFN-gamma: no change from baseline; IL-6: 8 fold; IL-12: no change from baseline; IP-10: 9 fold; and MCP-1: 3 fold.

Preclinical data for AST-008

We have observed that administration of AST-008 as a monotherapy can have anti-tumor activity in colon cancer, breast cancer, lymphoma and melanoma mouse models. We have also observed that, in preclinical studies in a variety of tumor models, AST-008 applied in combination with certain checkpoint inhibitors exhibited anti-tumor responses and survival rates that were greater than those demonstrated by checkpoint inhibitors alone. Importantly, in an anti-PD-1 antibody-resistant breast cancer mouse model, administration of AST-008 with certain anti-PD-1, or programmed death 1, antibodies restored the anti-tumor activity of these antibodies. We have also demonstrated that AST-008 is active when administered subcutaneously, intratumorally or intravenously, in both prevention and established mouse tumor models. The administration of AST-008 also produced localized as well as abscopal anti-tumor activity in mouse cancer models. Additionally, administration of AST-008 in combination with certain checkpoint inhibitors confers adaptive immunity in breast and colon cancer mouse models.

Our preclinical data with AST-008 illustrate many of the important attributes of our proprietary SNA technology. Our immuno-oncology SNAs bind to class A scavenger receptors and are localized on the endosomes of immune cells. These same endosomes contain TLRs and are responsible for inducing an innate immune response. SNAs present their TLR agonists externally, in a 3-D configuration, which allows SNAs to bind to TLRs efficiently. We have designed and prepared SNAs which activate multiple classes of TLRs. Our preclinical data show that SNAs induce a broad immune response. We believe that such broad immune response includes the production of cytokines that induce a potent adaptive immune response, which in turn, may confer long-term immunity. In preclinical studies, local administration of AST-008 elicits systemic pro-inflammatory cytokine response. In mouse tumor models, administration of AST-008 with anti-PD-1 antibodies suppresses regulatory T-cells, or Tregs, and myeloid-derived suppressor cells, or MDSCs, and increases the levels of CD8 effector T-cells.

AST-008 in combination with checkpoint inhibitors

We have demonstrated that the combination of AST-008 with certain anti-PD-1 antibodies enhances therapeutic activity in a number of animal models, including breast and colorectal cancers, as well as lymphoma and melanoma.

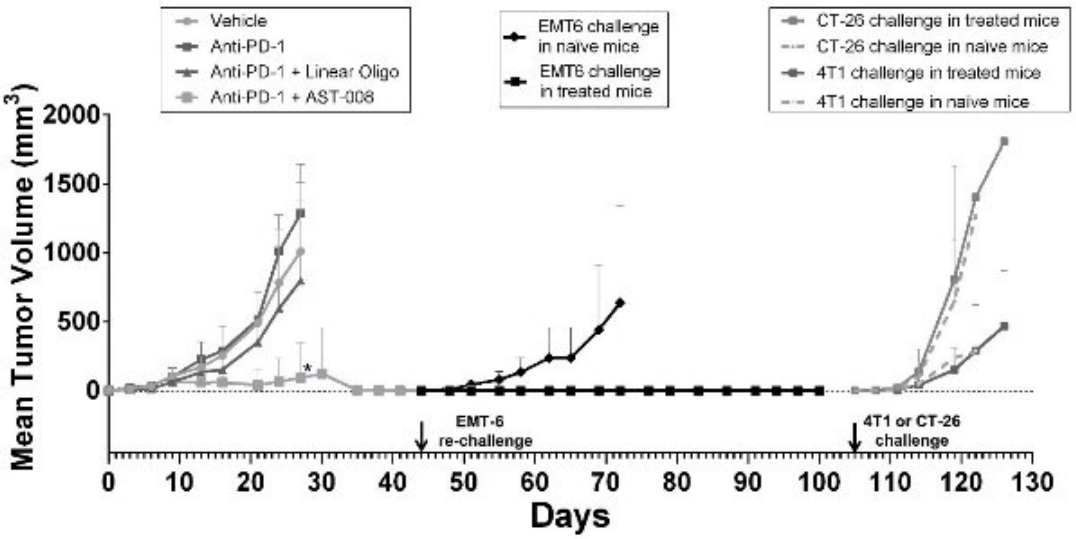
Breast cancer mouse model. We have demonstrated that administration of AST-008 with a selected anti-PD-1 antibody shows a durable anti-tumor response in an anti-PD-1 antibody insensitive mouse breast cancer model. This study was carried out with four groups, each consisting of eight mice per group. The four groups were vehicle treatment, antibody treatment alone, linear oligonucleotide plus antibody treatment, and AST-008 plus antibody treatment. Both the AST-008 and the linear oligonucleotide comparator treatments consisted of subcutaneous administration on days 3, 6, 9, 12, and 15 after tumor implantation at a dose of 0.8 mg/kg per injection. In the three

groups where mice received anti-PD-1 antibody therapy, drug administration was performed intraperitoneally on days 3, 8 and 13 at a dose of 10 mg/kg per injection. The mice were monitored for mortality and their tumor volumes were periodically measured. The mice treated with the combination of AST-008 and the anti-PD-1 antibody had average tumor volume reductions of greater than 90% compared to anti-PD-1 antibody treatment alone. In addition, treatment with AST-008 resulted in an 88% average decrease in tumor volume compared to mice treated with linear oligonucleotides at the same dose. At the conclusion of the initial phase of the experiment, seven out of eight mice in the group treated with the combination of AST-008 and the anti-PD-1 antibody had no palpable tumors. In contrast, no mice treated with linear oligonucleotides and the anti-PD-1 antibody survived.

In the next phase of this study, we re-challenged the seven surviving mice from the combination group that was treated with AST-008 and anti-PD-1 with the same breast cancer tumor type. A new group of six mice that had never received any therapy, referred to here as naïve mice, was also inoculated with the same breast cancer tumor type for comparison. The tumor growth and survival were monitored in both groups of mice without further treatment with the AST-008 and anti-PD-1 antibody combination. No palpable tumors were observed in the surviving mice from the combination group through day 105 of the study, whereas naïve mice showed tumor growth. Finally, on day 105 of the study, the mice from the combination group that had survived two rounds of tumor implantation were injected with different tumor types. The mouse colon cancer tumors grew in the animals that had survived two challenges with breast cancer cells. Taken together, we believe these data demonstrate an adaptive immune response and a systemic anti-cancer vaccination against the treated tumor type. We believe these data also demonstrate that AST-008 has the potential to synergize with checkpoint inhibitors for immuno-oncology applications.

Importantly, AST-008 in combination with selected anti-PD-1 antibodies shows significantly greater activity compared to the linear oligonucleotides of the same sequence and concentration. We believe this demonstrates the potential advantage of our proprietary SNA design compared to linear oligonucleotides for effecting a tumor clearing response.

*AST-008 in combination with a certain anti-PD-1 antibody in breast cancer mouse model resistant to anti-PD-1 treatment. Surviving mice from the experiment treated with anti-PD-1 and AST-008 survived when re-injected with the same EMT6 breast cancer cells, but did not survive when injected with unrelated CT-26 or 4T1 cancer cells. * $p < 0.0001$ versus vehicle treated group.*



SNAs for Neurology

Overview of gene regulation utilizing oligonucleotides

Gene regulation is the process of modulating target protein levels within cells. This could be a powerful approach for developing targeted therapies for diseases with known genetic origins. This approach may be for therapeutic targets that are identified as "undruggable" with small molecules or antibodies.

Gene regulation can be achieved with a number of approaches, three of which, siRNA-, miRNA-, and antisense-based therapeutics, have been the focus of commercial development. Small interfering RNAs, or siRNAs, are double-stranded RNA-like oligonucleotides that harness RNA interference, or RNAi, a potent and natural biological mechanism. When delivered into cells, siRNAs can lead to target mRNA degradation and a decrease in protein expression. miRNAs are naturally occurring small RNA molecules that modulate protein expression. Antisense therapeutics are short single-stranded oligonucleotides that bind to target mRNA and thus prevent its translation into protein.

Proof-Of-Concept Work with Nusinersen

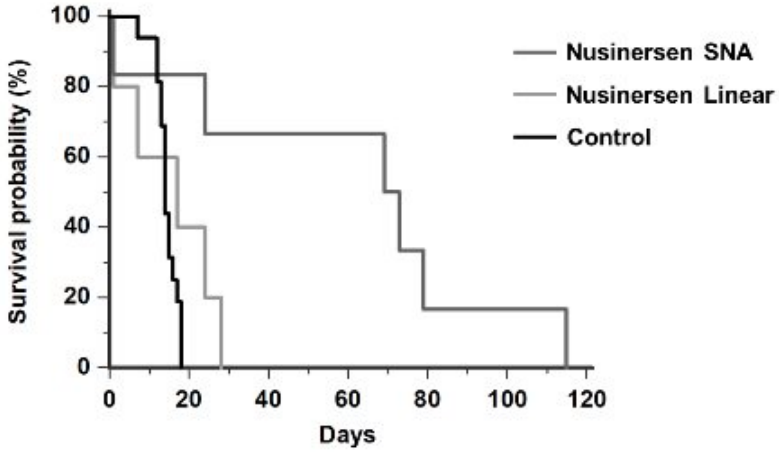
Despite delivery challenges, nucleic-acid based therapy has been successfully developed to treat a central nervous system, or CNS, disorder. Nusinersen, by Ionis Pharmaceuticals and Biogen Inc., was approved by the FDA in late 2016 for the treatment of spinal muscular atrophy, or SMA. SMA is a genetic disorder characterized by progressive muscle wasting and loss of muscle function due to motor neuron dysfunction. SMA is characterized by reduced amount of survival of motor neuron 1, or SMN1, protein. The severity of the disease depends on the amount of a related protein, SMN2, where lesser quantities of SMN2 are correlated to more severe disease. SMN2 is similar to SMN1, but leads to production of truncated protein, which is normally rapidly degraded.

Nusinersen is an antisense oligonucleotide designed to modulate splicing of SMN2 pre-mRNA in the nucleus to generate an alternative version of SMN2 mRNA that leads to production of a functional SMN protein. Nusinersen is designed to enhance the production of the full-length, more stable variant of SMN2, increasing the level of SMN2 protein, and thus improving motor function. In clinical trials, SMA patients treated with nusinersen achieved and sustained meaningful improvement in motor function and survival compared to untreated patients.

To evaluate the potential superiority of the SNA over linear oligonucleotides in directing the production of a more stable variant of the SMN2 protein, we compared the effects of nusinersen in linear format with nusinersen in SNA format in cells derived from SMA patients. The data showed that treatment with SNA format of nusinersen resulted in greater levels of the more stable variant of SMN2 mRNA compared with linear format. SNA format of nusinersen resulted in up to 45-fold increase in the more stable SMN2 mRNA variant versus controls, while a much smaller 2.5-fold increase was observed using nusinersen in the linear format.

We collaborated with The Ohio State University Wexner Medical Center to further study the pharmacology of our nusinersen SNA in mouse models. We tested nusinersen SNA in Δ7 SMA mouse model in which the untreated SMA-bearing mice have mean survival of approximately 15 days. New born Δ7 SMA mice were treated with a single dose of nusinersen SNA or nusinersen at 10, 20 or 30 μg by via intracerebroventricular injection on day 0. Following administration of compounds, mouse survival and body weights were recorded.

Nusinersen in SNA format prolonged survival compared to linear nusinersen in Δ7 SMA mice. The 20 μg treatment group is shown below.



In June 2018, the Company and researchers from The Ohio State University Wexner Medical Center presented a poster at the Cure SMA Annual Conference titled: "Nusinersen in spherical nucleic acid (SNA) format improves efficacy both in vitro in SMA patient fibroblasts and in Δ7 SMA mice and reduces toxicity in mice." It was observed in a preclinical study that nusinersen in SNA format prolonged survival by four-fold (maximal survival of 115 days compared to 28 days for nusinersen-treated mice) as well as doubled the levels of healthy full-length SMN2 mRNA and protein in SMA patient fibroblasts when compared to nusinersen. Based on the results of this preclinical study, we intend to further pursue our early stage research activities in neurological applications.

On June 26, 2019, we announced data from a preclinical study evaluating the biodistribution of SNAs in the non-human primate central nervous system. In our study, 7 mg of radio-labeled SNAs were injected intrathecally into cynomolgus monkeys. The biodistribution of the SNAs was followed for 14 days by PET/CT scans. SNAs were observed throughout the entire brain and were found both in the brain stem as well as inside the brain. High content of SNA was observed in all 46 regions of the brain examined. These key data indicate that the SNA platform may be well-suited for development of new therapeutics directed towards diseases of the central nervous system.

Friedreich's ataxia

We are developing XCUR-FXN, an SNA-based therapeutic candidate for the treatment of Friedreich's ataxia, or FA. FA is an autosomal recessive, neurodegenerative disease characterized by progressively impaired muscle coordination caused by the degeneration of neurons in the cerebellum and dorsal root ganglia in the spinal cord. FA patients may also experience impairment of visual, auditory and speech functions. FA patients also commonly suffer from life-threatening heart conditions such as hypertrophic cardiomyopathy, myocardial fibrosis and heart failure. The typical age of onset for FA is between 5 and 15 years. An estimated 5,000 patients in the US and 15,000 patients worldwide are affected by FA. There are no FDA-approved treatments for FA.

We have conducted extensive preclinical research evaluating the suitability of our SNA technology for genetically defined neurological diseases, including efficacy studies in animal models, and biodistribution in rodent and non-human primates. Based on the results, we believe we can target FA at the genetic source and meet an important unmet medical need for FA patients. FA is driven by expansion of guanine-adenine-adenine bases of the DNA sequence, or GAA, triplet repeats in the first intron of frataxin, or FXN, gene. The expanded repeat of FXN forms an intramolecular triple-helix, which impairs transcription and reduces levels of frataxin protein. Our strategy will be to use a genetically-targeted SNA therapy to increase FXN protein. Our FA program, XCUR-FXN, will be designed and developed with guidance from and in collaboration with the Friedreich's Ataxia Research Alliance, or

FARA, the non-profit, charitable organization dedicated to accelerating research leading to treatments and a cure for FA. We expect to initiate IND-enabling studies for XCUR-FXN in late 2020.

Other neurological indications

We are building on our proof-of-concept work with nusinersen and our therapeutic candidate XCUR-FXN to further explore new therapeutic applications of our SNA technology in neurology. We aim to address indications with great unmet medical need and where we believe the attributes of our SNA technology would lead to therapeutic and commercial advantages. In order to select new therapeutic indications, we expect to analyze a variety of attributes including: (i) indications where there is a known genetic basis for the disorder, (ii) disorders where we can target multiple genes, (iii) the existence of a patient registry or a patient advocacy group that can work with us for easier trial enrollment, (iv) the competitive therapeutic landscape including disorders not easily addressable by small molecules or antibodies, (v) indications with no approved therapies, and (vi) indications amenable to localized therapeutic administration. Based on these and other criteria, we are currently exploring additional neurological conditions, including spinocerebellar ataxia, Batten disease, amyotrophic lateral sclerosis (ALS), and Huntington's disease.

SNAs for inflammatory diseases

XCUR17—a topically applied anti-IL-17RA SNA

Overview

XCUR17 targets the mRNA that encodes IL-17RA, a protein that is considered essential in the initiation and maintenance of psoriasis. Although the availability of inhibitors of TNF revolutionized the systemic treatment of severe psoriasis, studies of disease pathogenesis have shifted attention to the IL-17 pathway, in which IL-17RA is a key driver of psoriasis. IL-17 binding to IL-17RA on keratinocytes stimulates and perpetuates the inflammation cascade of psoriasis. IL-17RA-mediated inflammation can be inhibited by disrupting the protein's function. Brodalumab, an anti-IL-17RA monoclonal antibody, was approved by the FDA as an effective treatment for chronic moderate to severe plaque psoriasis. Our strategy is to reduce the levels of IL-17RA in the skin by topically applying XCUR17. In preclinical studies, XCUR17 showed inhibition of IL-17RA expression in the keratinocytes of the skin.

Our approach

The clinical success of a systemically delivered anti-IL-17RA antibody has validated that target as a clinically relevant target for psoriasis. The IL-17 pathway is important for initiating and sustaining inflammatory responses. IL-17RA stimulation in the skin causes keratinocyte and T-cell proliferation as well as immune cell infiltration, which results in the formation of psoriatic lesions.

We are developing XCUR17, an SNA containing IL-17RA antisense oligonucleotides, for the treatment of mild to moderate psoriasis, which is often defined as psoriasis that affects less than 10% body surface area and is generally not treated with systemic antibody therapy. XCUR17 is intended to be applied locally as a topically applied gel to psoriatic lesions. We expect XCUR17 to enter into cells of the epidermis, especially keratinocytes, and modulate the production of IL-17RA.

Phase 1 clinical development for XCUR17

We filed a clinical trial authorization, or CTA, for a Phase 1 clinical trial of XCUR17 in patients with psoriasis in Germany in the third quarter of 2017, and we began dosing patients in April 2018. The Phase 1 clinical trial, which had final patient visits in the fourth quarter of 2018, was a randomized, double-blinded, placebo-controlled trial in 21 patients with mild to moderate chronic plaque psoriasis designed to assess the safety of XCUR17 formulated as a topical gel, and to evaluate early signs of efficacy. All patients received three strengths of XCUR17 gel, a vehicle gel, and an active comparator (Daivonex® cream), which were all applied on different areas of psoriatic skin within each individual patient.

The clinical trial design allows for intra-patient comparisons of XCUR17 to a placebo and a currently approved therapeutic. A mask containing 5 holes is placed on the patient's skin, enabling the application of three different

strengths of a gel containing XCUR17 as well as a placebo and a currently approved therapeutic within one psoriatic lesion. The drug is applied daily for 26 days in up to 25 patients. Over the course of the clinical trial, the safety and tolerability of XCUR17 is monitored. In addition, the severity of psoriasis in the treated areas is assessed. At the end of the clinical trial, biopsy samples from XCUR17- and vehicle-treated areas will be taken and interrogated for IL-17RA and downstream mRNA modulation to demonstrate that XCUR17 engages the target of interest and has an effect on inflammation in the skin. We believe our clinical trial design is consistent with the clinical trial design for other topically applied therapeutic candidates that have been accepted by the FDA and EMA.

In the fourth quarter of 2018, we reported results from the Phase 1 trial of XCUR17. In the case of XCUR17, of the 21 treated patients, 11 treated with the highest strength XCUR17 gel were observed to have a reduction in redness and improvement in healing as determined by blinded physician assessments. Further, the highest strength XCUR17 gel showed a statistically significant improvement in psoriasis symptoms versus the vehicle gel. By comparison, 17 of the 21 patients treated with the active comparator showed a clinical response, while four patients treated with the placebo vehicle had a clinical response.

We have observed no adverse safety events related to treatment with XCUR17 in the Phase 1 clinical trial to date. In addition to the safety, tolerability and clinical assessments, the trial measured psoriatic infiltrate thickness over the 26-day treatment period. No relevant changes in mean psoriatic infiltrate thickness were observed for the three XCUR17 gels or the active ingredient-free vehicle gel.

In October 2019, at the 15th Annual Meeting of the Oligonucleotide Therapeutics Society, we disclosed biomarker results from the skin biopsies collected from the 21 patients treated with XCUR17 in the Phase 1 trial. Clinical findings, correlated with psoriasis-related markers and histological changes from biopsies provided by the patients, showed that XCUR17:

- Resulted in a decrease in the levels of psoriasis and inflammation markers downstream of XCUR17's target, IL-17RA;
- Produced a statistically significant reduction in keratin 16 expression, a key marker of psoriasis (p=0.002);
- Resulted in reductions in the major inflammatory markers beta defensin 4A, interleukin 19, and interleukin 36A versus psoriatic skin at baseline; and
- Revealed clinical improvements that matched reductions in keratin 16 protein and epidermal thickness.

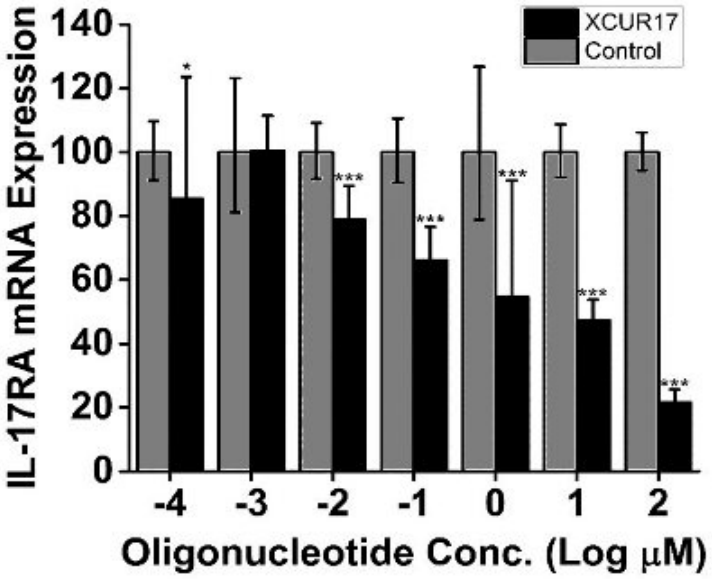
We currently are not conducting additional clinical activities for XCUR17 and we seek to out-license the XCUR17 program.

Preclinical development of XCUR17

We have gathered experimental evidence of the biological activity of XCUR17 in healthy human skin samples prior to undertaking the Phase 1 clinical trial. As a consequence, we believe we have a deeper understanding of how XCUR17 will perform during clinical trials than would be ordinarily possible with traditional therapeutic development.

XCUR17 exhibited cellular uptake and skin penetration properties. Specifically, XCUR17 entered into keratinocytes *in vitro* and entered into healthy human skin *ex vivo* after topical application. In addition, it also down-regulated the expression of IL-17RA mRNA and protein in keratinocytes *in vitro*. Further, XCUR17 gel down-regulated IL-17RA mRNA in healthy human skin *ex vivo*.

*Topical application of XCUR17 in a prototype gel to healthy human skin ex vivo results in a dose-dependent decrease in IL-17RA mRNA expression. * p < 0.05; *** p< 0.001 vs the controls*



Preclinical research programs

In addition to our named pipeline programs, a variety of early stage research efforts are ongoing in areas we believe will best leverage the properties of the SNA. Potential applications of the SNA include those in neurology, ophthalmology, pulmonology, and the gastroenterology.

Ophthalmology

Ophthalmic therapies, such as antibodies, peptides or aptamers, are typically injected into the eye to reach their target tissues and achieve therapeutic effects. We believe that the penetration properties of the SNA may result in the delivery of therapeutically relevant concentrations of oligonucleotides to certain tissues in the eye. We have observed in preclinical studies the delivery of SNAs into the eye either through eyedrops or intravitreal injections.

We believe that the eye may be an attractive organ for locally-applied SNAs because (i) it is a small and immune-privileged organ, (ii) there are established and non-invasive clinical assessment procedures, and (iii) effective trials can be designed by using a contralateral control eye. We believe that our preclinical data using SNA technology may provide proof-of-concept for expansion of our research and development activities into ophthalmological genetic disorders. Our preclinical data indicated that SNAs distributed to both posterior (retinal) and anterior (cornea) ocular structures, exhibited higher distribution and persisted longer compared to linear oligonucleotides, and did not cause inflammation in the eye.

In one study, to assess penetration into the eye, Dutch belted rabbits were given either eyedrops containing no SNAs, referred to as vehicle, or an SNA in a formulation targeting an ocular gene of interest. The eyedrops were administered to the animals 18 times over the course of five days. On the fifth day, the rabbit eyes were analyzed for SNA content. The results indicate that SNAs were detected in tissues at the surface of the eye, where the application occurred, but also in the retina and vitreous humor, indicating that the SNA had penetrated into the eye.

We believe SNAs may possess key potential advantages over gene therapy in the eye. These key potential advantages include: (i) delivery via intravitreal injections which are safer and easier than subretinal injections, (ii) tunable and reversible control of target expression, and (iii) the ability to treat toxic gain-of-function diseases and target large genes. We believe, based on our internal analysis, that there are approximately 250 rare

ophthalmological diseases with known genetic targets, such as CLN3 for Batten disease, BEST1 for vitelliform macular dystrophy, and USH2A for usher syndrome type 2A. As such, we intend to expand our preclinical research and development activities in ophthalmology in 2020 and beyond.

Gastroenterology

A variety of gastrointestinal disorders, including ulcerative colitis and Crohn's disease, collectively referred to as irritable bowel disease, or IBD, are inadequately treated with existing therapies such as immunosuppressive steroids and anti-TNF antibodies.

We believe that orally applied SNAs may provide the opportunity to treat diseases such as IBD by taking advantage of the local tissue penetration of the SNA technology. Accordingly, the effect of oral SNA treatment was assessed in an induced IBD mouse model. After the induction of colitis, the mice were treated with anti-TNF SNAs on day 1, 2, 3 and 4, for a total four doses, at 200 or 1000 μg/dose/mouse by oral gavage. Control mice were treated with vehicle only. The mice were monitored for mortality and scored clinically for seven days. On day 7, the surviving animals were sacrificed. Gross pathology assessment was performed on the proximal colon.

Clinical scores for the mice during the course of the study were assigned by considering the body weight, stool consistency, bleeding and any abnormalities observed in fur coat and abdomen. Gross pathology scores were assigned on the last day of study from the colons removed from the animals after euthanization. Gross pathology scores ranging from 0 to 5, indicating no abnormalities and multiple ulcers, respectively, were assigned based on the severity of the inflammation and ulceration in the colon.

The results showed statistically significant improvement in clinical score and gross pathology for animals treated with 1000 μg/dose of anti-TNF SNAs compared to those treated with vehicle only. Overall, the results suggest that oral administration of SNA had a positive effect on disease symptoms as reflected by lower clinical and pathology scores.

Pulmonology

Altering the immunological state of the lung has promising therapeutic implications for the treatment of allergic diseases, such as asthma. In a preliminary assessment, we demonstrated an alteration of the immunological state both locally in the lung and systemically in mice after the inhalation of SNAs. An intranasal dose of PBS or nebulized formulation of AST-008 was administered to mice at 7.5 mg/kg to assess the pharmacodynamic effects of SNA delivery to the lungs. Four mice per group were used. At 4, 10, 16, or 24 hours following administration, serum was collected from the animals and bronchoalveolar lavage, or BAL, was performed to produce fluid from the lung surface. Finally, lung tissue was also collected from the animals. The fluids and tissue were subjected to cytokine concentration analysis. The results show that nebulized SNAs can produce a cytokine response in the lung tissue and BAL fluid, as well as systemically, as measured in the mouse serum. We believe these results have implications for the potential treatment of allergic diseases of the lung.

Our Intellectual Property

Proprietary Protection

Our commercial success depends in part on our ability to obtain and maintain proprietary protection for our therapeutic candidates, manufacturing and process discoveries and other know-how, to operate without infringing the proprietary rights of others, and to prevent others from infringing on our proprietary rights. We have been building and continue to build our intellectual property portfolio relating to AST-008, XCUR17 and AST-005 therapeutic candidates and our SNA technology platform. Our policy is to seek to protect our proprietary position by, among other methods, filing and licensing U.S. and certain foreign patent applications related to our proprietary technology, inventions and improvements that are important to the development and implementation of our business. We also intend to rely on trade secrets, know-how, and technological innovation to develop and maintain our proprietary position. We cannot be sure that patents will be granted with respect to any of our owned or licensed pending patent applications or with respect to any patent applications filed or licensed by us in the future, nor can we

be sure that any of our existing owned or licensed patents or any patents that may be granted or licensed to us in the future will be commercially useful in protecting our technology.

Patent Rights

Our patent portfolio includes pending patent applications and issued patents in the United States and in foreign countries. As of December 31, 2019, our patent portfolio consists of over 85 issued patents and allowed patent applications and over 125 pending patent applications. Our general practice is to seek patent protection in major markets worldwide, including the U.S., Canada, China, Japan, Australia, certain members of the European Union, among others. Majority of the issued patents and allowed patent applications are licensed from Northwestern University. Among the pending patent applications, we license over 35 from NU, we exclusively own 75, and we jointly own 8 with Northwestern University.

Our license from Northwestern University is for royalty bearing worldwide exclusive rights to the use of SNAs for therapeutic applications. Pursuant to the license, we are allowed to manufacture, use, offer for sale, sell and import products covered by the licensed patent rights.

Our AST-008 patent portfolio includes 17 issued and 39 pending U.S. nonprovisional and foreign patent applications. Foreign jurisdictions where we are seeking patent protection for our AST-008 patent portfolio include Canada, China, Japan, Australia, the European Union, India, South Korea and Mexico. Each of these applications is a composition of matter and method of use type application. The claims of these applications are directed to certain nanoscale constructs, liposomal particles, and multivalent nanostructures, and their methods of use for treating cancer and other disorders. Any patents that may issue from these applications would expire between 2034 and 2037. The expiration dates do not take into consideration any potential patent term adjustment that may be applied by the U.S. Patent Office upon issuance of the patent, any terminal disclaimers that may be filed in the future or any regulatory extensions that may be obtained.

Our XCUR17 patent portfolio includes one issued and eight pending U.S. nonprovisional and foreign patent applications. The pending applications are composition of matter and method of use type applications and include claims to one or more oligonucleotides that are 18 nucleotides in length, and methods of use for treating dermal and other disorders. Any patents that may issue from this application would expire by 2037. The expiration date does not take into consideration any potential patent term adjustment that may be applied by the U.S. Patent Office upon issuance of the patent, any terminal disclaimers that may be filed in the future or any regulatory extensions that may be obtained.

Our AST-005 patent portfolio includes one issued U.S. patent application and eight pending U.S. nonprovisional and foreign patent applications. The applications are composition of matter and method of use type applications and include claims to an oligonucleotide that is 18 nucleotides in length, and methods of use for treating dermal and other disorders. Any patents that may issue from these applications would expire by 2035. The expiration dates do not take into consideration any potential patent term adjustment that may be applied by the U.S. Patent Office upon issuance of the patent, any terminal disclaimers that may be filed in the future or any regulatory extensions that may be obtained.

Upon receiving FDA approval for AST-008, XCUR17 or AST-005, we intend to list applicable patents in the FDA's Orange Book.

Patent life determination depends on the date of filing of the application and other factors as promulgated under the patent laws. In most countries, including the United States, the patent term is generally 20 years from the earliest claimed filing date of a non-provisional patent application in the applicable country.

Trade Secret and Other Protection

In addition to patented intellectual property, we also rely on trade secrets and proprietary know-how to protect our technology, especially when we do not believe that patent protection is appropriate or can be obtained. It is our policy to require our employees and consultants, outside scientific collaborators, sponsored researchers and other advisors who receive confidential information from us to execute confidentiality agreements upon the

commencement of employment or consulting relationships. These agreements provide that all confidential information developed or made known to these individuals during the course of the individual's relationship with the company is to be kept confidential and is not to be disclosed to third parties except in specific circumstances. The agreements provide that all inventions conceived by an employee shall be the property of our Company. There can be no assurance, however, that these agreements will provide meaningful protection or adequate remedies for our trade secrets in the event of unauthorized use or disclosure of such information.

Other Intellectual Property Rights

We seek trademark protection in the United States when appropriate. We have filed for trademark protection for the following marks: LIFE HAPPENS IN 3D, LIFE IN 3D, and EXICURE. We currently have one registered trademark, EXICURE.

From time to time, we may find it necessary or prudent to obtain licenses from third party intellectual property holders.

Northwestern University License Agreements

In September 2009, Northwestern University and AuraSense LLC, or ASLLC, our former parent, entered into a license agreement under which Northwestern University granted ASLLC an exclusive, worldwide license under certain Northwestern University patents and patent applications to exploit products and processes in the field of the use of nanoparticles, nanotechnology, microtechnology or nanomaterial-based constructs as or accompanying therapeutics or theradiagonostics and in or for intracellular diagnostic applications and intracellular research. On December 12, 2011, ASLLC assigned to us all of its worldwide rights and interests under the Northwestern University-ASLLC license in the field of the use of nanoparticles, nanotechnology, microtechnology or nanomaterial-based constructs as therapeutics or accompanying therapeutics as a means of delivery, but expressly excluding diagnostics (the "assigned field"). In accordance with the terms and conditions of this assignment, we assumed all liabilities and obligations of ASLLC to Northwestern University as set forth Northwestern University its license agreement in the assigned field and in August 2015 we entered into a restated license agreement with Northwestern University (the "Restated License Agreement"). In February 2016, we obtained exclusive license as to Northwestern University's rights in certain SNA technology we jointly own with Northwestern University (the "Co-owned Technology License"). The Company's license to Northwestern University's rights is limited to the assigned field, however we have no such limitation as to our own rights in this jointly owned technology. In June 2016, we entered into an exclusive license with Northwestern University to obtain worldwide rights to certain inhibitors of glucosylceramide synthase and their use in wound healing in diabetes (the "Wound Healing License"). Our rights and obligations in the Co-owned Technology License and the Wound Healing License agreements are substantially the same as in the Restated License Agreement from August 2015 (collectively referred to as "the Northwestern University License Agreements"). As of December 31, 2019, all pending patent applications under the Wound Healing License have been abandoned. For purposes of the assigned field, therapeutic uses means the use of products and processes that are covered by the patents and patent applications licensed from Northwestern University for the purpose of providing a therapy or course of medical treatment to address a medical condition or disease. The Northwestern University License Agreements provide to us the exclusive, worldwide right to make, have made, use, modify, sell, offer for sale and import any product or process that is covered by any claim in the licensed Northwestern University patents and patent applications. We have the right to sublicense these rights to third parties. The Northwestern University License Agreements require us to use commercially reasonable efforts, consistent with demand in the marketplace, regulatory procedures and industry conditions and development timelines, to research, develop, market and manufacture the licensed products.

Our rights under the Northwestern University License Agreements are subject to a variety of material limitations. First, the license specifically excludes use of the licensed patent rights to perform qualitative or quantitative *in vitro* analysis, testing, or measurement as well as detection of a variety of combinations of biodiagnostics field subsets and targets. Second, the license specifically prohibits us from using the licensed patent rights with regard to diagnostics, including without limitation, theradiagnostics. Third, though the license is otherwise exclusive in the assigned field, Northwestern University retains the right to use the licensed patent rights for research, teaching, and other educational purposes, including the right to distribute and publish materials related

to the licensed patent rights. Fourth, the license is subject to the rights of the U.S. government under any and all applicable laws including substantially manufacturing all licensed products in the U.S. unless such requirement is waived by the U.S. government. Fifth, other than in certain circumstances, the Northwestern University License Agreements are non-transferable without the consent of Northwestern University. Under the terms of the Northwestern University License Agreements, depending on the circumstances, either we or Northwestern University can sue to enforce the patent rights against third party infringers.

In order to secure the assignment of the Northwestern University-ASLLC license in the field, we assumed the obligation to pay Northwestern University an annual license fee, which may be credited against any royalties based on sales of licensed products that are due to Northwestern University in the same year, and to reimburse Northwestern University for expenses associated with the prosecution and maintenance of the licensed patent rights. In addition, we assumed the obligation to pay Northwestern University royalties at a low single-digit percentage of any net revenue generated by our sale or transfer of any licensed product. In the event we grant a sublicense under the licensed patent rights, we also assumed the obligation to pay Northwestern University, on a quarterly basis, a percentage of all sublicense payments we receive, and the greater of a mid-teen percentage of all sublicensee royalties or a low single-digit percent of any net revenue generated by a sublicensee's sale or transfer of any licensed product.

We may terminate the Northwestern University License Agreements at any time by providing 90 days written notice to Northwestern University. Northwestern University may terminate the agreements or, alternatively, convert our exclusive rights to non-exclusive rights if we fail to comply with certain prescribed timelines for research, development, marketing and manufacturing milestones for the licensed products. Northwestern University may also terminate the agreements if we sue, or do not terminate all agreements with a sublicensee who sues Northwestern University, in a matter not arising from the agreements themselves. Either party may terminate the agreements in the event of a material breach by the other that remains uncured for a period of 30 days after the non-breaching party provides notice to the breaching party. The agreements will automatically terminate if we reach specified thresholds of financial distress. In the event of termination, all rights immediately revert to Northwestern University. The agreements will automatically expire upon the expiration of the last to expire patent rights. In the event of expiration, the license automatically becomes a non-exclusive, irrevocable, fully-paid license to use or sublicense the use of know-how to make and sell products in each country where the license had previously been in effect.

Our intellectual property strategy

Our strategy around protection of our proprietary technology, including any innovations and improvements, is to obtain worldwide patent coverage with a focus on jurisdictions that represent significant global pharmaceutical markets. Generally, patent term is 20 years from the earliest claimed filing date of a non-provisional patent application in the applicable country, assuming that all maintenance fees are paid and the patent has not been invalidated. In certain jurisdictions, and in certain circumstances, patent terms can be extended, for example, by patent term adjustment or extension, or shortened, for example, by terminal disclaimer. We are pursuing worldwide patent protection for at least novel molecules, compositions of matter, pharmaceutical formulations, methods of use, including treatment of disease, methods of manufacture and other novel uses for the inventive molecules originating from our research and development efforts. We continuously assess whether it is strategically more favorable to maintain confidentiality for the "know-how" regarding a novel invention rather than pursue patent protection. For each patent application that is filed we strategically tailor our claims in accordance with the existing patent landscape around a particular technology.

There can be no assurance that an issued patent will remain valid and enforceable in a court of law through the entire patent term. Should the validity of a patent be challenged, the legal process associated with defending the patent can be costly and time consuming. Issued patents can be subject to oppositions, interferences and other third party challenges that can result in the revocation of the patent or limit patent claims such that patent coverage lacks sufficient breadth to protect subject matter that is commercially relevant. Competitors may be able to circumvent our patents. Development and commercialization of pharmaceutical products can be subject to substantial delays and it is possible that at the time of commercialization any patent covering the product has expired or will be in force for only a short period of time following commercialization. We cannot predict with any certainty if any third party U.S. or foreign patent rights, or other proprietary rights, will be deemed infringed by the use of our technology. Nor can

we predict with certainty which, if any, of these rights will or may be asserted against us by third parties. Should we need to defend ourselves and our partners against any such claims, substantial costs may be incurred. Furthermore, parties making such claims may be able to obtain injunctive or other equitable relief, which could effectively block our ability to develop or commercialize some or all of our products in the U.S. and abroad, and could result in the award of substantial damages. In the event of a claim of infringement, we or our partners may be required to obtain one or more licenses from a third party. There can be no assurance that we can obtain a license on a reasonable basis should we deem it necessary to obtain rights to an alternative technology that meets our needs. The failure to obtain a license may have a material adverse effect on our business, results of operations and financial condition.

We also rely on trade secret protection for our confidential and proprietary information. No assurance can be given that we can meaningfully protect our trade secrets on a continuing basis. Others may independently develop substantially equivalent confidential and proprietary information or otherwise gain access to our trade secrets.

It is our policy to require our employees and consultants, outside scientific collaborators, sponsored researchers and other advisors who receive confidential information from us to execute confidentiality agreements upon the commencement of employment or consulting relationships. These agreements provide that all confidential information developed or made known to these individuals during the course of the individual's relationship with the company is to be kept confidential and is not to be disclosed to third parties except in specific circumstances. The agreements provide that all inventions conceived by an employee shall be the property of the company. There can be no assurance, however, that these agreements will provide meaningful protection or adequate remedies for our trade secrets in the event of unauthorized use or disclosure of such information.

Our success will depend in part on our ability to obtain and maintain patent protection, preserve trade secrets, prevent third parties from infringing upon our proprietary rights and operate without infringing upon the proprietary rights of others, both in the U.S. and other territories worldwide.

Manufacturing and Supply

We do not currently own or operate manufacturing facilities for the production of preclinical, clinical or commercial quantities of any of our therapeutic candidates. We currently contract with two therapeutic substance and two drug product manufacturers for the supply of SNAs and we expect to continue to do so to meet the preclinical and any clinical requirements of our therapeutic candidates. We do not have a long-term agreement with these third parties.

We have agreements for the supply of such therapeutic materials with manufacturers or suppliers that we believe have sufficient capacity to meet our demands. In addition, we believe that adequate alternative sources for such supplies exist. However, there is a risk that, if supplies are interrupted, it would materially harm our business. We typically order raw materials and services on a purchase order basis and do not enter into long-term dedicated capacity or minimum supply arrangements.

Manufacturing is subject to extensive regulations that impose various procedural and documentation requirements, which govern record keeping, manufacturing processes and controls, personnel, quality control and quality assurance, among others. Our contract manufacturing organizations manufacture our therapeutic candidates subject to cGMP conditions. cGMPs are regulatory requirements for the production of therapeutics that will be used in humans.

Competition

We believe that our scientific knowledge and expertise in SNA-based therapies provide us with competitive advantages over the various companies and other entities that are attempting to develop oligonucleotide based-therapeutics. However, we face competition at the technology and therapeutic indication levels from both large and small biotechnology companies, academic institutions, government agencies and public and private research institutions. Many of our competitors have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved products than we do. These competitors also compete with us in recruiting and retaining

qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs.

Our success will be based in part upon our ability to identify, develop and manage a portfolio of therapeutics that are safer and more effective than competing products in the treatment of our targeted patients. Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer, more effective, have fewer side effects, are more convenient or are less expensive than any therapeutics we may develop.

Competition in oligonucleotide-based therapeutics

There is intense and rapidly evolving competition in the biotechnology, pharmaceutical and oligonucleotide therapeutics fields. We believe that while our SNA technology, its associated intellectual property and our scientific and technical know-how gives us a competitive advantage in this space, competition from many sources remains. Our competition includes larger and better funded pharmaceutical, biotechnological and oligonucleotide therapeutic firms. Moreover, we not only compete with other firms, but also with current and future therapeutics.

We are aware of several companies that are developing oligonucleotide delivery platforms and oligonucleotide based therapeutics. These competitors include Ionis Pharmaceuticals, Inc., Alnylam Pharmaceuticals, Inc., Dicerna Pharmaceuticals, Inc., Arbutus Biopharma Corp., Wave Life Sciences Ltd., Arrowhead Pharmaceuticals, Inc., ProQR Therapeutics N.V., Idera Pharmaceuticals, Inc., Stoke Therapeutics, Inc., and Checkmate Pharmaceuticals, Inc. These and other competitors compete with us in recruiting scientific and managerial talent, and for the finite funding available from biotechnology and pharmaceutical companies.

Our success will partially depend on our ability to develop and protect therapeutics that are safer and more effective than competing products. Our commercial opportunity and success will be reduced or eliminated if competing products are safer, more effective, or less expensive than the therapeutics we develop.

If our lead therapeutic candidates are approved for the indications for which we undertake clinical trials, they will compete with therapies that are either in development or currently marketed, such as the following:

Competition in immuno-oncology

There are a number of competitive products to SNAs for immuno-oncology on the market and in development. Ipilimumab and nivolumab from Bristol-Myers Squibb Company, atezolizumab from the Roche Group, as well as pembrolizumab from Merck & Co., Inc., are now marketed for the treatment of advanced melanoma or other cancers, and these and other therapeutic products are in development for other immuno-oncology applications. A number of our competitors are already conducting clinical trials testing combination of TLR9 agonists with checkpoint inhibitors in cancer patients. In addition, adoptive cell therapies such as CAR-T cells are showing great promise for the treatment of B-cell malignancies in clinical trials.

Government Regulation and Product Approval

Governmental authorities in the U.S., at the federal, state and local level, and other countries extensively regulate, among other things, the research, development, testing, manufacture, labeling, packaging, promotion, storage, advertising, distribution, marketing, sales, and export and import of products such as those we are developing. Our therapeutic candidates must be approved by the FDA through the NDA process before they may be legally marketed in the U.S. and will be subject to similar requirements in other countries prior to marketing in those countries. The process of obtaining regulatory approvals and the subsequent compliance with applicable federal, state, local and foreign statutes and regulations require the expenditure of substantial time and financial resources.

U.S. government regulation

*NDA approval processes***.** In the U.S., the FDA regulates drugs under the Federal Food, Drug, and Cosmetic Act of 1938, or the FDCA, and implementing regulations. If we fail to comply with applicable FDA or other requirements at any time during the product development or approval process, or after approval, we may become

subject to administrative or judicial sanctions, any of which could have a material adverse effect on us. These sanctions could include:

- refusal to approve pending applications;
- license suspension or revocation;
- withdrawal of an approval;
- imposition of a clinical hold;
- warning or untitled letters;
- seizures or administrative detention of product;
- product recalls;
- total or partial suspension of production or distribution; or
- injunctions, fines, disgorgement, or civil or criminal penalties.

The process required by the FDA before a therapeutic candidate may be marketed in the U.S. generally involves the following:

- completion of nonclinical laboratory tests, animal studies and formulation studies conducted according to Good Laboratory Practices, or GLPs, and other applicable regulations;
- submission to the FDA of an IND, which must become effective before human clinical trials may begin;
- performance of adequate and well-controlled human clinical trials according to Good Clinical Practices, or GCPs, to establish the safety and efficacy of the therapeutic candidate for its intended use;
- submission to the FDA of an NDA;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities at which the therapeutic candidate is produced to assess readiness for commercial manufacturing and conformance to the manufacturing-related elements of the application, to conduct a data integrity audit, and to assess compliance with cGMPs to assure that the facilities, methods and controls are adequate to preserve the therapeutic candidate's identity, strength, quality and purity; and
- FDA review and approval of the NDA.

The testing and approval process requires substantial time, effort, and financial resources, and we cannot be certain any approvals for our therapeutic candidates will be granted on a timely basis, if at all.

Once a therapeutic candidate is identified for development, it enters the preclinical or nonclinical testing stage. Nonclinical tests include laboratory evaluations of product chemistry, toxicity, formulation and stability, as well as animal studies. An IND sponsor must submit the results of the nonclinical tests, together with manufacturing information and analytical data, to the FDA as part of the IND. Some nonclinical testing may continue even after the IND is submitted. In addition to including the results of the nonclinical studies, the IND will also include a protocol detailing, among other things, the objectives of the clinical trial, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated if the first phase lends itself to an efficacy determination. Currently, the IND automatically becomes effective 30 days after receipt by the FDA, unless the FDA, within the 30-day time period, raises concerns or questions about the conduct of the clinical trial, including concerns that human research subjects will be exposed to unreasonable health risks. In such a case, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial can begin. Submission of an IND may result in the FDA not allowing the clinical trials to commence or not allowing the clinical trials to commence on the terms originally specified in the IND. A separate submission to an existing IND must also be made for each successive clinical trial conducted

during drug development, and the FDA must grant permission, either explicitly or implicitly by not objecting, before each clinical trial can begin.

All clinical trials must be conducted under the supervision of one or more qualified investigators in accordance with GCPs. They must be conducted under protocols detailing the objectives of the trial, dosing procedures, research subject selection and exclusion criteria and the safety and effectiveness criteria to be evaluated. Each protocol, and any subsequent material amendment to the protocol, must be submitted to the FDA as part of the IND, and progress reports detailing the status of the clinical trials must be submitted to the FDA annually. Sponsors also must report to the FDA serious and unexpected adverse reactions in a timely manner, any clinically important increase in the rate of a serious suspected adverse reaction over that listed in the protocol or investigation brochure or any findings from other studies or animal or *in vitro* testing that suggest a significant risk in humans exposed to the therapeutic. An IRB at each institution participating in the clinical trial must review and approve the protocol before a clinical trial commences at that institution and must also approve the information regarding the trial and the consent form that must be provided to each research subject or the subject's legal representative, monitor the trial until completed and otherwise comply with IRB regulations. There are also requirements governing the reporting of ongoing clinical trials and completed clinical trials results to public registries.

Human clinical trials are typically conducted in three sequential phases that may overlap or be combined.

- Phase 1-The therapeutic candidate is initially introduced into healthy human subjects and tested for safety, dosage tolerance, absorption, metabolism, distribution and elimination. In the case of some therapeutic candidates for severe or life-threatening diseases, such as cancer, especially when the therapeutic candidate may be inherently too toxic to ethically administer to healthy volunteers, the initial human testing is often conducted in patients.

- Phase 2-Clinical trials are performed on a limited patient population intended to identify possible adverse effects and safety risks, to preliminarily evaluate the efficacy of the product for specific targeted diseases and to determine dosage tolerance and optimal dosage.

- Phase 3-Clinical trials are undertaken to further evaluate dosage, clinical efficacy and safety in an expanded patient population at geographically dispersed clinical trial sites. These studies are intended to establish the overall risk-benefit ratio of the product and provide an adequate basis for product labeling.

Human clinical trials are inherently uncertain and Phase 1, Phase 2 and Phase 3 testing may not be successfully completed. The FDA or the sponsor may suspend a clinical trial at any time for a variety of reasons, including a finding that the research subjects or patients are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution if the clinical trial is not being conducted in accordance with the IRB's requirements or if the therapeutic candidate has been associated with unexpected serious harm to patients.

A drug being studied in clinical trials may be made available to individual patients, in certain circumstances. Pursuant to the 21st Century Cures Act, or Cures Act, which was signed into law in December 2016, the manufacturer of an investigational drug for a serious disease or condition is required to make available, such as by posting on its website, its policy on evaluating and responding to requests for individual patient access to such investigational drug.

During the development of a new therapeutic candidate, sponsors are given opportunities to meet with the FDA at certain points; specifically, prior to the submission of an IND, at the end of Phase 2 and before an NDA is submitted. Meetings at other times may be requested. These meetings can provide an opportunity for the sponsor to share information about the data gathered to date and for the FDA to provide advice on the next phase of development. Sponsors typically use the meeting at the end of Phase 2 to discuss their Phase 2 clinical results and present their plans for the pivotal Phase 3 clinical trial that they believe will support the approval of the new therapeutic.

Concurrent with clinical trials, sponsors usually complete additional animal safety studies and also develop additional information about the chemistry and physical characteristics of the therapeutic candidate and finalize a

process for manufacturing commercial quantities of the therapeutic candidate in accordance with cGMP requirements. The manufacturing process must be capable of consistently producing quality batches of the therapeutic candidate and the manufacturer must develop methods for testing the quality, purity and potency of the therapeutic candidate. Additionally, appropriate packaging must be selected and tested and stability studies must be conducted to demonstrate that the therapeutic candidate does not undergo unacceptable deterioration over its proposed shelf-life.

The results of product development, nonclinical studies and clinical trials, along with descriptions of the manufacturing process, analytical tests and other control mechanisms, proposed labeling and other relevant information are submitted to the FDA as part of an NDA requesting approval to market the product. Under the Prescription Drug User Fee Act, or PDUFA, as amended, each NDA must be accompanied by a significant user fee. The FDA adjusts the PDUFA user fees on an annual basis. PDUFA also imposes an annual product fee for products and an annual establishment fee on facilities used to manufacture prescription drug products. Fee waivers or reductions are available in certain circumstances, such as where a waiver is necessary to protect the public health, where the fee would present a significant barrier to innovation, or where the applicant is a small business submitting its first human therapeutic application for review. Within 60 days following submission of the application, the FDA reviews all NDAs submitted to ensure that they are sufficiently complete for substantive review before it accepts them for filing. It may request additional information rather than accept an NDA for filing. In this event, the NDA must be resubmitted with the additional information. The resubmitted application also is subject to review before the FDA accepts it for filing.

Once the submission is accepted for filing, the FDA begins an in-depth substantive review. NDAs receive either standard or priority review. A therapeutic representing a significant improvement in treatment, prevention or diagnosis of disease may receive priority review. The FDA reviews an NDA to determine, among other things, whether a product is safe and effective for its intended use and whether its manufacturing is cGMP-compliant. The FDA may refer the NDA to an advisory committee for review and recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendation of an advisory committee, but it considers such recommendations carefully when making decisions.

Before approving an NDA, the FDA will inspect the facilities at which the product is manufactured. The FDA will not approve the product unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Additionally, before approving an NDA, the FDA will typically inspect one or more clinical sites to assure that the clinical trials were conducted in compliance with IND trial requirements and GCP requirements. To assure cGMP and GCP compliance, an applicant must incur significant expenditures of time, money and effort in the areas of training, record keeping, production and quality control.

During the product approval process, the FDA also will determine whether a REMS plan is necessary to assure the safe use of the product. If the FDA concludes a REMS plan is needed, the sponsor of the NDA must submit a proposed REMS plan. The FDA will not approve an NDA without a REMS plan, if required. The FDA has authority to require a REMS plan under the Food and Drug Administration Amendments Act of 2007, or FDAAA, when necessary to ensure that the benefits of a therapeutic outweigh the risks. In determining whether a REMS plan is necessary, the FDA must consider the size of the population likely to use the therapeutic, the seriousness of the disease or condition to be treated, the expected benefit of the therapeutic, the duration of treatment, the seriousness of known or potential adverse events, and whether the therapeutic is a new molecular entity. A REMS plan may be required to include various elements, such as a medication guide or patient package insert, a communication plan to educate health care providers of the risks, limitations on who may prescribe or dispense the therapeutic, or other measures that the FDA deems necessary to assure the safe use of the therapeutic. In addition, the REMS plan must include a timetable to assess the strategy at 18 months, three years, and seven years after the strategy's approval.

The FDA may also require a REMS plan for a therapeutic that is already on the market if it determines, based on new safety information, that a REMS plan is necessary to ensure that the product's benefits outweigh its risks.

Notwithstanding the submission of relevant data and information, the FDA may ultimately decide that the NDA does not satisfy its regulatory criteria for approval and deny approval. Data obtained from clinical trials are not

always conclusive and the FDA may interpret data differently than we interpret the same data. If the agency decides not to approve the NDA in its present form, the FDA will issue a complete response letter that describes all of the specific deficiencies in the NDA identified by the FDA. The deficiencies identified may be minor, for example, requiring labeling changes, or major, for example, requiring additional clinical trials. Additionally, the complete response letter may include recommended actions that the applicant might take to place the application in a condition for approval. If a complete response letter is issued, the applicant may either resubmit the NDA, addressing all of the deficiencies identified in the letter, or withdraw the application. Even if the NDA is resubmitted, FDA may again decide that the resubmitted NDA does not satisfy the criteria for approval.

Even if a product receives regulatory approval, the approval may be significantly limited to specific indications and dosages or the indications for use may otherwise be limited, which could restrict the commercial value of the product. Further, the FDA may require that certain contraindications, warnings or precautions be included in the product labeling. The FDA may impose restrictions and conditions on product distribution, prescribing, or dispensing in the form of a risk management plan, or otherwise limit the scope of any approval. In addition, the FDA may require post-marketing clinical trials, sometimes referred to as "Phase 4" clinical trials, designed to further assess a product's safety and effectiveness, and testing and surveillance programs to monitor the safety of approved products that have been commercialized.

Companion Diagnostics. The FDA has issued a final guidance document addressing the agency's policy in relation to in vitro companion diagnostic tests. The guidance explains that for some therapeutics, the use of a companion diagnostic test is essential for the safe and effective use of the product, such as when the use of a product is limited to a specific patient subpopulation that can be identified by using the test. According to the guidance, the FDA generally will not approve such a product if the companion diagnostic is not also approved or cleared for the appropriate indication, and accordingly the therapeutic product and the companion diagnostic should be developed and approved or cleared contemporaneously. However, the FDA may decide that it is appropriate to approve such a product without an approved or cleared in vitro companion diagnostic device when the therapeutic is intended to treat a serious or life-threatening condition for which no satisfactory alternative treatment exists and the FDA determines that the benefits from the use of a product with an unapproved or uncleared in vitro companion diagnostic device are so pronounced as to outweigh the risks from the lack of an approved or cleared in vitro companion diagnostic device. The FDA encourages sponsors considering developing a therapeutic product that requires a companion diagnostic to request a meeting with both relevant device and therapeutic product review divisions to ensure that the product development plan will produce sufficient data to establish the safety and effectiveness of both the therapeutic product and the companion diagnostic. Because the FDA's policy on companion diagnostics is set forth only in guidance, this policy is subject to change and is not legally binding.

Expedited review and approval. The FDA has various programs, including Fast Track, priority review, accelerated approval and breakthrough therapy, which are intended to expedite or simplify the process for reviewing therapeutic candidates, or provide for the approval of a therapeutic candidate on the basis of a surrogate endpoint. Even if a therapeutic candidate qualifies for one or more of these programs, the FDA may later decide that the therapeutic candidate no longer meets the conditions for qualification or that the time period for FDA review or approval will be lengthened. Generally, therapeutic candidates that are eligible for these programs are those for serious or life-threatening conditions, those with the potential to address unmet medical needs and those that offer meaningful benefits over existing treatments. For example, Fast Track is a process designed to facilitate the development and expedite the review of therapeutic candidates to treat serious or life-threatening diseases or conditions and fill unmet medical needs. Priority review is designed to give a therapeutic candidate that treats a serious condition and, if approved, would provide a significant improvement in safety or effectiveness, an initial review within eight months as compared to a standard review time of twelve months.

Although Fast Track and priority review do not affect the standards for approval, the FDA will attempt to facilitate early and frequent meetings with a sponsor of a Fast Track designated therapeutic candidate and expedite review of the application for a therapeutic candidate designated for priority review. Accelerated approval, which is described in Subpart H of 21 CFR Part 314, provides for an earlier approval for a new therapeutic candidate that is intended to treat a serious or life-threatening disease or condition, generally provides a meaningful advantage over available therapies and demonstrates an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit or on a clinical endpoint that can be measured earlier than irreversible morbidity or mortality, or IMM, that is

reasonably likely to predict an effect on IMM or other clinical benefit. A surrogate endpoint is a laboratory measurement or physical sign used as an indirect or substitute measurement representing a clinically meaningful outcome. As a condition of approval, the FDA may require that a sponsor of a therapeutic candidate receiving accelerated approval perform post-marketing clinical trials to verify and describe the predicted effect on irreversible morbidity or mortality or other clinical endpoint, and the product may be subject to accelerated withdrawal procedures.

In the Food and Drug Administration Safety and Innovation Act, or FDASIA, which was signed into law in July 2012, the U.S. Congress encouraged the FDA to utilize innovative and flexible approaches to the assessment of therapeutic candidates under accelerated approval. The law required the FDA to issue related guidance and also promulgate confirming regulatory changes. In May 2014, the FDA published a final Guidance for Industry titled "Expedited Programs for Serious Conditions—Drugs and Biologics," which provides guidance on FDA programs that are intended to facilitate and expedite development and review of new therapeutic candidates as well as threshold criteria generally applicable to concluding that a therapeutic candidate is a candidate for these expedited development and review programs.

In addition to the Fast Track, accelerated approval and priority review programs discussed above, the FDA also provided guidance on a new program for Breakthrough Therapy Designation, established by FDASIA to subject a new category of drugs to accelerated approval. A sponsor may seek FDA designation of a therapeutic candidate as a "breakthrough therapy" if the therapeutic is intended, alone or in combination with one or more other therapeutics, to treat a serious or life-threatening disease or condition, and preliminary clinical evidence indicates that the therapeutic may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. A request for Breakthrough Therapy designation should be submitted concurrently with, or as an amendment to, an IND, but ideally no later than the end of the Phase 2 meeting.

Similar to FDASIA, the Cures Act, which was signed into law in December 2016, includes numerous provisions intended to accelerate the development of new products regulated by the FDA. As an example, the Cures Act provides that the FDA may allow the sponsor of an NDA for a genetically targeted drug or variant protein targeted drug to rely upon data and information previously developed by the same sponsor (or another sponsor that has provided the sponsor with a contractual right of reference to such data and information) and submitted by the sponsor in support of one or more previously approved applications submitted to the FDA for a drug that incorporates or utilizes the same or similar genetically targeted technology or the same variant protein targeted drug.

Patent term restoration and marketing exclusivity. Depending upon the timing, duration and specifics of FDA approval of the use of our therapeutic candidates, some of our U.S. patents may be eligible for limited patent term extension under the Drug Price Competition and Patent Term Restoration Act of 1984, referred to as the Hatch-Waxman Act. The Hatch-Waxman Act permits a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. However, patent term restoration cannot extend the remaining term of a patent beyond a total of 14 years from the therapeutic candidate's approval date. The patent term restoration period is generally one half of the time between the effective date of an IND and the submission date of an NDA, plus the time between the submission date of an NDA and the approval of that application, except that the review period is reduced by any time during which the applicant failed to exercise due diligence. Only one patent applicable to an approved therapeutic candidate is eligible for the extension and the application for extension must be made prior to expiration of the patent. The U.S. Patent and Trademark Office, in consultation with the FDA, reviews and approves the application for any patent term extension or restoration. In the future, we intend to apply for restorations of patent term for some of our currently owned or licensed patents to add patent life beyond their current expiration date, depending on the expected length of clinical trials and other factors involved in the submission of the relevant NDA.

Market exclusivity provisions under the FDCA also can delay the submission or the approval of certain applications. The FDCA provides a five-year period of non-patent marketing exclusivity within the U.S. to the first applicant to gain approval of an NDA for a new chemical entity. A therapeutic candidate is a new chemical entity if the FDA has not previously approved any other new therapeutic candidate containing the same active moiety, which is the molecule or ion responsible for the action of the therapeutic candidate substance. During the exclusivity

period, the FDA may not accept for review an abbreviated new drug application, or ANDA, or a 505(b)(2) NDA submitted by another company for another version of such therapeutic candidate where the applicant does not own or have a legal right of reference to all the data required for approval. However, an application may be submitted after four years if it contains a certification of patent invalidity or non-infringement. The FDCA also provides three years of marketing exclusivity for an NDA, 505(b)(2) NDA or supplement to an approved NDA if new clinical investigations, other than bioavailability studies, that were conducted or sponsored by the applicant are deemed by the FDA to be essential to the approval of the application, for example, for new indications, dosages or strengths of an existing therapeutic candidate. This three-year exclusivity covers only the conditions associated with the new clinical investigations and does not prohibit the FDA from approving ANDAs for therapeutic candidates containing the original active agent. Five-year and three-year exclusivity will not delay the submission or approval of a full NDA. However, an applicant submitting a full NDA would be required to conduct or obtain a right of reference to all of the preclinical studies and adequate and well-controlled clinical trials necessary to demonstrate safety and effectiveness.

Orphan drug designation. Under the Orphan Drug Act, the FDA may grant orphan drug designation to therapeutic candidates intended to treat a rare disease or condition, which is generally a disease or condition that affects fewer than 200,000 individuals in the U.S. or more than 200,000 individuals in the U.S. and for which there is no reasonable expectation that the cost of developing and making available in the U.S. a therapeutic candidate for this type of disease or condition will be recovered from sales in the U.S. for that therapeutic candidate. Orphan drug designation must be requested before submitting a marketing application for the therapeutic for that particular disease or condition. After the FDA grants orphan drug designation, the identity of the therapeutic agent and its potential orphan use are disclosed publicly by the FDA. Orphan drug designation does not convey any advantage in or shorten the duration of the regulatory review and approval process. The FDA may revoke orphan drug designation, and if it does, it will publicize the drug is no longer designated as an orphan drug.

If a therapeutic candidate with orphan drug designation subsequently receives the first FDA approval for the disease for which it has such designation, the therapeutic candidate is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications to market the same therapeutic candidate for the same indication, except in very limited circumstances, for seven years. Orphan drug exclusivity, however, could also block the approval of one of our therapeutic candidates for seven years if a competitor obtains approval of the same therapeutic candidate as defined by the FDA or if our therapeutic candidate is determined to be contained within the competitor's therapeutic candidate for the same indication or disease.

Pediatric exclusivity and pediatric use. Under the Best Pharmaceuticals for Children Act, or BPCA, certain therapeutic candidates may obtain an additional six months of exclusivity if the sponsor submits information requested in writing by the FDA, referred to as a Written Request, relating to the use of the active moiety of the therapeutic candidate in children. The FDA may not issue a Written Request for studies on unapproved or approved indications where it determines that information relating to the use of a therapeutic candidate in a pediatric population, or part of the pediatric population, may not produce health benefits in that population.

In addition, the Pediatric Research Equity Act, or PREA, requires a sponsor to conduct pediatric studies for most therapeutic candidates and biologics, for a new active ingredient, new indication, new dosage form, new dosing regimen or new route of administration. Under PREA, original NDAs, BLAs and supplements thereto must contain a pediatric assessment unless the sponsor has received a deferral or waiver. The required assessment must assess the safety and effectiveness of the therapeutic candidate for the claimed indications in all relevant pediatric subpopulations and support dosing and administration for each pediatric subpopulation for which the therapeutic candidate is safe and effective. The sponsor or the FDA may request a deferral of pediatric studies for some or all of the pediatric subpopulations. A deferral may be granted for several reasons, including a finding that the drug or biologic is ready for approval for use in adults before pediatric studies are complete or that additional safety or effectiveness data needs to be collected before the pediatric studies begin. The FDA must send a noncompliance letter to any sponsor that fails to submit the required assessment, keep a deferral current or fails to submit a request for approval of a pediatric formulation. The FDA also must post the PREA noncompliance letter and sponsor's response.

As part of the FDASIA, the U.S. Congress made a few revisions to BPCA and PREA, which were slated to expire on September 30, 2012, and made both laws permanent.

Post-approval requirements. Once an approval is granted, the FDA may withdraw the approval if compliance with regulatory requirements is not maintained or if problems occur after the therapeutic candidate reaches the market. Later discovery of previously unknown problems with a therapeutic candidate may result in restrictions on the therapeutic candidate or even complete withdrawal of the therapeutic candidate from the market. After approval, some types of changes to the approved therapeutic candidate, such as adding new indications, manufacturing changes and additional labeling claims, are subject to further FDA review and approval. In addition, the FDA may under some circumstances require testing and surveillance programs to monitor the effect of approved therapeutic candidates that have been commercialized, and the FDA under some circumstances has the power to prevent or limit further marketing of a therapeutic candidate based on the results of these post-marketing programs.

Any therapeutic candidates manufactured or distributed by us or our collaborators pursuant to FDA approvals are subject to continuing regulation by the FDA, including, among other things:

- record-keeping requirements;
- reporting of adverse experiences associated with the therapeutic candidate;
- providing the FDA with updated safety and efficacy information;
- therapeutic sampling and distribution requirements;
- notifying the FDA and gaining its approval of specified manufacturing or labeling changes; and
- complying with FDA promotion and advertising requirements, which include, among other things, standards for direct-to-consumer advertising, restrictions on promoting products for uses or in patient populations that are not described in the product's approved labeling, limitations on industry-sponsored scientific and educational activities and requirements for promotional activities involving the internet.

Therapeutic manufacturers, their subcontractors, and other entities involved in the manufacture and distribution of approved therapeutic candidates are required to register their establishments with the FDA and certain state agencies and are subject to periodic unannounced inspections by the FDA and some state agencies for compliance with cGMPs and other laws. The FDA periodically inspects manufacturing facilities to assess compliance with ongoing regulatory requirements, including cGMPs, which impose extensive procedural, substantive and record-keeping requirements upon us and any third-party manufacturers that we may decide to use if our therapeutic candidates are approved. In addition, changes to the manufacturing process are strictly regulated, and, depending on the significance of the change, may require FDA approval before being implemented. FDA regulations would also require investigation and correction of any deviations from cGMPs and impose reporting and documentation requirements upon us and the third-party manufacturers. Accordingly, manufacturers must continue to expend time, money and effort in the area of production and quality control to maintain compliance with cGMPs and other aspects of regulatory compliance. Failure to comply with the statutory and regulatory requirements can subject a manufacturer to possible legal or regulatory actions, such as warning letters, suspension of manufacturing, seizures of products, injunctive actions or other civil penalties. We cannot be certain we or our present or future third-party manufacturers or suppliers will be able to comply with the cGMP regulations and other ongoing FDA regulatory requirements. If we or our present or future third-party manufacturers or suppliers are not able to comply with these requirements, the FDA may halt our clinical trials or require us to recall a product from distribution.

New Legislation and Regulations. From time to time, legislation is drafted, introduced and passed in the U.S. Congress that could significantly change the statutory provisions governing the testing, approval, manufacturing and marketing of products regulated by the FDA. In addition to new legislation, FDA regulations and policies are often revised or interpreted by the agency in ways that may significantly affect our business and our products. It is impossible to predict whether further legislative changes will be enacted or whether FDA regulations, guidance, policies or interpretations will be changed or what the effect of such changes, if any, may be.

Regulation outside of the U.S.

In addition to regulations in the U.S., we will be subject to regulations of other countries governing any clinical trials and commercial sales and distribution of our therapeutic candidates. Whether or not we obtain FDA approval for a product, we must obtain approval by the comparable regulatory authorities of countries outside of the U.S. before we can commence clinical trials in such countries and approval of the regulators of such countries or economic areas, such as the European Union, before we may market products in those countries or areas. The approval process and requirements governing the conduct of clinical trials, product licensing, pricing and reimbursement vary greatly from place to place, and the time may be longer or shorter than that required for FDA approval.

The currently applicable Clinical Trials Directive 2001/20/EC and Commission Directive 2005/28/EC on GCP setting out the system for the approval of clinical trials in the European Union, or EU, have been implemented through national legislation in the EU Member States. Under this system, an applicant must obtain approval from the national competent authorities in all EU Member States in which the clinical trials are to be conducted. Furthermore, the applicant may only start a clinical trial at a specific study site once approved by the competent ethics committee.

In 2014, a new Clinical Trials Regulation 536/2014, replacing the current Clinical Trials Directive, was adopted. The new Regulation will become directly applicable in all EU Member States (without national implementation) once the EU Portal and Database are fully functional. The Regulation was expected to apply by October 2018. However, due to technical difficulties with the development of the IT systems, it is currently expected that the new Regulation will come into application during 2020. The new Regulation seeks to simplify and streamline the approval of clinical trials in the EU. For example, the sponsor shall submit a single application for approval of a clinical trial via the EU Portal. As part of the application process, the sponsor shall propose a reporting Member State, who will coordinate the validation and evaluation of the application. The reporting Member State shall consult and coordinate with the other concerned Member States. If an application is rejected, it can be amended and resubmitted through the EU Portal. If an approval is issued, the sponsor can start the clinical trial in all concerned Member States. However, a concerned Member State can in limited circumstances declare an “opt-out” from an approval. In such a case, the clinical trial cannot be conducted in that Member State. The Regulation also aims to streamline and simplify the rules on safety reporting, and introduces enhanced transparency requirements such as mandatory submission of a summary of the clinical trial results to the EU Database.

In the EU, a company may submit a marketing authorization application either: (i) at the national level with the national competent authorities in one EU Member State, referred to as the national procedure; (ii) via mutual recognition of a national authorization in other EU Member States, referred to as the mutual recognition procedure; (iii) at the national level in several EU Member States, or the decentralized procedure; or (iv) at centralized level with the European Medicines Agency, or EMA, referred to as the centralized procedure. The national procedure allows the applicant to choose the EU Member State in which they wish to first submit an application. The mutual recognition procedure allows a marketing authorization granted in one EU Member State via the national procedure to be recognized in other EU Member States. The decentralized procedure allows a medicine that has not yet been authorized in the EU to be authorized in several EU Member States. The centralized procedure, whereby a medicine receives marketing authorization in all EU Member States, is compulsory for certain medicines and is optional for other types of medicines if the applicant can show eligibility.

As in the U.S., we may apply for designation of a therapeutic candidate as an orphan drug for the treatment of a specific indication in the EU before the application for marketing authorization is made. Regulation (EC) No. 141/2000 and Regulation (EC) No. 847/2000 provide that a product can be designated as an orphan drug by the European Commission if its sponsor can establish: that the product is intended for the diagnosis, prevention or treatment of (1) a life-threatening or chronically debilitating condition affecting not more than five in ten thousand persons in the European Union when the application is made, or (2) a life-threatening, seriously debilitating or serious and chronic condition in the European Union and that without incentives it is unlikely that the marketing of the product in the European Union would generate sufficient return to justify the necessary investment. For either of these conditions, the applicant must also demonstrate that there exists no satisfactory method of diagnosis, prevention, or treatment of the condition in question that has been authorized in the European Union or, if such method exists, the product has to be of significant benefit compared to products available for the condition.

An orphan drug designation provides a number of benefits, including fee reductions, regulatory assistance and the possibility to apply for a centralized European Union marketing authorization. The grant of a marketing authorization for an orphan drug leads to a ten-year period of market exclusivity. During this market exclusivity period, neither the EMA nor the European Commission or the Member States can accept an application or grant a marketing authorization for the same therapeutic indication in respect of a "similar medicinal product". A "similar medicinal product" is defined as a medicinal product containing a similar active substance or substances as contained in an authorized orphan medicinal product, and which is intended for the same therapeutic indication. The market exclusivity period for the authorized therapeutic indication may, however, be reduced to six years if, at the end of the fifth year, it is established that the product no longer meets the criteria for orphan drug designation because, for example, the product is sufficiently profitable not to justify market exclusivity. There are a number of derogations from the ten-year period of market exclusivity pursuant to which the European Commission may grant a marketing authorization for a similar medicinal product in the same therapeutic indication, including where the second applicant can establish that although their product is similar to the orphan medicinal product already authorized, the second product is safer, more effective or otherwise clinically superior.

Healthcare Reform

In March 2010, Congress passed the ACA, a sweeping law intended to broaden access to health insurance, reduce or constrain the growth of health spending, enhance remedies against fraud and abuse, add new transparency requirements for the healthcare and health insurance industries, impose new taxes and fees on the health industry, and impose additional policy reforms. The ACA contains a number of provisions, including those governing enrollment in federal healthcare programs, reimbursement changes, and fraud and abuse, impacting existing government healthcare programs and resulting in the development of new programs, including Medicare payment for performance initiatives, and improvements to the physician quality reporting system and feedback program. Other aspects of the ACA include, but are not limited to:

- Increases in pharmaceutical manufacturer rebate liability under the Medicaid Drug Rebate Program due to an increase in the minimum basic Medicaid rebate on most branded prescription drugs, and the application of Medicaid rebate liability to drugs used in risk-based Medicaid managed care plans.
- Expansion of the 340B Drug Pricing Program to require discounts for "covered outpatient drugs" sold to certain children's hospitals, critical access hospitals, freestanding cancer hospitals, rural referral centers, and sole community hospital.
- Requirements on pharmaceutical companies to offer discounts on brand-name drugs to patients who fall within the Medicare Part D coverage gap, commonly referred to as the "Donut Hole."
- Requirements on manufacturers to participate in a coverage gap discount program, under which they must agree to offer point-of-sale discounts (increased to 70 percent pursuant to the Bipartisan Budget Act of 2018, effective as of January 1, 2019) off negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period, as a condition for the manufacturer's outpatient drugs to be covered under Medicare Part D.
- Requirements on pharmaceutical companies to pay an annual non-tax-deductible fee to the federal government based on each company's market share of prior year total sales of branded drugs to certain federal healthcare programs, such as Medicare, Medicaid, Department of Veterans Affairs, and Department of Defense.
- Establishment of the Patient-Centered Outcomes Research Institute to identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research. The research conducted by the Patient-Centered Outcomes Research Institute may affect the market for certain pharmaceutical products.
- Establishment the Center for Medicare and Medicaid Innovation within the Centers for Medicare and Medicaid Services, or CMS, to test innovative payment and service delivery models to lower Medicare and

Medicaid spending, potentially including prescription drug spending. Funding has been allocated to support the mission of the Center for Medicare and Medicaid Innovation from 2011 to 2019.

From time to time, legislation is drafted, introduced, and passed in Congress that could significantly change the statutory provisions governing the sale, marketing, coverage, and reimbursement of products regulated by CMS or other government agencies. In addition to new legislation, CMS regulations and policies are often revised or interpreted by the agency in ways significantly affecting our business and our products.

Since its enactment, there have been judicial, administrative, executive and Congressional legislative challenges to certain aspects of the ACA, and we expect there will be additional challenges and amendments to the ACA in the future. Various portions of the ACA are currently undergoing constitutional challenges in the Fifth Circuit Court and the United States Supreme Court, the Trump Administration has issued various Executive Orders eliminating cost sharing subsidies and various provisions that would impose a fiscal burden on states or a cost, fee, tax, penalty or regulatory burden on individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices, and Congress has introduced several pieces of legislation aimed at significantly revising or repealing the ACA. It is unclear whether the ACA will be overturned, repealed, replaced, or further amended, and we cannot predict what affect further changes to the ACA would have on our business.

Third-Party Payor Coverage and Reimbursement

Significant uncertainty exists as to the coverage and reimbursement status of any products for which we may obtain regulatory approval. In the U.S., sales of any products for which we may receive regulatory marketing approval will depend, in part, on the availability of coverage and reimbursement from third-party payors. Third-party payors include government authorities such as Medicare, Medicaid, TRICARE, and the Veterans Administration, managed care providers, private health insurers, and other organizations.

The Medicaid Drug Rebate Program, which is part of the federal Medicaid program (a program for financially needy patients, among others), requires pharmaceutical manufacturers to enter into and have in effect a national rebate agreement with the Secretary of the Department of Health and Human Services as a condition for receiving federal reimbursement for the manufacturer's outpatient drugs furnished to Medicaid patients.

In order for a pharmaceutical product to (i) receive federal reimbursement under Medicaid and Medicare Part B (the part of the federal Medicare program covering outpatient items and services for the aged and disabled) or (ii) be sold directly to U.S. government agencies, the manufacturer must extend discounts to entities eligible to participate in the 340B drug pricing program, which is a federal program that requires manufacturers to provide discounts to certain statutorily defined safety-net providers. The required 340B discount on a given product is calculated based on certain Medicaid Drug Rebate Program metrics the manufacturer is required to report to CMS. The failure to report or the misreporting of such pricing metrics could result in significant civil monetary penalties and fines for each item of false or omitted information and per day per labeler code for each day the submission of such pricing information is late beyond the due date.

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003, or MMA, imposed requirements for the distribution and pricing of prescription drugs for Medicare beneficiaries. Under Part D, Medicare beneficiaries may enroll in prescription drug plans offered by private entities, which will provide coverage of outpatient prescription drugs. Part D plans include both stand-alone prescription drug benefit plans and prescription drug coverage as a supplement to Medicare Advantage plans. Unlike Medicare Part A and B, Part D coverage is not standardized. Part D prescription drug plan sponsors are not required to pay for all covered Part D drugs, and each drug plan can develop its own drug formulary that identifies which drugs it will cover and at what tier or level. However, Part D prescription drug formularies must include drugs within each therapeutic category and class of covered Part D drugs, though not necessarily all the drugs in each category or class. Any formulary used by a Part D prescription drug plan must be developed and reviewed by a pharmacy and therapeutic committee. Government payment for some of the costs of prescription drugs may increase demand for our products for which we receive marketing approval. However, any negotiated prices for our products covered by a Part D prescription drug plan will likely be lower than the prices we might otherwise obtain. Moreover, while the MMA applies only to drug benefits for Medicare beneficiaries, private payors often follow Medicare coverage policy and payment

limitations in setting their own payment rates. Any reduction in payment that results from the MMA may result in a similar reduction in payments from non-governmental payors.

In the United States, no uniform policy exists for coverage and reimbursement for pharmaceutical products among third-party payors. Therefore, decisions regarding the extent of coverage and amount of reimbursement to be provided are made on a plan-by-plan basis. The process for determining whether a payor will provide coverage for a product is typically separate from the process for setting the reimbursement rate a payor will pay for the product. Third-party payors may limit coverage to specific products on an approved list or formulary, which may not include all FDA-approved products for a particular indication. Also, third-party payors may refuse to include a particular branded product on their formularies or otherwise restrict patient access to a branded drug when a less costly generic equivalent or other alternative is available. One third-party payor's decision to cover a particular product or service does not ensure that other payors will also provide coverage for the medical product or service, and the level of coverage and reimbursement can differ significantly from payor to payor. Furthermore, a payor's decision to provide coverage for a product does not imply an adequate reimbursement rate will be available. Adequate third-party reimbursement may not be available to enable us to maintain price levels sufficient to realize an appropriate return on our investment in product development.

Third-party payors are increasingly challenging the price and examining the medical necessity and cost-effectiveness of medical products and services. Additionally, the containment of healthcare costs has become a priority of federal and state governments, and the prices of therapeutics have been a focus in this effort. The U.S. government, state legislatures, and foreign governments have shown significant interest in implementing cost-containment programs, including price controls, restrictions on reimbursement, and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit our net revenue and results. Our drug candidates may not be considered medically necessary or cost-effective. If third-party payors do not consider a product to be cost-effective compared to other available therapies, they may not cover an approved product as a benefit under their plans or, if they do, the level of payment may not be sufficient to allow us to sell our products at a profit.

Further, the American Recovery and Reinvestment Act of 2009 provides funding for the federal government to compare the effectiveness of different treatments for the same illness. The plan for the research was published in 2012 by the Department of Health and Human Services, the Agency for Healthcare Research and Quality, or AHRQ, and the National Institutes for Health, and periodic reports on the status of the research and related expenditures will be made to the U.S. Congress. In addition, the ACA requires, among other things, that AHRQ broadly disseminate findings from federally funded comparative clinical effectiveness research. Although the results of the comparative effectiveness studies are not intended to mandate coverage policies for public or private payors, it is not clear what effect, if any, the research will have on the sales of our therapeutic candidates if any such therapeutic, or the condition that it is intended to treat, is the subject of a study. It is also possible that comparative effectiveness research demonstrating benefits in a competitor's product could adversely affect the sales of our therapeutic candidates.

In addition, other legislative changes have been proposed and adopted in the United States since the ACA was enacted. On August 2, 2011, the Budget Control Act of 2011 among other things, created measures for spending reductions by the U.S. Congress. A Joint Select Committee on Deficit Reduction, tasked with recommending a targeted deficit reduction of at least $1.2 trillion for the years 2013 through 2021, was unable to reach required goals, thereby triggering the legislation's automatic reduction to several government programs. This includes aggregate reductions to Medicare payments to providers of up to 2% per fiscal year, started in April 2013, and, due to subsequent legislative amendments, will stay in effect through 2029 unless additional Congressional action is taken. On January 2, 2013, President Obama signed into law the American Taxpayer Relief Act of 2012, or the ATRA, which among other things, also reduced Medicare payments to several providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers. We expect that additional federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare drugs and services, and in turn could significantly reduce the projected value of certain development projects and reduce our profitability.

Further, the Trump Administration released a "Blueprint" to lower drug prices and reduce out of pocket costs of drugs that contains additional proposals to increase drug manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products, and reduce the out of pocket costs of drug products paid by consumers. The Trump administration's budget proposal for fiscal year 2020 contains further drug price control measures that could be enacted during the 2020 budget process or in other future legislation, including, for example, measures to permit Medicare Part D plans to negotiate the price of certain drugs under Medicare Part B, to allow some states to negotiate drug prices under Medicaid, and to eliminate cost sharing for generic drugs for low-income patients. The Department of Health and Human Services has begun implementation of the Trump administration Blueprint, soliciting feedback on some of these measures and, immediately implementing others under its existing authority. For example, in May 2019, CMS issued a final rule to allow Medicare Advantage Plans the option of using step therapy for Part B drugs beginning January 1, 2020.

Finally, in some foreign countries, the proposed pricing for a therapeutic candidate must be approved before it may be lawfully marketed. The requirements governing therapeutic pricing vary widely from country to country. For example, in the EU, pricing and reimbursement of pharmaceutical products are regulated at a national level under the individual EU Member States' social security systems. Some foreign countries provide options to restrict the range of medicinal products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. A country may approve a specific price for the medicinal product or it may instead adopt a system of direct or indirect controls on the profitability of the company placing the medicinal product on the market. There can be no assurance that any country that has price controls or reimbursement limitations for pharmaceutical products will allow favorable reimbursement and pricing arrangements for any of our therapeutic candidates. Even if approved for reimbursement, historically, therapeutic candidates launched in some foreign countries such as some countries in the EU do not follow price structures of the U.S. and prices generally tend to be significantly lower.

Other Healthcare Laws and Regulations

If we obtain regulatory approval of our products, we may be subject to various federal and state laws targeting fraud and abuse in the healthcare industry. These laws may impact, among other things, our proposed sales and marketing strategies. In addition, we may be subject to patient privacy regulation by both the federal government and the states in which we conduct our business. These laws include, without limitation, state and federal anti-kickback, fraud and abuse, false claims, privacy and security, and physician sunshine laws and regulations.

The federal Anti-Kickback Statute prohibits, among other things, any person from knowingly and willfully offering, soliciting, receiving or paying remuneration (a term interpreted broadly to include anything of value, including, for example, gifts, discounts and credits), directly or indirectly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, order or recommendation of, an item or reimbursable, in whole or in part, under a federal healthcare program, such as the Medicare and Medicaid programs. Violations of the federal Anti-Kickback Statute can result in significant civil monetary and criminal penalties, per kickback plus three times the amount of remuneration and a prison term per violation. Further, violation of the federal Anti-Kickback Statute can also form the basis for False Claims Act liability (discussed below). The Anti-Kickback Statute is subject to evolving interpretations. In the past, the government has enforced the Anti-Kickback Statute to reach large settlements with healthcare companies based on allegedly inappropriate consulting, discounting and other financial arrangements with physicians and others in a position to refer patients to receive items or services reimbursable by a federal healthcare program. A person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation. Many states have adopted laws similar to the federal Anti-Kickback Statute, some of which apply to the referral of patients for healthcare items or services reimbursed by any source, not only government programs.

Additionally, the civil False Claims Act prohibits knowingly presenting or causing the presentation of a false, fictitious or fraudulent claim for payment to the U.S. government. Actions under the False Claims Act may be brought by the Attorney General or as a qui tam action by a private individual in the name of the government. Violations of the False Claims Act can result in very significant monetary penalties, including for each false claim and treble the amount of the government's damages. Manufacturers can be held liable under the False Claims Act even when they do not submit claims directly to government payors if they are deemed to "cause" the submission of

false or fraudulent claims. The federal government continues to use the False Claims Act, and the accompanying threat of significant liability, in its investigations and prosecutions of pharmaceutical and biotechnology companies throughout the U.S. Such investigations and prosecutions frequently involve, for example, the alleged promotion of products for unapproved uses and other sales and marketing practices. The government has obtained multi-million and multi-billion dollar settlements under the False Claims Act in addition to individual criminal convictions under applicable criminal statutes. Given the significant size of actual and potential settlements, it is expected that the government will continue to devote substantial resources to investigating healthcare providers' and manufacturers' compliance with the False Claims Act and other applicable fraud and abuse laws.

We may be subject to the federal Civil Monetary Penalties Law, which prohibits, among other things, the offering or transferring of remuneration to a Medicare or Medicaid beneficiary that the person knows or should know is likely to influence the beneficiary's selection of a particular supplier of Medicare or Medicaid payable items or services. Federal government price reporting laws require manufacturers to calculate and report complex pricing metrics to government programs.

The U.S. federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, includes a fraud and abuse provision referred to as the HIPAA All-Payor Fraud Law, which imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program, or knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation.

We may also be subject to data privacy and security regulation by both the federal government and the states in which we conduct our business. HIPAA, as amended by HITECH, and its implementing regulations, including the final omnibus rule published on January 25, 2013, imposes certain requirements relating to the privacy, security and transmission of individually identifiable health information. Among other things, HITECH makes HIPAA's privacy and security standards directly applicable to "business associates," defined as independent contractors or agents of covered entities that create, receive, maintain or transmit protected health information in connection with providing a service for or on behalf of a covered entity. HITECH also increased the civil and criminal penalties that may be imposed against covered entities, business associates and possibly other persons, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorney's fees and costs associated with pursuing federal civil actions.

We may also be subject to federal transparency laws, including the federal Physician Payment Sunshine Act, which was part of the ACA and requires manufacturers of certain drugs and biologics, among others, to track and disclose payments and other transfers of value they make to U.S. physicians and teaching hospitals, as well as physician ownership and investment interests in the manufacturer. Effective January 1, 2022, these reporting obligations will extend to include transfers of value made to certain non-physician providers such as physician assistants and nurse practitioners. This information is subsequently made publicly available in a searchable format on a CMS website. Failure to disclose required information may result in civil monetary penalties for all payments, transfers of value or ownership or investment interests that are not timely, accurately and completely reported in an annual submission. Certain states also mandate implementation of compliance programs, impose restrictions on drug manufacturer marketing practices and/or require the tracking and reporting of gifts, compensation and other remuneration to physicians and/or other healthcare providers.

Finally, as noted above, analogous state laws and regulations, such as, state anti-kickback and false claims laws may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers. Some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government in addition to requiring drug manufacturers to report information related to payments to physicians and other healthcare providers or marketing expenditures. There are also state and local laws that require the registration of pharmaceutical sales representatives. Similarly, many states also have laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

Environment

Our third party manufacturers are subject to inspections by the FDA for compliance with cGMP and other U.S. regulatory requirements, including U.S. federal, state and local regulations regarding environmental protection and hazardous and controlled substance controls, among others. Environmental laws and regulations are complex, change frequently and have tended to become more stringent over time. We have incurred, and may continue to incur, significant expenditures to ensure we are in compliance with these laws and regulations. We would be subject to significant penalties for failure to comply with these laws and regulations.

Sales and Marketing

Our current focus is on the development of our existing portfolio, the initiation and completion of clinical trials and, if and where appropriate, the registration of our therapeutic candidates. We currently do not have marketing, sales and distribution capabilities. If we receive marketing and commercialization approval for any of our therapeutic candidates, we intend to market the product through strategic alliances and distribution agreements with third parties. The ultimate implementation of our strategy for realizing the financial value of our therapeutic candidates is dependent on the results of clinical trials for our therapeutic candidates, the availability of funds and the ability to negotiate acceptable commercial terms with third parties.

Advisors

We seek advice from our advisory board, which consists of a number of leading executive officers, scientists and physicians, on strategic direction, scientific and medical matters. Our advisory board may provide advice regarding

- our research and development programs;
- the design and implementation of our clinical programs;
- our patent and publication strategies;
- new technologies relevant to our research and development programs; and
- specific scientific and technical issues relevant to our business.

The current members of our advisory board are as follows.

Name	Position and Institutional Affiliation
Freddy Boey, Ph.D.	Deputy President and Provost, Nanyang Technological University
Sunandana (Sue) Chandra, M.D., M.S.	Assistant Professor of Medicine (Hematology and Oncology) at the Feinberg School of Medicine at Northwestern University
Michael Hodges, M.D., MBBS, BSc, MRCP	Chief Medical Officer, Amplyx Pharmaceuticals
Steven O'Day, M.D.	Executive director of the John Wayne Cancer Institute and Cancer Clinic, director of Providence Los Angeles Regional Research and professor of medical oncology, director of immuno-oncology, director of clinical research at the John Wayne Cancer Institute at Providence Saint John's Health Center
Amy S. Paller, M.D.	Walter J. Hamlin Professor and Chair Department of Dermatology at Northwestern University Feinberg School of Medicine
Henry Paulson, M.D., Ph.D.	Professor of neurology for Alzheimer's Disease and Related Disorders in the department of neurology at the University of Michigan
Susan Perlman, M.D.	Professor in the department of neurology and director of Ataxia and Neurogenetics Program and Post-polio Program at the David Geffen School of Medicine at UCLA
Jeffrey Raizer, M.D.	Medical director for oncology at Astellas Pharma
Steven T. Rosen, M.D., F.A.C.P.	Provost and Scientific Director, City of Hope
Cy Stein, M.D.	Professor of Medical Oncology and Molecular and Cellular Biology and the former chair of the Department of Medical Oncology and Therapeutics Research at City of Hope

Employees

As of December 31, 2019, we have 29 full time employees, of whom 22 are engaged in research and development activities and 7 are engaged in finance, legal, human resources, business development and general management. We have no collective bargaining agreement with our employees and we have not experienced any work stoppages. We consider our relations with our employees to be good.

Corporate Information

We were originally incorporated in the State of Delaware on February 6, 2017 under the name "Max-1 Acquisition Corporation." Prior to the Merger (as defined below), Max-1 was a "shell" company registered under the Securities Exchange Act of 1934, as amended, or the Exchange Act, with no specific business plan or purpose until it began operating the business of Exicure Operating Company (Exicure OpCo) through a transaction on September 26, 2017 (the "Merger"). Exicure OpCo was originally formed as a limited liability company under the name AuraSense Therapeutics, LLC in the State of Delaware in June 2011 and was a clinical-stage biotechnology company developing gene regulatory and immuno-oncology therapeutics based on its proprietary SNA technology. AuraSense Therapeutics, LLC was subsequently converted into AuraSense Therapeutics, Inc., a Delaware corporation, on July 9, 2015, and changed its name on the same date to Exicure, Inc. Immediately after giving effect to the Merger and the initial closing of a private placement transaction on September 26, 2017, the business of Exicure OpCo became our business.

Our corporate headquarters are located at 8045 Lamon Avenue, Suite 410, Skokie, IL 60077, and our telephone number is (847) 673-1700.

All trademarks, service marks and trade names appearing in this prospectus are the property of their respective holders. Use or display by us of other parties' trademarks, trade dress, or products in this prospectus is not intended to, and does not, imply a relationship with, or endorsements or sponsorship of, us by the trademark or trade dress owners.

Available Information

We are subject to the informational requirements of the Exchange Act, and, accordingly, file Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act, with the Securities and Exchange Commission (the "SEC"). In addition, the SEC maintains a web site (http://www.sec.gov) that contains material regarding issuers that file electronically, such as ourselves, with the SEC.

We maintain a website at www.exicuretx.com, to which we regularly post copies of our press releases as well as additional information about us. Our filings with the SEC will be available free of charge through the website as soon as reasonably practicable after being electronically filed with or furnished to the SEC. Information contained in our website is not a part of, nor incorporated by reference into, this prospectus or our other filings with the SEC, and should not be relied upon.

Item 1A. Risk Factors.

We are providing the following cautionary discussion of risk factors, uncertainties and assumptions that we believe are relevant to our business. These are factors that, individually or in the aggregate, we think could cause our actual results to differ materially from expected and historical results and our forward-looking statements. We note these factors for investors as permitted by Section 21E of the Exchange Act and Section 27A of the Securities Act. You should understand that it is not possible to predict or identify all such factors. Consequently, you should not consider this section to be a complete discussion of all potential risks or uncertainties that may substantially impact our business. Moreover, we operate in a competitive and rapidly changing environment. New factors emerge from time to time and it is not possible to predict the impact of all of these factors on our business, financial condition or results of operations.

Risks Related to Our Business

We are a clinical-stage biotechnology company with a history of losses. We expect to continue to incur significant losses for the foreseeable future and may never achieve or maintain profitability, which could result in a decline in the market value of our common stock.

We are a biotechnology company developing therapeutics for immuno-oncology, genetic disorders and other indications based on our proprietary SNA technology. We have a limited operating history. Since our inception in June 2011, we have devoted our resources to the development of SNA technology. We have had significant operating losses since our inception. As of December 31, 2019, we have generated an accumulated deficit of $100.1 million. For the years ended December 31, 2019 and 2018, our net loss was $26.3 million and $22.4 million, respectively. Substantially all of our losses have resulted from expenses incurred in connection with our research programs and from general and administrative costs associated with our operations. Our technology and therapeutic candidates are in early stages of development, and we are subject to the risks of failure inherent in the development of therapeutic candidates based on novel technologies.

We have not generated, and do not expect to generate, any product revenue for the foreseeable future, and we expect to continue to incur significant operating losses for the foreseeable future due to the cost of research and development, preclinical studies, clinical trials, and the regulatory approval process for therapeutic candidates. The amount of future losses is uncertain. Our ability to achieve profitability, if ever, will depend on, among other things, us, or any current or future collaborators, successfully developing therapeutic candidates, obtaining regulatory approvals to market and commercialize therapeutic candidates, manufacturing any approved products on commercially reasonable terms, establishing a sales and marketing organization or suitable third-party alternatives for any approved product and raising sufficient funds to finance business activities. If we, or any current or future collaborators, are unable to develop and commercialize one or more of our therapeutic candidates or if sales revenue from any therapeutic candidate that receives approval is insufficient, we will not achieve profitability, which could have a material adverse effect on our business, financial condition, results of operations and prospects.

Our approach to the discovery and development of innovative therapeutic treatments based on our technology is unproven and may not result in marketable products.

We plan to develop a pipeline of therapeutic candidates based on our proprietary SNA technology. We believe that therapeutic candidates identified with our therapeutic discovery technology may offer an improved therapeutic approach compared to small molecules and antibodies, as well as several advantages over linear oligonucleotide-based therapeutics. However, the scientific research that forms the basis of our efforts to develop therapeutic candidates based on our SNA technology and the identification and optimization of SNA-based therapeutic candidates is relatively new. Further, the scientific evidence to support the feasibility of developing therapeutic treatments based on SNA technology is both preliminary and limited.

Therapeutic candidates based on SNA technology have not been extensively tested in humans, and a number of clinical trials conducted by other companies using oligonucleotide technologies have not been successful. We may discover that the SNA-based therapeutic candidates do not possess certain properties required for therapeutic treatment to be effective, such as the ability to remain stable in the human body for the period of time required for

the therapeutic candidate to reach the target tissue or the ability to cross the cell membrane and enter into cells within the target tissue for effective delivery. We currently have only limited data, and no conclusive evidence, to suggest that we can introduce these necessary drug-like properties into SNA-based therapeutic candidate. We may spend substantial funds attempting to introduce these properties and may never succeed in doing so. In addition, therapeutic candidates based on SNA technology may demonstrate different chemical and pharmacological properties in patients than they do in laboratory studies. Even if therapeutic candidates have successful results in animal studies, they may not demonstrate the same chemical and pharmacological properties in humans and may interact with human biological systems in unforeseen, ineffective or harmful ways. As a result, we may never succeed in developing a marketable therapeutic, we may not become profitable and the value of our common stock would decline.

Further, the U.S. Food and Drug Administration (the "FDA") and equivalent foreign regulatory authorities have limited experience with SNA-based therapeutics. No regulatory authority has granted approval to any person or entity, including us, to market and commercialize SNA-based therapeutics, which may increase the complexity, uncertainty and length of the regulatory approval process for our therapeutic candidates. We and any current or future collaborators may never receive approval to market and commercialize any therapeutic candidate. Even if we or a future collaborator obtain regulatory approval, the approval may be for disease indications or patient populations that are not as broad as we intended or desired or may require labeling that includes significant use or distribution restrictions or safety warnings. We or a future collaborator may be required to perform additional or unanticipated clinical trials to obtain approval or be subject to post-marketing testing requirements to maintain regulatory approval. If our SNA technology proves to be ineffective, unsafe or commercially unviable, our technology and pipeline would have little, if any, value, which could have a material adverse effect on our business, financial condition, results of operations and prospects.

Our therapeutic candidates are in early stages of development and may fail in development or suffer delays that materially and adversely affect their commercial viability.

We have no therapeutics on the market and all of our therapeutic candidates are in early stages of development. Our ability to achieve and sustain profitability depends on obtaining regulatory approvals, including an institutional review board ("IRB") approval to conduct clinical trials at particular sites for, and successfully commercializing, our therapeutic candidates, either alone or with third parties. Before obtaining regulatory approval for the commercial distribution of our therapeutic candidates, we or an existing or a future collaborator must conduct extensive preclinical studies and clinical trials to demonstrate the safety and efficacy in humans of our therapeutic candidates. Preclinical studies and clinical trials are expensive, difficult to design and implement, can take many years to complete and are uncertain as to outcome. The start or end of a clinical trial is often delayed or halted due to changing regulatory requirements, manufacturing challenges, required clinical trial administrative actions, slower than anticipated patient enrollment, changing standards of care, availability or prevalence of use of a comparative therapeutic or required prior therapy, clinical outcomes or financial constraints. For instance, delays or difficulties in patient enrollment or difficulties in retaining trial participants can result in increased costs, longer development times or termination of a clinical trial. Clinical trials of a new therapeutic candidate require the enrollment of a sufficient number of patients, including patients who are suffering from the disease the therapeutic candidate is intended to treat and who meet other eligibility criteria. Rates of patient enrollment are affected by many factors, including the size of the patient population, the eligibility criteria for the clinical trial, the age and condition of the patients, the stage and severity of disease, the nature of the protocol, the proximity of patients to clinical sites and the availability of effective treatments for the relevant disease.

A therapeutic candidate can unexpectedly fail at any stage of preclinical and clinical development. The historical failure rate for therapeutic candidates is high due to scientific feasibility, safety, efficacy, changing standards of medical care and other variables. The results from preclinical studies or early clinical trials of a therapeutic candidate may not predict the results that will be obtained in later phase clinical trials of the therapeutic candidate. We, the FDA, an IRB, an independent ethics committee, or other applicable regulatory authorities may suspend clinical trials of a therapeutic candidate at any time for various reasons, including a finding that subjects participating in such trials are being exposed to unreasonable and significant risk of illness or injury. Similarly, an IRB or ethics committee may suspend a clinical trial at a particular trial site. We may not have the financial resources to continue development of, or to enter into collaborations for, a therapeutic candidate if we experience

any problems or other unforeseen events that delay or prevent regulatory approval of, or our ability to commercialize, therapeutic candidates, including:

- negative or inconclusive results from our clinical trials or the clinical trials of others for therapeutic candidates similar to ours, leading to a decision or requirement to conduct additional preclinical testing or clinical trials or abandon a program;
- therapeutic-related side effects experienced by participants in our clinical trials or by individuals using therapeutics similar to our therapeutic candidates;
- delays in submitting INDs or CTAs, or comparable foreign applications or delays or failure in obtaining the necessary approvals from regulators or IRBs or ethics committees to commence a clinical trial, or a suspension or termination of a clinical trial once commenced;
- conditions imposed by the FDA or comparable foreign authorities, such as the European Medicines Agency ("EMA"), or European Union national competent authorities, regarding the scope or design of our clinical trials;
- delays in enrolling research subjects in clinical trials;
- high drop-out rates of research subjects;
- inadequate supply or quality of therapeutic candidate components or materials or other supplies necessary for the conduct of our clinical trials;
- greater than anticipated clinical trial costs;
- poor effectiveness of our therapeutic candidates during clinical trials;
- unfavorable FDA or other regulatory agency inspection and review of a clinical trial site;
- failure of our third-party contractors or investigators to comply with regulatory requirements or otherwise meet their contractual obligations in a timely manner, or at all;
- delays and changes in regulatory requirements, policy and guidelines, including the imposition of additional regulatory oversight around clinical testing generally or with respect to our technology in particular, especially in light of the novelty of our therapeutic candidates;
- varying interpretations of data by the FDA and similar foreign regulatory agencies; or
- refusal of the FDA to accept data from clinical trials conducted outside the United States, or acceptance of these data subject to certain conditions by the FDA.

Product development involves a lengthy and expensive process with an uncertain outcome, and results of earlier preclinical studies and clinical trials may not be predictive of future clinical trial results.

Clinical testing is expensive and generally takes many years to complete, and the outcome is inherently uncertain. Failure can occur at any time and at any stage during the clinical trial process. The results of preclinical studies and early clinical trials of our therapeutic candidates may not be predictive of the result of any subsequent clinical trials. Therapeutic candidates that have shown promising results in early stage clinical trials may still suffer significant setbacks in subsequent clinical trials. We will have to conduct trials in our proposed indications to verify the results obtained to date and to support any regulatory submissions for further clinical development. A number of companies in the biopharmaceutical industry have suffered significant setbacks in clinical trials due to lack of efficacy or adverse safety profiles despite promising results in earlier clinical trials. Moreover, clinical data is often susceptible to varying interpretations and analyses. We do not know whether Phase 1, Phase 2, Phase 3, or other clinical trials we may conduct will demonstrate consistent or adequate efficacy and safety with respect to the proposed indication for use sufficient to receive regulatory approval or market our therapeutic candidates. If we experience delays in the completion of, or termination of, any clinical trial of our therapeutic candidates, the commercial prospects of our therapeutic candidates may be harmed, and our ability to generate product revenues

from any of these therapeutic candidates will be delayed. In addition, any delays in completing clinical trials will increase our costs, slow down our therapeutic candidate development and approval process and jeopardize our ability to commence product sales and generate revenues. Any of these occurrences could materially and adversely affect our business, financial condition, results of operations or prospects.

Additionally, some of the clinical trials we conduct may be open-label in study design and may be conducted at a limited number of clinical sites on a limited number of patients. An "open-label" clinical trial is one where both the patient and investigator know whether the patient is receiving the investigational product candidate or either an existing approved drug or placebo. Most typically, open-label clinical trials test only the investigational product candidate and sometimes may do so at different dose levels. Open-label clinical trials are subject to various limitations that may exaggerate any therapeutic effect as patients in open-label clinical trials are aware when they are receiving treatment. Open-label clinical trials may be subject to a "patient bias" where patients perceive their symptoms to have improved merely due to their awareness of receiving an experimental treatment. Moreover, patients selected for early clinical studies often include the most severe sufferers and their symptoms may have been bound to improve notwithstanding the new treatment. In addition, open-label clinical trials may be subject to an "investigator bias" where those assessing and reviewing the physiological outcomes of the clinical trials are aware of which patients have received treatment and may interpret the information of the treated group more favorably given this knowledge. Given that our planned open-label Phase 1b/2 clinical trial of AST-008 includes an open-label dosing design, the results from this clinical trial may not be predictive of future clinical trial results with this or other product candidates for which we conduct an open-label clinical trial when studied in a controlled environment with a placebo or active control.

We will need substantial additional funds to advance the development of our therapeutic candidates, and we cannot guarantee that we will have sufficient funds available in the future to develop and commercialize our current or future therapeutic candidates.

If our existing therapeutic candidates or our future therapeutic candidates enter and advance through preclinical studies and clinical trials, we will need substantial additional funds to expand our development, regulatory, manufacturing, marketing, and sales capabilities or contract with other organizations to provide these capabilities for us. We have used substantial funds to develop our therapeutic candidates and will require significant funds to conduct further research and development and preclinical studies and clinical trials of our therapeutic candidates, to seek regulatory approvals for our therapeutic candidates and to manufacture and market products, if any, that are approved for commercial sale. As of December 31, 2019, we had $48.5 million in cash and cash equivalents and $62.3 million in short-term investments. Based on our current operating plans, we believe that existing working capital at December 31, 2019 is sufficient to fund our operations into early 2022. Our future capital requirements and the period for which we expect our existing resources to support our operations may vary significantly from what we expect. Our monthly spending levels vary based on new and ongoing development and corporate activities. Since the length of time and activities associated with successful development of our therapeutic candidates is highly uncertain, we are unable to estimate the actual funds we will require for development and any approved marketing and commercialization activities. To execute our business plan, we will need, among other things:

- to obtain the human and financial resources necessary to develop, test, obtain regulatory approval for, manufacture and market our therapeutic candidates;
- to build and maintain a strong intellectual property portfolio and avoid infringing the intellectual property of third parties;
- to establish and maintain successful licenses, collaborations and alliances;
- to satisfy the requirements of clinical trial protocols, including patient enrollment;
- to establish and demonstrate the clinical efficacy and safety of our therapeutic candidates;
- to obtain regulatory approvals;

- to manage our spending as costs and expenses increase due to preclinical studies and clinical trials, regulatory approvals, and commercialization;
- to obtain additional capital to support and expand our operations; and
- to market our products to achieve acceptance and use by the medical community in general.

If we are unable to obtain funding on a timely basis or on acceptable terms, we may have to delay, reduce or terminate our research and development programs and preclinical studies or clinical trials, if any, limit strategic opportunities or undergo reductions in our workforce or other corporate restructuring activities. We also could be required to seek funds through arrangements with collaborators or others that may require us to relinquish rights to some of our technology or therapeutic candidates that we would otherwise pursue on our own. We do not expect to realize revenue from product sales, milestone payments or royalties in the foreseeable future, if at all. Our revenue sources are, and will remain, extremely limited unless and until our therapeutic candidates are clinically tested, approved for commercialization and successfully marketed. To date, we have primarily financed our operations through the sale of equity securities, payments received in connection with our collaboration, option, and license agreement with Allergan plc, or Allergan, our research collaboration, license, and option agreement with Purdue Pharma L.P., or Purdue, our license and development agreement with Dermelix LLC, or Dermelix, or as a primary contractor or as a subcontractor on government grants, and proceeds from our loan agreement with Hercules Technology Growth Capital, or Hercules. We will be required to seek additional funding in the future and intend to do so through either collaborations, public or private equity offerings or debt financings, credit or loan facilities or a combination of one or more of these funding sources. Our ability to raise additional funds will depend on financial, economic and other factors, many of which are beyond our control. Additional funds may not be available to us on acceptable terms or at all. If we raise additional funds by issuing equity securities, our stockholders will suffer dilution and the terms of any financing may adversely affect the rights of our stockholders. In addition, as a condition to providing additional funds to us, future investors may demand, and may be granted, rights superior to those of existing stockholders. Debt financing, if available, may involve restrictive covenants limiting our flexibility in conducting future business activities, and, in the event of insolvency, debt holders would be repaid before holders of equity securities received any distribution of corporate assets.

Our quarterly operating results may fluctuate significantly or may fall below the expectations of investors or securities analysts, each of which may cause our stock price to fluctuate or decline.

We expect our operating results to be subject to quarterly fluctuations. Our net loss and other operating results will be affected by numerous factors, including:

- variations in the level of expense related to our therapeutic candidates or future development programs;
- results of clinical trials, or the addition or termination of clinical trials or funding support by us, or a future collaborator or licensing partner;
- our execution of any collaboration, licensing or similar arrangement, and the timing of payments we may make or receive under such existing or future arrangements or the termination or modification of any such existing or future arrangements;
- any intellectual property infringement lawsuit or opposition, interference or cancellation proceeding in which we may become involved;
- additions and departures of key personnel;
- strategic decisions by us or our competitors, such as acquisitions, divestitures, spin-offs, joint ventures, strategic investments or changes in business strategy;
- whether or not any of our therapeutic candidates receives regulatory approval, market acceptance and demand for such therapeutic candidates;
- regulatory developments affecting our therapeutic candidates or those of our competitors; and

- changes in general market and economic conditions.

If our quarterly operating results fall below the expectations of investors or securities analysts, the price of our common stock could decline substantially. Furthermore, any quarterly fluctuations in our operating results may, in turn, cause the price of our stock to fluctuate substantially.

We may not successfully engage in strategic transactions, including any additional collaborations we seek, which could adversely affect our ability to develop and commercialize product candidates, impact our cash position, increase our expense and present significant distractions to our management.

From time to time, we may consider strategic transactions, such as collaborations, acquisitions of companies, asset purchases and out- or in-licensing of product candidates or technologies. In particular, in addition to our current arrangements with Allergan, which began in November 2019, and Dermelix, which began in February 2019, and Purdue, with which there no active therapeutic candidates in development and which has not indicated any further interest in development, we will evaluate and, if strategically attractive, seek to enter into additional collaborations, including with major biotechnology or pharmaceutical companies. The competition for collaborators is intense, and the negotiation process is time-consuming and complex. Any new collaboration may be on terms that are not optimal for us, and we may be unable to maintain any new or existing collaboration if, for example, development or approval of a therapeutic candidate is delayed, sales of an approved product do not meet expectations or the collaborator terminates the collaboration. Any such collaboration, or other strategic transaction, may require us to incur non-recurring or other charges, increase our near- and long-term expenditures and pose significant integration or implementation challenges or disrupt our management or business. These transactions entail numerous operational and financial risks, including exposure to unknown liabilities, disruption of our business and diversion of our management's time and attention in order to manage a collaboration or develop acquired products, product candidates or technologies, incurrence of substantial debt or dilutive issuances of equity securities to pay transaction consideration or costs, higher than expected collaboration, acquisition or integration costs, write-downs of assets or goodwill or impairment charges, increased amortization expenses, difficulty and cost in facilitating the collaboration or combining the operations and personnel of any acquired business, impairment of relationships with key suppliers, manufacturers or customers of any acquired business due to changes in management and ownership and the inability to retain key employees of any acquired business. Accordingly, although there can be no assurance that we will undertake or successfully complete any transactions of the nature described above, any transactions that we do complete may be subject to the foregoing or other risks and have a material adverse effect on our business, results of operations, financial condition and prospects. Conversely, any failure to enter any collaboration or other strategic transaction that would be beneficial to us could delay the development and potential commercialization of our product candidates and have a negative impact on the competitiveness of any product candidate that reaches market.

If third parties on which we depend to conduct our preclinical studies and clinical trials do not perform as contractually required, fail to satisfy regulatory or legal requirements, or miss expected deadlines, our development program could be delayed with materially adverse effects on our business, financial condition, results of operations and prospects.

We rely on third-party clinical investigators, contract research organizations ("CROs"), clinical data management organizations and consultants to design, conduct, supervise and monitor preclinical studies and clinical trials for our therapeutic candidates. Because we rely on third parties and do not have the ability to conduct preclinical studies or clinical trials independently, we have less control over the timing, quality and other aspects of preclinical studies and clinical trials than we would if we conducted them on our own. These investigators, CROs and consultants are not our employees and we have limited control over the amount of time and resources that they dedicate to our programs. These third parties may have contractual relationships with other entities, some of which may be our competitors, which may draw time and resources away from our programs. The third parties with which we contract might not be diligent, careful or timely in conducting our preclinical studies or clinical trials, resulting in the preclinical studies or clinical trials being delayed or unsuccessful.

If we cannot contract with acceptable third parties on commercially reasonable terms, or at all, or if these third parties do not carry out their contractual duties, satisfy legal and regulatory requirements for the conduct of

preclinical studies or clinical trials or meet expected deadlines, our clinical development programs could be delayed and otherwise adversely affected. In all events, we are responsible for ensuring that each of our preclinical studies and clinical trials is conducted in accordance with the general investigational plan and protocols for the trial. The FDA requires preclinical studies to be conducted in accordance with applicable GLPs, and clinical trials to be conducted in accordance with applicable FDA regulations and GCPs, including requirements for conducting, recording and reporting the results of preclinical studies and clinical trials to assure that data and reported results are credible and accurate and that the rights, integrity and confidentiality of clinical trial participants are protected. Our reliance on third parties that we do not control does not relieve us of these responsibilities and requirements. Any adverse development or delay in our preclinical studies or clinical trials could have a material adverse effect on our business, financial condition, results of operations and prospects.

Because we rely on third-party manufacturing and supply partners, our supply of research and development, preclinical studies and clinical trial materials may become limited or interrupted or may not be of satisfactory quantity or quality.

We rely on third-party partners to manufacture and supply the materials and components for our research and development, preclinical study and clinical trial supplies. We do not own manufacturing facilities or supply sources for such components and materials. Our manufacturing requirements include oligonucleotides and lipids. We procure our nonclinical toxicology and clinical development materials from a single source supplier on a purchase order basis. There can be no assurance that our supply of research and development, preclinical study and clinical trial therapeutic candidates and other materials will not be limited, interrupted, restricted in certain geographic regions or of satisfactory quality or continue to be available at acceptable prices. In particular, any replacement of our drug product manufacturers could require significant effort and expertise because there may be a limited number of qualified replacements.

The manufacturing process for a therapeutic candidate is subject to oversight by the FDA and foreign regulatory authorities. Suppliers and manufacturers must meet applicable manufacturing requirements and undergo rigorous facility and process validation tests required by regulatory authorities in order to comply with regulatory requirements, such as cGMPs. In the event that any of our suppliers or manufacturers fails to comply with such requirements or to perform its obligations to us in relation to quality, timing or otherwise, or if our supply of components or other materials becomes limited or interrupted for other reasons, we may be forced to manufacture the materials ourselves, for which we currently do not have the capabilities or resources, or enter into an agreement with another third-party, which we may not be able to do on reasonable terms, if at all. In some cases, the technical skills or technology required to manufacture our therapeutic candidates may be unique or proprietary to the original manufacturer and we may have difficulty, or there may be contractual restrictions prohibiting us from, transferring such skills or technology to another third-party and a feasible alternative may not exist. These factors would increase our reliance on such manufacturer or require us to obtain a license from such manufacturer in order to have another third-party manufacture our therapeutic candidates. If we are required to change manufacturers for any reason, we will be required to verify that the new manufacturer maintains facilities and procedures that comply with quality standards and with all applicable regulations. The delays associated with the verification of a new manufacturer could negatively affect our ability to develop therapeutic candidates in a timely manner or within budget.

We expect to continue to rely on third-party manufacturers if we receive regulatory approval for any therapeutic candidate. To the extent that we have existing, or enter into future, manufacturing arrangements with third parties, we will depend on these third parties to perform their obligations in a timely manner consistent with contractual and regulatory requirements, including those related to quality control and assurance. If we are unable to obtain or maintain third-party manufacturing for therapeutic candidates, or to do so on commercially reasonable terms, we may not be able to develop and commercialize our therapeutic candidates successfully. Our or a third-party's failure to execute on our manufacturing requirements and comply with cGMPs could adversely affect our business in a number of ways, including:

- an inability to initiate or continue preclinical studies or clinical trials of our therapeutic candidates under development;
- delay in submitting regulatory applications, or receiving regulatory approvals, for therapeutic candidates;

- loss of the cooperation of a future collaborator;
- subjecting manufacturing facilities of our therapeutic candidates to additional inspections by regulatory authorities;
- requirements to cease distribution or to recall batches of our therapeutic candidates; and
- in the event of approval to market and commercialize a therapeutic candidate, an inability to meet commercial demands for our therapeutics.

We face competition from entities that have developed or may develop therapeutic candidates for our target disease indications, including companies developing novel treatments and technology platforms based on modalities and technology similar to ours. If these companies develop technologies, including delivery technologies, or therapeutic candidates more rapidly than we do or their technologies are more effective, our ability to develop and successfully commercialize therapeutic candidates may be adversely affected.

The development and commercialization of therapeutic candidates is highly competitive. We compete with a number of multinational pharmaceutical companies and specialized biotechnology companies, as well as technology being developed at universities and other research institutions. Our competitors have developed, are developing or will develop therapeutic candidates and processes competitive with our therapeutic candidates. Competitive therapeutic treatments include those that have already been approved and accepted by the medical community and any new treatments that enter the market. We believe that a significant number of therapeutics are currently under development, and may become commercially available in the future, for the treatment of conditions for which we may try to develop therapeutic candidates. There is intense and rapidly evolving competition in the biotechnology, pharmaceutical and oligonucleotide therapeutics fields. While we believe that our SNA technology, its associated intellectual property and our scientific and technical know-how give us a competitive advantage in this space, competition from many sources remains. Our competitors include larger and better funded pharmaceutical, biotechnology and oligonucleotide therapeutics companies. Moreover, we also compete with current and future therapeutics developed at universities and other research institutions.

We are aware of several companies that are developing oligonucleotide delivery platforms and oligonucleotide-based therapeutics. These competitors include Ionis Pharmaceuticals, Inc., Alnylam Pharmaceuticals, Inc., Dicerna Pharmaceuticals, Inc., Arbutus Biopharma Corp., Wave Life Sciences Ltd., Arrowhead Pharmaceuticals, Inc., ProQR Therapeutics N.V., Idera Pharmaceuticals, Inc., Stoke Therapeutics, Inc., and Checkmate Pharmaceuticals, Inc. These and other competitors compete with us in recruiting scientific and managerial talent, and for funding from pharmaceutical companies.

Our success will partially depend on our ability to develop and protect therapeutics that are safer and more effective than competing therapeutics. Our commercial opportunity and success will be reduced or eliminated if competing therapeutics are safer, more effective, or less expensive than the therapeutics we develop.

If our therapeutic candidates are approved for the indications we are currently pursuing, they will compete with a range of therapeutic treatments that are either in development or currently marketed. A number of therapeutics for treating psoriasis and cancers are on the market or in clinical development. For the treatment of psoriasis, marketed therapies range from small molecules like topical steroids to biologics, such as AbbVie Inc.'s adalimumab. In addition, numerous compounds are in clinical development for psoriasis treatment. With respect to immunogenic cancers such as melanoma, the most common treatments are chemotherapeutic compounds, radiation therapy and now immunotherapeutic antibodies such as ipilimumab, atezolizumab, pembrolizumab and others.

Many of our competitors have significantly greater financial, technical, manufacturing, marketing, sales and supply resources or experience than we do. If we successfully obtain approval for any therapeutic candidate, we will face competition based on many different factors, including the safety and effectiveness of our therapeutics, the ease with which our therapeutics can be administered and the extent to which patients accept relatively new routes of administration, the timing and scope of regulatory approvals for these therapeutics, the availability and cost of manufacturing, marketing and sales capabilities, price, reimbursement coverage and patent position. Competing therapeutics could present superior treatment alternatives, including by being more effective, safer, less expensive or

marketed and sold more effectively than any therapeutics we may develop. Competitive therapeutics may make any therapeutics we develop obsolete or noncompetitive before we recover the expense of developing and commercializing our therapeutic candidates. Such competitors could also recruit our employees, which could negatively impact our level of expertise and our ability to execute our business plan.

The market may not be receptive to our therapeutic candidates based on a novel therapeutic modality, and we may not generate any future revenue from the sale or licensing of therapeutic candidates.

Even if approval is obtained for a therapeutic candidate, we may not generate or sustain revenue from sales of the product due to factors such as whether the product can be sold at a competitive cost and otherwise accepted in the market. The therapeutic candidates that we are developing are based on our SNA technology. Market participants with significant influence over acceptance of new treatments, such as physicians and third-party payors, may not adopt a treatment based on SNA technology, and we may not be able to convince the medical community and third-party payors to accept and use, or to provide favorable reimbursement for any therapeutic candidates developed by us or any current or future collaborators. Market acceptance of our therapeutic candidates will depend on, among other factors:

- the timing of our receipt of any marketing and commercialization approvals;
- the terms of any approvals and the countries in which approvals are obtained;
- the safety and efficacy of our therapeutic candidates;
- the prevalence and severity of any adverse side effects associated with our therapeutic candidates;
- limitations or warnings contained in any labeling approved by the FDA or other regulatory authority;
- relative convenience and ease of administration of our therapeutic candidates;
- the willingness of patients to accept any new methods of administration;
- the success of our physician education programs;
- the availability of adequate government and third-party payor reimbursement;
- the pricing of our products, particularly as compared to alternative treatments; and
- availability of alternative effective treatments for indications our therapeutic candidates are intended to treat and the relative risks, benefits and costs of those treatments.

With our focus on SNAs, these risks may increase to the extent the space becomes more competitive or less favored in the commercial marketplace. Additional risks apply in relation to any disease indications we may pursue which are classified as rare diseases and allow for orphan drug designation by regulatory agencies in major commercial markets, such as the U.S., Europe and Japan. Because of the small patient population for a rare disease, if pricing is not approved or accepted in the market at an appropriate level for an approved product with orphan drug designation, such therapeutic may not generate enough revenue to offset costs of development, manufacturing, marketing and commercialization despite any benefits received from the orphan drug designation, such as market exclusivity, assistance in clinical trial design or a reduction in user fees or tax credits related to development expense. Market size is also a variable in disease indications not classified as rare. Our estimates regarding potential market size for any indication may be materially different from what we discover to exist at the time we commence commercialization, if any, for a therapeutic, which could result in significant changes in our business plan and have a material adverse effect on our business, financial condition, results of operations and prospects.

If a therapeutic candidate that has orphan drug designation subsequently receives the first FDA approval for the indication for which it has such designation, the therapeutic candidate is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications to market the same therapeutic candidate for the same indication, except in very limited circumstances, for seven years. Orphan drug exclusivity, however, could also

block the approval of one of our therapeutic candidates for seven years if a competitor obtains approval of the same therapeutic candidate as defined by the FDA or if our therapeutic candidate is determined to be contained within the competitor's therapeutic candidate for the same indication or disease.

As in the U.S., we may apply for designation of a therapeutic candidate as an orphan drug for the treatment of a specific indication in the European Union before the application for marketing authorization is made. Sponsors of orphan drugs in the European Union can enjoy economic and marketing benefits, including up to ten years of market exclusivity for the approved indication. During such period, marketing applications for similar medicinal products will not be accepted, unless certain exceptions apply. In the EU, a "similar medicinal product" is a medicinal product containing a similar active substance or substances as contained in a currently authorized orphan medicinal product, and which is intended for the same therapeutic indication.

Any inability to attract and retain qualified key management and technical personnel would impair our ability to implement our business plan.

Our success largely depends on the continued service of key management and other specialized personnel, including David A. Giljohann, Ph.D., our Chief Executive Officer, David S. Snyder, our Chief Financial Officer, and Matthias G. Schroff, our Chief Operating Officer. The loss of one or more members of our management team or other key employees or advisors could delay our research and development programs and materially harm our business, financial condition, results of operations and prospects. The relationships that our key managers have cultivated within our industry make us particularly dependent upon their continued employment with us. We are dependent on the continued service of our technical personnel because of the highly technical nature of our therapeutic candidates and our technology and the specialized nature of the regulatory approval process. Because our management team and key employees are not obligated to provide us with continued service, they could terminate their employment with us at any time without penalty. We do not maintain key person life insurance policies on any of our management team members or key employees. Our future success will depend in large part on our continued ability to attract and retain highly qualified scientific, technical and management personnel, as well as personnel with expertise in clinical testing, manufacturing, governmental regulation and commercialization. We face competition for personnel from other companies, universities, public and private research institutions, government entities and other organizations.

As our therapeutic candidates advance into clinical trials, we may experience difficulties in managing our growth and expanding our operations.

We have limited experience in therapeutic development and limited experience with clinical trials of therapeutic candidates. As our therapeutic candidates enter and advance through preclinical studies and clinical trials, we will need to expand our development, regulatory and manufacturing capabilities or contract with other organizations to provide these capabilities for us. In the future, we expect to have to manage additional relationships with collaborators or partners, suppliers and other organizations. Our ability to manage our operations and future growth will require us to continue to improve our operational, financial and management controls, reporting systems and procedures. We may not be able to implement improvements to our management information and control systems in an efficient or timely manner and may discover deficiencies in existing systems and controls.

If any of our therapeutic candidates are approved for marketing and commercialization and we are unable to develop sales, marketing and distribution capabilities on our own or enter into agreements with third parties to perform these functions on acceptable terms, we will be unable to successfully commercialize any such future therapeutics.

We currently have no sales, marketing or distribution capabilities or experience. If any of our therapeutic candidates is approved, we will need to develop internal sales, marketing and distribution capabilities to appropriately commercialize such therapeutics, which would be expensive and time-consuming, or enter into collaborations with third parties to perform these services. If we decide to market our approved therapeutics directly, we will need to commit significant financial and managerial resources to develop a marketing and sales force with technical expertise and supporting distribution, administration and compliance capabilities. If we rely on third parties with such capabilities to market our approved therapeutics or decide to co-promote therapeutics with

collaborators, we will need to establish and maintain compliant marketing and distribution arrangements with third parties, and there can be no assurance that we will be able to enter into such arrangements on acceptable terms or at all. In entering into third-party marketing or distribution arrangements, any revenue we receive will depend upon the efforts of the third parties and there can be no assurance that such third parties will establish adequate sales and distribution capabilities or be successful in gaining market acceptance of any approved therapeutic. If we are not successful in commercializing any therapeutic approved in the future, either on our own or through third parties, our business, financial condition, results of operations and prospects could be materially and adversely affected.

If we fail to comply with U.S. or foreign regulatory requirements, regulatory authorities could withhold marketing or commercialization approvals, limit or withdraw any marketing or commercialization approvals we may receive and subject us to other penalties that could materially harm our business.

We and our therapeutic candidates, as well as our suppliers, contract manufacturers, distributors, and contract testing laboratories are subject to extensive regulation by governmental authorities in the European Union, the U.S., and other countries, with the regulations differing from country to country.

If we or current or future collaborators, manufacturers or service providers fail to comply with applicable requirements, these regulatory authorities could refuse to issue necessary approvals for marketing and commercialization. Even if we receive marketing and commercialization approval of a therapeutic candidate, we and our third-party service providers will be subject to continuing regulatory requirements, including a broad array of regulations related to establishment registration and product listing, manufacturing processes, risk management measures, quality and pharmacovigilance systems, pre- and post-approval clinical data, labeling, advertising and promotional activities for such therapeutic, record keeping, distribution, and import and export of therapeutics for any therapeutic for which we obtain marketing approval. We are required to submit safety and other post market information and reports and are subject to continuing regulatory review, including in relation to adverse patient experiences with the therapeutic and clinical results that are reported after a therapeutic is made commercially available, both in the U.S. and any foreign jurisdiction in which we seek regulatory approval. The FDA and certain foreign regulatory authorities, such as the EMA, have significant post-market authority, including the authority to require labeling changes based on new safety information and to require post-market studies or clinical trials to evaluate safety risks related to the use of a therapeutic or to require withdrawal of the therapeutic from the market. The FDA also has the authority to require a Risk Evaluation and Mitigation Strategies, or REMS, plan either before or after approval, which may impose further requirements or restrictions on the distribution or use of an approved therapeutic. The EMA now routinely requires risk management plans, or RMPs, as part of the marketing authorization application process, and such plans must be continually modified and updated throughout the lifetime of the product as new information becomes available. In addition, for nationally authorized medicinal products, the relevant governmental authority of any European Union member state can request an RMP whenever there is a concern about the risk/benefit balance of the product.

The manufacturer and manufacturing facilities we use to make a future therapeutic, if any, will also be subject to periodic review and inspection by the FDA and other regulatory agencies, including for continued compliance with cGMP requirements. The discovery of any new or previously unknown problems with our third-party manufacturers, manufacturing processes or facilities may result in restrictions on the therapeutic, manufacturer or facility, including withdrawal of the therapeutic from the market. If we rely on third-party manufacturers, we will not have control over compliance with applicable rules and regulations by such manufacturers. Any product promotion and advertising will also be subject to regulatory requirements and continuing regulatory review. If we or our future collaborators, manufacturers or service providers fail to comply with applicable continuing regulatory requirements in the U.S. or foreign jurisdictions in which we seek to market our therapeutics, we or they may be subject to, among other things, fines, warning and untitled letters, clinical holds, delay or refusal by the FDA or foreign regulatory authorities to approve pending applications or supplements to approved applications, suspension, refusal to renew or withdrawal of regulatory approval, recalls, seizures or administrative detention of products, refusal to permit the import or export of therapeutics, operating restrictions, inability to participate in government programs including Medicare and Medicaid, and total or partial suspension of production or distribution, injunction, restitution, disgorgement, debarment, civil and criminal penalties and criminal prosecution.

Price controls imposed in foreign markets may adversely affect our future profitability.

In some countries, particularly member states of the European Union, the pricing of prescription drugs is subject to governmental control at the national level, and in some cases also at the regional level. In these countries, pricing negotiations with governmental authorities can take considerable time after receipt of marketing approval for a therapeutic. In addition, there can be considerable pressure by governments and other stakeholders on prices and reimbursement levels, including as part of cost containment measures. Political, economic and regulatory developments may further complicate pricing and reimbursement negotiations, and pricing negotiations may continue after reimbursement has been obtained. 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 some countries, we or current or future collaborators may be required to conduct a clinical trial or other studies that compare the cost-effectiveness of our SNA therapeutic candidates to other available therapies in order to obtain or maintain reimbursement or pricing approval. Publication of discounts by third-party payors or authorities may lead to further pressure on the prices or reimbursement levels within the country of publication and other countries. If reimbursement of any therapeutic candidate approved for marketing is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our business, financial condition, results of operations or prospects could be adversely affected.

Our business entails a significant risk of product liability and our inability to obtain sufficient insurance coverage could have a material adverse effect on our business, financial condition, results of operations or prospects.

Our business exposes us to significant product liability risks inherent in the development, testing, manufacturing and marketing of therapeutic treatments. Product liability claims could delay or prevent completion of our development programs. If we succeed in marketing therapeutics, such claims could result in an investigation by certain regulatory authorities, such as the FDA or foreign regulatory authorities, of the safety and effectiveness of our therapeutics, our manufacturing processes and facilities or our marketing programs and potentially a recall of our therapeutics or more serious enforcement action, limitations on the approved indications for which they may be used or suspension or withdrawal of approvals. Regardless of the merits or eventual outcome, liability claims may also result in decreased demand for our therapeutics, injury to our reputation, costs to defend the related litigation, a diversion of management's time and our resources, substantial monetary awards to trial participants or patients and a decline in our stock price. We currently have product liability insurance that we believe is appropriate for our stage of development and may need to obtain higher levels of product liability insurance prior to marketing any of our therapeutic candidates. Any insurance we have or may obtain may not provide sufficient coverage against potential liabilities. Furthermore, clinical trial and product liability insurance is becoming increasingly expensive. As a result, we may be unable to obtain sufficient insurance at a reasonable cost to protect us against losses caused by product liability claims that could have a material adverse effect on our business.

Our employees may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements which could have an adverse effect on our business.

We are exposed to the risk of employee fraud or other misconduct. Misconduct by employees could include, but is not limited to, intentional failures to comply with FDA, the Centers for Medicare and Medicaid Services ("CMS"), the Department of Health and Human Services ("HHS"), Office of Inspector General ("OIG") or other agency regulations, applicable laws, regulations, guidance or codes of conduct set by foreign governmental authorities or self-regulatory industry organizations, or provide accurate information to any governmental authorities, such as the FDA, comply with manufacturing standards we may establish, comply with federal and state healthcare fraud and abuse laws and regulations, report financial information or data accurately or disclose unauthorized activities to us.

In particular, sales, marketing and business arrangements in the healthcare industry are subject to extensive laws, regulations, guidance and codes of conduct intended to prevent fraud, kickbacks, self-dealing and other abusive practices. These laws, regulations, guidance and codes of conduct may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs and other business arrangements.

Employee misconduct could also involve the improper use of information obtained in the course of clinical trials, which could result in regulatory sanctions, including, fines, debarment, or disqualification of those employees from participation in certain government-regulated activities, and serious harm to our reputation. This could include violations of the U.S. federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act, or HITECH, other U.S. federal and state law, and requirements of non-U.S. jurisdictions, including the European Union Data Protection Directive.

It is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws, regulations, guidance or codes of conduct. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, including exclusion from participation in the U.S. federal healthcare programs, the imposition of significant fines or other sanctions.

Compliance with governmental regulations regarding the treatment of animals used in research could increase our operating costs, which would adversely affect the commercialization of our technology.

The Animal Welfare Act, or AWA, is the federal law that covers the treatment of certain animals used in research. Currently, the AWA imposes a wide variety of specific regulations that govern the humane handling, care, treatment and transportation of certain animals by producers and users of research animals, most notably relating to personnel, facilities, sanitation, cage size, and feeding, watering and shipping conditions. Third parties with whom we contract are subject to registration, inspections and reporting requirements under the AWA. Furthermore, some states have their own regulations, including general anti-cruelty legislation, which establish certain standards in handling animals. Comparable rules, regulations, and or obligations exist in many foreign jurisdictions. If we or our contractors fail to comply with regulations concerning the treatment of animals used in research, we may be subject to fines and penalties and adverse publicity, and our operations could be adversely affected.

Our internal computer systems, or those of our CROs or other contractors or consultants, may fail or suffer security breaches, which could result in a material disruption of our therapeutic development programs.

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, terrorism, war and telecommunication and electrical failures. Such events could cause interruptions of our operations. For instance, the loss of preclinical study or clinical trial data involving our therapeutic candidates could result in delays in our development and regulatory filing efforts and significantly increase our costs. In addition, theft or other exposure of data may interfere with our ability to protect our intellectual property, trade secrets, and other information critical to our operations. We can provide no assurances that certain sensitive and proprietary information relating to one or more of our therapeutic candidates has not been, or will not in the future be, compromised. Although we have invested resources to enhance the security of our computer systems, there can be no assurances we will not experience additional unauthorized intrusions into our computer systems, or those of our CROs and other contractors and consultants, that we will successfully detect future unauthorized intrusions in a timely manner, or that future unauthorized intrusions will not result in material adverse effects on our financial condition, reputation, or business prospects. Payments related to the elimination of ransomware may materially affect our financial condition and results of operations.

Certain data breaches must also be reported to affected individuals and the government, and in some cases to the media, under provisions of HIPAA, as amended by HITECH, other U.S. federal and state law, and requirements of non-U.S. jurisdictions, including the European Union Data Protection Directive. Financial penalties may also apply in some data breaches where noncompliance with the applicable law is identified.

To the extent that any disruption or security breach were to result in a loss of, or damage to, our data, or inappropriate disclosure of confidential or proprietary information, we could incur liability and the development of our therapeutic candidates could be delayed.

We are subject to European data protection laws, including the new EU General Data Protection Regulation 2016/679, or GDPR. If we fail to comply with existing or future data protection regulations, our business, financial condition, results of operations and prospects may be materially adversely affected.

By virtue of our clinical trial activities in the United Kingdom and Germany, we are subject to European data protection laws, including GDPR. The GDPR which came into effect on May 25, 2018, establishes new requirements applicable to the processing of personal data (*i.e.*, data which identifies an individual or from which an individual is identifiable), affords new data protection rights to individuals (e.g., the right to erasure of personal data) and imposes penalties for serious breaches of up to 4% annual worldwide turnover or €20 million, whichever is greater. Individuals (*e.g.*, study subjects) also have a right to compensation for financial or non-financial losses (*e.g.*, distress). There may be circumstances under which a failure to comply with GDPR, or the exercise of individual rights under the GDPR, would limit our ability to utilize clinical trial data collected on certain subjects. The GDPR will likely impose additional responsibility and liability in relation to our processing of personal data. This may be onerous and materially adversely affect our business, financial condition, results of operations and prospects. Given the limited enforcement of the GDPR to date, particularly in this space, we face uncertainty as to the exact interpretation of the new requirements on our trials and we may be unsuccessful in implementing all measures required by data protection authorities or courts in interpretation of the new law.

If we do not comply with laws regulating the protection of the environment and health and human safety, our business could be adversely affected.

Our research, development and manufacturing involve the use of hazardous materials and various chemicals. We maintain quantities of various flammable and toxic chemicals in our facilities in Skokie, Illinois that are required for our research, development and manufacturing activities. We are subject to federal, state and local laws and regulations governing the use, manufacture, storage, handling and disposal of these hazardous materials. We believe our procedures for storing, handling and disposing these materials in our Skokie facilities comply with the relevant guidelines of Skokie, the state of Illinois, and the Occupational Safety and Health Administration of the U.S. Department of Labor. Although we believe that our safety procedures for handling and disposing of these materials comply with the standards mandated by applicable regulations, the risk of accidental contamination or injury from these materials cannot be eliminated. If an accident occurs, we could be held liable for resulting damages, which could be substantial. We are also subject to numerous environmental, health and workplace safety laws and regulations, including those governing laboratory procedures, exposure to blood-borne pathogens and the handling of animals and biohazardous materials. Although we maintain workers' compensation insurance to cover us for costs and expenses we may incur due to injuries to our employees resulting from the use of these materials, this insurance may not provide adequate coverage against potential liabilities. We do not maintain insurance for environmental liability or toxic tort claims that may be asserted against us in connection with our storage or disposal of biological or hazardous materials. Additional federal, state and local laws and regulations affecting our operations may be adopted in the future. We may incur substantial costs to comply with, and substantial fines or penalties if we violate, any of these laws or regulations.

Our information technology systems could face serious disruptions that could adversely affect our business.

Our information technology and other internal infrastructure systems, including corporate firewalls, servers, leased lines and connection to the Internet, face the risk of systemic failure that could disrupt our operations. A significant disruption in the availability of our information technology and other internal infrastructure systems could cause interruptions and delays in our research and development work.

Increasing scrutiny and changing expectations from customers, regulators, investors, and other stakeholders with respect to our environmental, social and governance practices may impose additional costs on us or expose us to new or additional risks.

Companies are facing increasing scrutiny from customers, regulators, investors, and other stakeholders related to their environmental, social and governance practices. Investor advocacy groups, investment funds and influential investors are also increasingly focused on these practices, especially as they relate to the environment, health and safety, supply chain management, diversity and human rights. Failure to adapt to or comply with regulatory

requirements or investor or stakeholder expectations and standards could negatively impact our reputation and the price of our ordinary shares.

Any of the factors mentioned above, or the perception that we or our suppliers, or contract manufacturers or collaborators have not responded appropriately to the growing concern for such issues, regardless of whether we are legally required to do so, may damage our reputation and have a material adverse effect on our business, financial condition, results of operations cash flows and/or ordinary share price.

Natural disasters or other unexpected events may disrupt our operations, adversely affect our results of operations and financial condition, and may not be covered by insurance.

The occurrence of one or more unexpected events, including fires, tornadoes, tsunamis, hurricanes, earthquakes, floods, and other forms of severe hazards in the United States or in other countries in which we or our suppliers or manufacturers operate or are located could adversely affect our operations and financial performance. These types of unexpected events could result in physical damage to and complete or partial closure of one or more of the manufacturing facilities operated by our contract manufacturers, or the temporary or long-term disruption in the supply of products, and/or disruption of our ability to deliver products to customers. Further, the long-term effects of climate change on general economic conditions and the pharmaceutical manufacturing and distribution industry in particular are unclear, and changes in the supply, demand or available sources of energy and the regulatory and other costs associated with energy production and delivery may affect the availability or cost of goods and services, including natural resources, necessary to run our businesses. Existing insurance arrangements may not provide protection for the costs that may arise from such events, particularly if such events are catastrophic in nature or occur in combination. Any long-term disruption in our ability to service our customers from one or more distribution centers or outsourcing facilities could have a material adverse effect on our operations, our business, results of operations and stock price.

Our current operations are concentrated in one location and any events affecting this location may have material adverse consequences.

Our current operations are located in our facilities situated in Skokie, Illinois. Any unplanned event, such as flood, fire, explosion, earthquake, extreme weather condition, medical epidemics, power shortage, telecommunication failure or other natural or man-made accidents or incidents that result in us being unable to fully utilize the facilities, may have a material adverse effect on our ability to operate our business, particularly on a daily basis, and have significant negative consequences on our financial and operating conditions. Loss of access to these facilities may result in increased costs, delays in the development of our therapeutic candidates or interruption of our business operations. As part of our risk management policy, we maintain insurance coverage at levels that we believe are appropriate for our business. However, in the event of an accident or incident at these facilities, we cannot assure you that the amounts of insurance will be sufficient to satisfy any damages and losses. If our facilities are unable to operate because of an accident or incident or for any other reason, even for a short period of time, any or all of our research and development programs may be harmed. Any business interruption may have a material adverse effect on our business, financial position, results of operations and prospects.

The investment of our cash, cash equivalents and fixed income marketable securities is subject to risks which may cause losses and affect the liquidity of these investments.

As of December 31, 2019, we had $48.5 million in cash and cash equivalents and $62.3 million in short-term investments. We historically have invested excess cash in certificates of deposit or money market mutual funds that invest in securities issued or guaranteed by the U.S. government or U.S. government agencies, floating rate and variable rate demand notes of U.S. and foreign corporations, and commercial paper. During the fourth quarter of 2019, we have made direct purchases, and expect to continue to make direct purchases of, U.S. government or U.S. government agency securities, floating rate and variable rate demand notes of U.S. and foreign corporations, and commercial paper. These investments are subject to general credit, liquidity, market and interest rate risks, including potential future impacts similar to the impact of U.S. sub-prime mortgage defaults that have affected various sectors of the financial markets and caused credit and liquidity issues. We may realize losses in the fair

value of these investments, an inability to access cash in these investments for a potentially meaningful period, or a complete loss of these investments, which would have a negative effect on our financial statements.

In addition, should our investments cease paying or reduce the amount of interest paid to us, our interest income would suffer. The market risks associated with our investment portfolio may have an adverse effect on our results of operations, liquidity and financial condition.

Changes in accounting rules and regulations, or interpretations thereof, could result in unfavorable accounting charges or require us to change our compensation policies.

Accounting methods and policies for biotechnology companies, including policies governing revenue recognition, research and development and related expenses, and accounting for stock-based compensation, are subject to review, interpretation and guidance from our auditors and relevant accounting authorities, including the SEC. Changes to accounting methods or policies, or interpretations thereof, may require us to reclassify, restate or otherwise change or revise our historical financial statements, including those contained in this Annual Report on Form 10-K.

We previously identified a material weakness in our internal control over financial reporting, and if we are unable to implement and maintain effective internal control over financial reporting in the future, investors may lose confidence in the accuracy and completeness of our financial reports, the market price of our common stock may be adversely affected, and we may become subject to litigation and regulatory investigation.

During the quarter ended March 31, 2018, we identified a material weakness in internal control over financial reporting related to a deficiency in the Company's information and communication controls, which led to ineffectively designed controls over management's review of certain research and development contracts to ensure expenses were recognized as incurred by third-party contract research organizations. Those ineffectively designed controls arose in a prior period and resulted in an immaterial error, which we corrected in 2018 in previously issued financial statements beginning with those included in our Quarterly Reports on Form 10-Q for the period ended March 31, 2018.

Management successfully remediated the control deficiency during 2018 that gave rise to the above-mentioned material weakness. If we identify new material weaknesses in the future in our internal controls over financial reporting, we may not detect errors in a timely manner and our consolidated financial statements may be materially misstated. We or our independent registered public accounting firm may not be able to conclude on an ongoing basis that we have effective internal control over financial reporting, which could harm our operating results, cause investors to lose confidence in our reported financial information and cause the trading price of our stock to fall. We may also fail to report our financial results on a timely and accurate basis, which could result in sanctions, lawsuits, or other adverse consequences that would materially harm our business. In addition, we could become subject to investigations by the national stock exchange on which our securities are eventually listed, the SEC, or other regulatory authorities, and become subject to litigation from investors and stockholders, which could harm our reputation and our financial condition, or divert financial and management resources from our core business.

Our business may be affected by litigation and government investigations.

We may from time to time receive inquiries and subpoenas and other types of information requests from government authorities and others and we may become subject to claims and other actions related to our business activities. While the ultimate outcome of investigations, inquiries, information requests and legal proceedings is difficult to predict, defense of litigation claims can be expensive, time-consuming and distracting, and adverse resolutions or settlements of those matters may result in, among other things, modification of our business practices, costs and significant payments, any of which could have a material adverse effect on our business, financial condition, results of operations and prospects.

Risks Related to Intellectual Property

If we are not able to obtain and enforce patent protection for our technology or therapeutic candidates, development and commercialization of our therapeutic candidates may be adversely affected.

Our success depends in part on our ability to obtain and maintain patents and other forms of intellectual property rights, including in-licenses of intellectual property rights of others, for our therapeutic candidates, methods used to manufacture our therapeutic candidates and methods for treating patients using our therapeutic candidates, as well as our ability to preserve our trade secrets, to prevent third parties from infringing upon our proprietary rights and to operate without infringing upon the proprietary rights of others. As of December 31, 2019, our patent portfolio consists of over 85 issued patents and allowed patent applications and over 125 pending patent applications. We may not be able to apply for patents on certain aspects of our therapeutic candidates in a timely fashion or at all. Our existing issued and granted patents and any future patents we obtain may not be sufficiently broad to prevent others from using our technology or from developing competing therapeutics and technology. There is no guarantee that any of our pending patent applications will result in issued or granted patents, that any of our issued or granted patents will not later be found to be invalid or unenforceable or that any issued or granted patents will include claims that are sufficiently broad to cover our therapeutic candidates or to provide meaningful protection from our competitors. Moreover, the patent position of pharmaceutical and biotechnology companies can be highly uncertain because it involves complex legal and factual questions. We will be able to protect our proprietary rights from unauthorized use by third parties only to the extent that our current and future proprietary technology and therapeutic candidates are covered by valid and enforceable patents or are effectively maintained as trade secrets. If third parties disclose or misappropriate our proprietary rights, it may materially and adversely impact our position in the market.

The U.S. Patent and Trademark Office, or 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. The standards applied by the USPTO and foreign patent offices in granting patents are not always applied uniformly or predictably. For example, there is no uniform worldwide policy regarding patentable subject matter or the scope of claims allowable in biotechnology and pharmaceutical patents. As such, we do not know the degree of future protection that we will have on our proprietary therapeutics and technology. While we will endeavor to try to protect our therapeutic candidates with intellectual property rights such as patents, as appropriate, the process of obtaining patents is time-consuming, expensive and sometimes unpredictable.

In addition, there are numerous recent changes to the patent laws and proposed changes to the rules of the USPTO, which may have a significant impact on our ability to protect our technology and enforce our intellectual property rights. For example, the Leahy-Smith America Invents Act enacted in 2011, involves significant changes in patent legislation. The U.S. Supreme Court has ruled on several patent cases in recent years, some of which cases either narrow the scope of patent protection available in certain circumstances or weaken the rights of patent owners in certain situations. The 2013 decision by the Supreme Court in *Association for Molecular Pathology v. Myriad Genetics, Inc.* precludes a claim to a nucleic acid having a stated nucleotide sequence that is identical to a sequence found in nature and unmodified. We currently are not aware of an immediate impact of this decision on our patents or patent applications because we are developing oligonucleotide therapeutics which contain modifications that we believe are not found in nature. However, this decision has yet to be clearly interpreted by courts and by the USPTO. We cannot assure you that the interpretations of this decision or subsequent rulings will not adversely impact our patents or patent applications. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the value of patents, once obtained. Depending on decisions by the U.S. Congress, the federal courts and the USPTO, the laws and regulations governing patents could change in unpredictable ways that may weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future.

Once granted, patents may remain open to opposition, interference, re-examination, post-grant review, inter partes review, nullification or derivation action in court or before patent offices or similar proceedings for a given

period after allowance or grant, during which time third parties can raise objections against such initial grant. In the course of such proceedings, which may continue for a protracted period of time, the patent owner may be compelled to limit the scope of the allowed or granted claims thus attacked, or may lose the allowed or granted claims altogether. In addition, there can be no assurance that:

- Others will not or may not be able to make, use or sell compounds that are the same as or similar to our therapeutic candidates but that are not covered by the claims of the patents that we own or license.
- We or our licensors, or any current or future collaborators, are the first to make the inventions covered by each of our issued patents and pending patent applications that we own or license.
- We or our licensors, or any current or future collaborators, are the first to file patent applications covering certain aspects of our inventions.
- Others will not independently develop similar or alternative technologies or duplicate any of our technology without infringing our intellectual property rights.
- A third-party will not challenge our patents and, if challenged, a court may not hold that our patents are valid, enforceable and infringed.
- Any issued patents that we own or have licensed will provide us with any competitive advantages, or will not be challenged by third parties.
- We will develop additional proprietary technologies that are patentable.
- The patents of others will not have an adverse effect on our business.
- Our competitors will not conduct research and development activities in countries where we lack enforceable patent rights and then use the information learned from such activities to develop competitive therapeutics for sale in our major commercial markets.

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

Given the amount of time required for the development, testing and regulatory review of new therapeutic candidates, patents protecting such candidates might expire before or shortly after such candidates are commercialized. We expect to seek extensions of patent terms in the U.S. and, if available, in other countries where we have patents covering our product candidates. In the U.S., the Drug Price Competition and Patent Term Restoration Act of 1984 permits a patent term extension of up to five years as compensation for patent term lost during product development and the FDA regulatory review process. However, the patent term extension or restoration cannot extend the remaining term of a patent beyond a total of 14 years from the approval date of the product candidate. Only one patent applicable to an approved product candidate is eligible for the extension and the application for extension must be made prior to expiration of the patent. The USPTO, in consultation with the FDA, reviews and approves the application for any patent term extension or restoration. In the future, we intend to apply for restorations of patent term for some of our currently owned or licensed patents to add patent life beyond their current expiration dates. However, the applicable authorities, including the FDA and the USPTO in the U.S., and any equivalent regulatory authority in other countries, may not agree with our assessment of whether such extensions are available, and may refuse to grant extensions to our patents, or may grant more limited extensions than we request. If this occurs, our competitors may be able to take advantage of our investment in development and clinical trials by referencing our clinical and preclinical data and launch their product earlier than might otherwise be the case.

We currently license patent rights from Northwestern University and may in the future license patent rights from third-party owners or licensees. If Northwestern University or such other owners or licensees do not properly or successfully obtain, maintain or enforce the patents underlying such licenses, or if they retain or license to others any competing rights, our competitive position and business prospects may be adversely affected.

We do, and will continue to, rely on intellectual property rights licensed from third parties to protect our technology. We are a party to a number of licenses that give us rights to third-party intellectual property that is necessary or useful for our business. In particular, we have a license from Northwestern University, which provides us the exclusive worldwide right under certain patents and patent applications owned by Northwestern University to exploit therapeutics and processes using nanoparticles, nanotechnology, microtechnology and nanomaterial-based constructs as therapeutics or accompanying therapeutics as a means of administration. We may also license additional third-party intellectual property in the future. Our success will depend in part on the ability of our licensors to obtain, maintain and enforce patent protection for our licensed intellectual property, and in particular, for those patents to which we have secured exclusive rights. Our licensors may not successfully prosecute the patent applications licensed to us. Even if patents issue or are granted, our licensors may fail to maintain these patents, may determine not to pursue litigation against other companies that are infringing these patents, or may pursue litigation less aggressively than we would. Further, we may not obtain exclusive rights, which would allow for third parties to develop competing therapeutics. Without protection for, or exclusive rights to, the intellectual property we license, other companies might be able to offer substantially identical therapeutics for sale, which could adversely affect our competitive business position and harm our business prospects. In addition, the U.S. government has certain rights to the inventions covered by the patent rights licensed to us by third parties and Northwestern University, as an academic research and medical center, has reserved the right to practice the patent rights it has licensed to us (i) for research, teaching and/or other educationally related purposes (including the right to distribute materials for such purposes) and (ii) for use in the field of diagnostics (including theradiagnostics) and in any field other than the field of use licensed to us.

Other companies or organizations may challenge our or our licensors' patent rights or may assert patent rights that prevent us from developing and commercializing our therapeutic candidates.

Oligonucleotide and SNA-based therapeutics are a relatively new scientific field. We have obtained grants and issuances of SNA therapeutic patents and have licensed many of these patents from a third-party on an exclusive basis for therapeutics applications. The issued patents and pending patent applications in the U.S. and in key markets around the world that we own or license claim many different methods, compositions and processes relating to the discovery, development, manufacture and commercialization of SNA therapeutics. Specifically, we own and have licensed a portfolio of patents, patent applications and other intellectual property covering SNA compositions of matter as well as their methods of use.

As the field of SNA therapeutics matures, patent applications are being processed by national patent offices around the world. There is uncertainty about which patents will issue, and, if they do, as to when, to whom, and with what claims. In addition, third parties may attempt to invalidate our intellectual property rights. Even if our rights are not directly challenged, disputes could lead to the weakening of our intellectual property rights. Our defense against any attempt by third parties to circumvent or invalidate our intellectual property rights could be costly to us, could require significant time and attention of our management and could have a material adverse effect on our business and our ability to successfully compete.

There are many issued and pending patents that claim aspects of oligonucleotide chemistry and modifications that we may need to apply to our SNA therapeutic candidates. There are also many issued patents that claim targeting genes or portions of genes that may be relevant for SNA therapeutics we wish to develop. Thus, it is possible that one or more organizations will hold patent rights to which we will need a license. If those organizations refuse to grant us a license to such patent rights on reasonable terms, we may not be able to market therapeutics or perform research and development or other activities covered by these patents.

We may be unable to protect our intellectual property rights throughout the world.

Obtaining a valid and enforceable issued or granted patent covering our technology in the U.S. and worldwide can be extremely costly. In jurisdictions where we have not obtained patent protection, competitors may use our technology to develop their own therapeutics and, further, may export otherwise infringing therapeutics to territories where we have patent protection, but where it is more difficult to enforce a patent as compared to the U.S. Competitor therapeutics may compete with our future therapeutics in jurisdictions where we do not have issued or granted patents or where our issued or granted patent claims or other intellectual property rights are not sufficient to prevent competitor activities in these jurisdictions. The legal systems of certain countries, particularly certain developing countries, make it difficult to enforce patents and such countries may not recognize other types of intellectual property protection, particularly that relating to biotechnology and pharmaceuticals. This could make it difficult for us to prevent the infringement of our patents or marketing of competing therapeutics in violation of our proprietary rights generally in certain jurisdictions. 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.

We generally file a provisional patent application first, also known as a priority filing, at the USPTO. An international application under the Patent Cooperation Treaty, or PCT, is usually filed within twelve months after the priority filing. Based on the PCT filing, national and regional patent applications may be filed in the U.S., European Union, Japan, Australia and Canada and, depending on the individual case, also in any or all of, *inter alia*, China, India, South Korea, and Mexico. We have so far not filed for patent protection in all national and regional jurisdictions where such protection may be available. In addition, we may decide to abandon national and regional patent applications before grant or after grant by nonpayment of maintenance fees for the resulting patent. Finally, the grant proceeding of each national or regional patent is an independent proceeding which may lead to situations in which applications might in some jurisdictions be refused by the relevant registration authorities, while granted by others. It is also quite common that depending on the country, various scopes of patent protection may be granted on the same therapeutic candidate or technology.

The laws of some jurisdictions do not protect intellectual property rights to the same extent as the laws in the U.S., and many companies have encountered significant difficulties in protecting and defending such rights in such jurisdictions. If we or our licensors encounter difficulties in protecting, or are otherwise precluded from effectively protecting, the intellectual property rights important for our business in such jurisdictions, the value of these rights may be diminished and we may face additional competition from others in those jurisdictions. Many countries have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In addition, many countries limit the enforceability of patents against government agencies or government contractors. In these countries, the patent owner may have limited remedies, which could materially diminish the value of such patent. If we or any of our licensors are forced to grant a license to third parties with respect to any patents relevant to our business, our competitive position in the relevant jurisdiction may be impaired and our business and results of operations may be adversely affected.

We or our licensors, or any current or future strategic partners, may become subject to third-party claims or litigation alleging infringement of patents or other proprietary rights or seeking to invalidate patents or other proprietary rights, and we may need to resort to litigation to protect or enforce our patents or other proprietary rights, all of which could be costly, time consuming, delay or prevent the development and commercialization of our therapeutic candidates, or put our patents and other proprietary rights at risk.

We or our licensors, or any current or future strategic partners, may be subject to third-party claims for infringement or misappropriation of patent or other proprietary rights. We are generally obligated under our license agreements to indemnify and hold harmless our licensors for damages arising from intellectual property infringement by us. If we or our licensors, or any current or future strategic partners, are found to infringe a third-party patent or other intellectual property rights, we could be required to pay damages, potentially including treble damages, if we are found to have willfully infringed. In addition, we or our licensors, or any current or future strategic partners, may choose to seek, or be required to seek, a license from a third-party, which may not be available on acceptable terms, if at all. Even if a license can be obtained on acceptable terms, the rights may be non-exclusive, which could give our competitors access to the same technology or intellectual property rights licensed to us. If we fail to obtain a required license, we or any current or future collaborator may be unable to effectively

market therapeutic candidates based on our technology, which could limit our ability to generate revenue or achieve profitability and possibly prevent us from generating revenue sufficient to sustain our operations. In addition, we may find it necessary to pursue claims or initiate lawsuits to protect or enforce our patent or other intellectual property rights. The cost to us in defending or initiating any litigation or other proceeding relating to patent or other proprietary rights, even if resolved in our favor, could be substantial, and litigation would divert our management's attention. Some of our competitors may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could delay our research and development efforts and limit our ability to continue our operations.

If we were to initiate legal proceedings against a third-party to enforce a patent covering one of our therapeutics or our technology, the defendant could counterclaim that our patent is invalid or unenforceable. In patent litigation in the U.S., defendant counterclaims alleging invalidity or unenforceability are commonplace. Grounds for a validity challenge could be an alleged failure to meet any of several statutory requirements, for example, lack of novelty, obviousness or non-enablement. Grounds for an unenforceability assertion could be an allegation that someone connected with prosecution of the patent withheld relevant information from the USPTO, or made a misleading statement, during prosecution. The outcome following legal assertions of invalidity and unenforceability during patent litigation is unpredictable. With respect to the validity question, for example, we cannot be certain that there is no invalidating prior art, of which we and the patent examiner were unaware during prosecution. If a defendant were to prevail on a legal assertion of invalidity or unenforceability, we would lose at least part, and perhaps all, of the patent protection on one or more of our therapeutics or certain aspects of our technology. Such a loss of patent protection could have a material adverse impact on our business. Patents and other intellectual property rights also will not protect our technology if competitors design around our protected technology without legally infringing our patents or other intellectual property rights.

It is also possible that we have failed to identify relevant third-party patents or applications. For example, U.S. applications filed before November 29, 2000 and certain U.S. applications filed after that date that will not be filed outside the U.S. remain confidential until patents issue. Patent applications in the U.S. and elsewhere are published approximately 18 months after the earliest filing for which priority is claimed, with such earliest filing date being commonly referred to as the priority date. Therefore, patent applications covering our therapeutics or technology could have been filed by others without our knowledge. Additionally, pending patent applications which have been published can, subject to certain limitations, be later amended in a manner that could cover our SNA technology, our therapeutics or the use of our therapeutics. Third-party intellectual property right holders may also actively bring infringement claims against us. We cannot guarantee that we will be able to successfully settle or otherwise resolve such infringement claims. If we are unable to successfully settle future claims on terms acceptable to us, we may be required to engage in or continue costly, unpredictable and time-consuming litigation and may be prevented from or experience substantial delays in marketing our therapeutics. If we fail in any such dispute, in addition to being forced to pay damages, we may be temporarily or permanently prohibited from commercializing any of our therapeutic candidates that are held to be infringing. We might, if possible, also be forced to redesign therapeutic candidates so that we no longer infringe the third-party intellectual property rights. Any of these events, even if we were ultimately to prevail, could require us to divert substantial financial and management resources that we would otherwise be able to devote to our business.

If we fail to comply with our obligations under any license, collaboration or other agreements, we may be required to pay damages and could lose intellectual property rights that are necessary for developing and protecting our therapeutic candidates or we could lose certain rights to grant sublicenses.

Our current licenses impose, and any future licenses we enter into are likely to impose, various development, commercialization, funding, milestone, royalty, diligence, sublicensing, insurance, patent prosecution and enforcement, and other obligations on us. If we breach any of these obligations, or use the intellectual property licensed to us in an unauthorized manner, we may be required to pay damages and the licensor may have the right to terminate the license, which could result in us being unable to develop, manufacture and sell therapeutics that are covered by the licensed technology or could enable a competitor to gain access to the licensed technology. Moreover, our licensors may own or control intellectual property that has not been licensed to us and, as a result, we may be subject to claims, regardless of their merit, that we are infringing or otherwise violating the licensor's rights

in such unlicensed intellectual property. In addition, while we cannot currently determine the amount of the royalty obligations we would be required to pay on sales of future therapeutics, if any, the amounts may be significant. The amount of our future royalty obligations will depend on the technology and intellectual property we use in therapeutics that we successfully develop and commercialize, if any. Therefore, even if we successfully develop and commercialize therapeutics, we may be unable to achieve or maintain profitability.

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

In addition to seeking patent protection for certain aspects of our therapeutic candidates, we also consider trade secrets, including confidential and unpatented know-how important to the maintenance of our competitive position. We protect trade secrets and confidential and unpatented know-how, in part, by entering into non-disclosure and confidentiality agreements with parties who have access to such knowledge, such as our employees, corporate collaborators, outside scientific collaborators, CROs, contract manufacturers, consultants, advisors and other third parties. We also enter into confidentiality and invention or patent assignment agreements with our employees and consultants that obligate them to maintain confidentiality and 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 in the U.S. and certain foreign jurisdictions 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.

Under the terms of the Northwestern University License Agreements, Northwestern University could publish research findings relating to the patent rights licensed to us by Northwestern University, which could have a material adverse effect on our business.

We are also subject both in the U.S. and outside the U.S. to various regulatory schemes regarding requests for the information we provide to regulatory authorities, which may include, in whole or in part, trade secrets or confidential commercial information. While we are likely to be notified in advance of any disclosure of such information and would likely object to such disclosure, there can be no assurance that our challenge to the request would be successful.

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 were previously employed at universities or pharmaceutical or biotechnology 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 therapeutic 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 our trademarks and trade names are not adequately protected, then we may not be able to build name recognition in our markets of interest and our business may be adversely affected.

Our trademarks or trade names may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. We may not be able to protect our rights to these trademarks and trade names or may be forced to stop using these names, which we need for name recognition by potential partners or customers in

our markets of interest. If we are unable to establish name recognition based on our trademarks and trade names, we may not be able to compete effectively and our business may be adversely affected.

Third parties may independently develop similar or superior technology.

There can be no assurance that others will not independently develop, or have not already developed, similar or more advanced technologies than our technology; or that others will not design around, or have not already designed around, aspects of our technology and/or our trade secrets developed therefrom. If third parties develop technology similar or superior to our technology, or they successfully design around our current or future technology, our competitive position, business prospects, and results of operations could be materially and adversely affected.

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

We have licensed certain intellectual property from Northwestern University pursuant to the Northwestern University License Agreements. The Northwestern University License Agreements indicate that the rights licensed to us by Northwestern University are subject to the obligations to and the rights of the U.S. government, including those set forth in the Bayh-Dole Act of 1980, or the Bayh-Dole Act. As a result, the U.S. government may have certain rights to intellectual property embodied in our current or future therapeutics based on the licensed Northwestern University intellectual property. These U.S. government rights in certain inventions developed under a government-funded program include a non-exclusive, non-transferable, irrevocable worldwide license to use inventions for any governmental purpose. In addition, the U.S. government has the right to require us to grant exclusive, partially exclusive, or nonexclusive licenses to any of these inventions to a third-party if it determines that: (i) adequate steps have not been taken to commercialize the invention; (ii) government action is necessary to meet public health or safety needs; or (iii) government action is necessary to meet requirements for public use under federal regulations, also referred to as "march-in rights." While the U.S. government has sparingly used, and to the Company's knowledge never successfully exercised, such march-in rights, any exercise of the march-in rights by the U.S. government could harm our competitive position, business, financial condition, results of operations, and prospects. If the U.S. government exercises such march-in rights, we may receive compensation that is deemed reasonable by the U.S. government in its sole discretion, which may be less than what we might be able to obtain in the open market. Intellectual property generated under a government funded program is also subject to certain reporting requirements, compliance with which may require us to expend substantial resources.

In addition, the U.S. government requires that any therapeutics embodying any invention generated through the use of U.S. government funding be manufactured substantially in the U.S. The manufacturing preference requirement can be waived if the owner of the intellectual property can show that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible. This preference for U.S. manufacturers may limit our ability to contract with non-U.S. therapeutic manufacturers for therapeutics covered by such intellectual property.

Risks Related to Government Regulation

We may be unable to obtain U.S. or foreign regulatory approval and, as a result, unable to commercialize our therapeutic candidates.

Our therapeutic candidates are subject to extensive governmental regulations relating to, among other things, research, testing, development, manufacturing, safety, efficacy, approval, recordkeeping, reporting, labeling, storage, packaging, advertising and promotion, pricing, marketing, sampling, and distribution of therapeutics. Rigorous preclinical testing and clinical trials and an extensive regulatory approval process are required to be successfully completed in the U.S. and in many foreign jurisdictions before a new therapeutic can be marketed. Satisfaction of these and other regulatory requirements is costly, time consuming, uncertain and subject to unanticipated delays. It is

possible that none of the therapeutic candidates we may develop will obtain the regulatory approvals necessary for us or any current or future collaborators to begin selling them.

We have very limited experience in conducting and managing the clinical trials necessary to obtain regulatory approvals, including approval by the FDA as well as foreign regulatory authorities, such as the EMA and European Union national competent authorities. The time required to obtain FDA and foreign regulatory approvals is unpredictable but typically takes many years following the commencement of clinical trials, depending upon the type, complexity and novelty of the therapeutic candidate. The standards that the FDA and its foreign counterparts use when regulating us are not always applied predictably or uniformly and can change. Any analysis we perform of data from preclinical and clinical activities is subject to confirmation and interpretation by regulatory authorities, which could delay, limit or prevent regulatory approval. We may also encounter unexpected delays or increased costs due to new government regulations, for example, from future legislation or administrative action, or from changes in the policy of the FDA or foreign regulatory authorities during the period of therapeutic development, clinical trials and regulatory review by the FDA or foreign regulatory authorities. It is impossible to predict whether legislative changes will be enacted, or whether FDA or foreign laws, regulations, guidance or interpretations will be changed, or what the impact of such changes, if any, may be.

Because the therapeutics we are developing may represent a new class of therapeutic, the FDA and its foreign counterparts have not yet established any definitive policies, practices or guidelines in relation to these therapeutics. While we believe the therapeutic candidates that we are currently developing are regulated as new drugs under the Federal Food, Drug, and Cosmetic Act, or the FDCA, the FDA could decide to regulate them or other therapeutics we may develop as biologics under the Public Health Service Act. The lack of policies, practices or guidelines may hinder or slow review by the FDA or foreign regulatory authorities of any regulatory filings that we may submit. Moreover, the FDA may respond to these submissions by defining requirements we may not have anticipated. Such responses could lead to significant delays in the clinical development of our therapeutic candidates.

Any delay or failure in obtaining required approvals could have a material adverse effect on our ability to generate revenues from the particular therapeutic candidate for which we are seeking approval. Furthermore, any regulatory approval to market a therapeutic may be subject to limitations on the approved uses for which we may market the therapeutic or the labeling or other restrictions. Regulatory authorities also may impose requirements for costly post-marketing studies or clinical trials and surveillance to monitor the safety or efficacy of the therapeutic. In addition, the FDA has the authority to require a REMS plan as part of a NDA or a Biologics License Application, or BLA, or after approval, which may impose further requirements or restrictions on the distribution or use of an approved drug or biologic, such as limiting prescribing to certain physicians or medical centers that have undergone specialized training, limiting treatment to patients who meet certain safe-use criteria and requiring treated patients to enroll in a registry. These limitations and restrictions may limit the size of the market for the therapeutic and affect coverage and reimbursement by third-party payors.

We are also subject to numerous foreign regulatory requirements governing, among other things, the conduct of clinical trials, manufacturing and marketing authorization, pricing and third-party reimbursement. The foreign regulatory approval process varies among countries and may include all of the risks associated with FDA approval described above as well as risks attributable to the satisfaction of local regulations in foreign jurisdictions. Moreover, the time required to obtain approval may differ from that required to obtain FDA approval. Approval by the FDA does not ensure approval by regulatory authorities outside the U.S. and vice versa.

Certain of our therapeutic candidates may require companion diagnostics in certain indications. Failure to successfully develop, validate and obtain regulatory clearance or approval for such tests could harm our product development strategy or prevent us from realizing the full commercial potential of our therapeutic candidates.

Certain of our therapeutic candidates may require companion diagnostics to identify appropriate patients for those therapeutic candidates in certain indications. Companion diagnostics are subject to regulation by the FDA and comparable foreign regulatory authorities as a medical device and may require separate regulatory authorization prior to commercialization. We may rely on third parties for the design, development, testing and manufacturing of these companion diagnostics, the application for and receipt of any required regulatory authorization, and the commercial supply of these companion diagnostics. If these parties are unable to successfully develop companion

diagnostics for these therapeutic candidates, or experience delays in doing so, the development of our therapeutic candidates may be adversely affected and we may not be able to obtain marketing authorization for these therapeutic candidates. Furthermore, our ability to market and sell, as well as the commercial success, of any of our therapeutic candidates that require a companion diagnostic will be tied to, and dependent upon, the receipt of required regulatory authorization and the continued ability of such third parties to make the companion diagnostic commercially available on reasonable terms in the relevant geographies. Any failure to develop, validate, obtain and maintain marketing authorization for a companion diagnostic and supply such companion diagnostic will harm our business, results of operations and financial condition.

If we or current or future collaborators, manufacturers or service providers fail to comply with healthcare laws and regulations, we or they could be subject to enforcement actions, which could affect our ability to develop, market and sell our therapeutics and may harm our reputation.

Although we do not currently have any products on the market, once our therapeutic candidates or clinical trials are covered by federal health care programs, we will be subject to additional healthcare statutory and regulatory requirements and enforcement by the federal, state and foreign governments of the jurisdictions in which we conduct our business. Healthcare providers, physicians and third-party payors play a primary role in the recommendation and prescription of any therapeutic candidates for which we obtain marketing approval. Our arrangements with third-party payors and customers may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell or distribute our therapeutic candidates for which we obtain marketing approval. Restrictions under applicable federal and state healthcare laws and regulations, include, but are not limited to, the following:

- the U.S. federal Anti-Kickback Statute, which prohibits, among other things, persons from soliciting, receiving, offering or providing remuneration (including any kickback, bribe, or certain rebate), directly or indirectly, to induce either the referral of an individual for a healthcare item or service, or the purchasing or ordering of an item or service, for which payment may be made, in whole or in part, under a federal healthcare program, such as Medicare or Medicaid. This statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand, and prescribers, purchasers and formulary managers, among others, on the other. A person or entity does not need to have actual knowledge pf the statute or specific intent to violate it in order to have committed a violation;

- the U.S. federal False Claims Act, which imposes criminal and civil penalties, including through civil whistleblower or qui tam actions, against individuals or entities for knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false or fraudulent or making a false statement to avoid, decrease or conceal an obligation to pay money to the federal government. For example, pharmaceutical companies have been prosecuted under the False Claims Act in connection with their alleged off-label promotion of drugs, purportedly concealing price concessions in the pricing information submitted to the government for government price reporting purposes, and allegedly providing free product to customers with the expectation that the customers would bill federal health care programs for the product. In addition, the government may assert that a claim including items and services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the False Claims Act;

- federal consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers;

- federal price reporting laws, which require manufacturers to calculate and report complex pricing metrics to government programs, where such reported prices may be used in the calculation of reimbursement and/or discounts on approved products;

- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA includes a fraud and abuse provision referred to as the HIPAA All-Payor Fraud Law, which imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program (i.e., not just federal healthcare programs), or knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services; similar to the

federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;

- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009, or HITECH, and its implementing regulations, which impose obligations on certain covered entity healthcare providers, health plans, and healthcare clearinghouses as well as their business associates that perform certain services involving the use or disclosure of individually identifiable health information, including mandatory contractual terms, with respect to safeguarding the privacy, security, and transmission of individually identifiable health information, and require notification to affected individuals and regulatory authorities of certain breaches of security of individually identifiable health information. HITECH also created new tiers of civil monetary penalties, amended HIPAA to make civil and criminal penalties directly applicable to business associates, and gave state attorneys general new authority to file civil actions for damages or injunctions in federal courts to enforce the federal HIPAA laws and seek attorneys' fees and costs associated with pursuing federal civil actions;

- the federal Physician Payment Sunshine Act and the implementing regulations, also referred to as "Open Payments," issued under the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, collectively, the ACA, which require that manufacturers of pharmaceutical and biological drugs reimbursable under Medicare, Medicaid, or the Children's Health Insurance Program report to the Department of Health and Human Services all consulting fees, travel reimbursements, research grants, and other payments, transfers of value or gifts made to U.S.-licensed physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors) and U.S. teaching hospitals with limited exceptions. Effective January 1, 2022, these reporting obligations will extend to include transfers of value made to certain non-physician providers such as physician assistants and nurse practitioners; and

- analogous state laws and regulations, such as, state anti-kickback and false claims laws potentially applicable to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers; and some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government in addition to requiring drug manufacturers to report information related to payments to physicians and other healthcare providers or marketing expenditures, and state laws governing the privacy and security of health information in certain circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts; and state transparency laws that require the reporting of certain pricing information; among other state laws.

Ensuring that our future business arrangements with third-parties comply with applicable healthcare laws and regulations could involve substantial costs. If our operations are found to be in violation of any such requirements, we may be subject to penalties, including civil or criminal penalties, monetary damages, the curtailment or restructuring of our operations, or exclusion from participation in government contracting, healthcare reimbursement or other government programs, including Medicare and Medicaid, any of which could adversely affect our financial results. Although an effective compliance program can mitigate the risk of investigation and prosecution for violations of these laws, these risks cannot be entirely eliminated. Any action against us for an alleged or suspected violation could cause us to incur significant legal expenses and could divert our management's attention from the operation of our business, even if our defense is successful. In addition, achieving and sustaining compliance with applicable laws and regulations may be costly to us in terms of money, time and resources.

If we or current or future collaborators, manufacturers or service providers fail to comply with applicable federal, state or foreign laws or regulations, we could be subject to enforcement actions, which could affect our ability to develop, market and sell our therapeutics successfully and could harm our reputation and lead to reduced acceptance of our therapeutics by the market. These enforcement actions include, among others:

- adverse regulatory inspection findings;

- warning or untitled letters;

- voluntary product recalls or public notification or medical product safety alerts to healthcare professionals;
- restrictions on, or prohibitions against, marketing our therapeutics;
- restrictions on, or prohibitions against, importation or exportation of our therapeutics;
- suspension of review or refusal to approve pending applications or supplements to approved applications;
- exclusion from participation in government-funded healthcare programs;
- exclusion from eligibility for the award of government contracts for our therapeutics;
- FDA debarment;
- suspension or withdrawal of therapeutic approvals;
- seizures or administrative detention of therapeutics;
- injunctions; and
- civil and criminal penalties and fines.

Any therapeutics we develop may become subject to unfavorable pricing regulations, third-party coverage and reimbursement practices or healthcare reform initiatives, thereby harming our business.

The regulations that govern marketing approvals, pricing and reimbursement for new therapeutics vary widely from country to country. Some countries require approval of the sale price of a therapeutic before it can be marketed. In many countries, the pricing review period begins after marketing or therapeutic licensing approval is granted. In some foreign markets, prescription pharmaceutical pricing remains subject to continuing governmental control even after initial approval is granted. Although we intend to monitor these regulations, our programs are currently in the early stages of development and we will not be able to assess the impact of price regulations for a number of years. As a result, we might obtain regulatory approval for a therapeutic in a particular country, but then be subject to price regulations that delay our commercial launch of the therapeutic and negatively impact the revenues we are able to generate from the sale of the therapeutic in that country.

Patients who are prescribed therapeutics for the treatment of their conditions generally rely on third-party payors to reimburse all or part of the costs associated with their prescription drugs. There is significant uncertainty related to third-party payor coverage and reimbursement of newly approved therapeutics. Our ability to commercialize any therapeutics successfully also will depend in part on the extent to which coverage and reimbursement for these therapeutics and related treatments will be available from government health administration authorities, private health insurers and other organizations. However, there may be significant delays in obtaining coverage for newly-approved therapeutics. Moreover, eligibility for coverage does not necessarily signify that a therapeutic will be reimbursed in all cases or at a rate that covers our costs, including research, development, manufacture, sale and distribution costs. Also, interim payments for new therapeutics, if applicable, may be insufficient to cover our costs and may not be made permanent. Thus, even if we succeed in bringing one or more therapeutics to the market, these therapeutics may not be considered cost-effective, and the amount reimbursed for any therapeutics may be insufficient to allow us to sell our therapeutics on a competitive basis. Because our programs are in the early stages of development, we are unable at this time to determine their cost effectiveness or the likely level or method of reimbursement. Increasingly, the third-party payors who reimburse patients or healthcare providers, such as government and private insurance plans, are seeking greater upfront discounts, additional rebates and other concessions to reduce the prices for therapeutics. If the price we are able to charge for any therapeutics we develop, or the reimbursement provided for such therapeutics, is inadequate in light of our development and other costs, our return on investment could be adversely affected.

We currently expect that some therapeutics we develop may need to be administered under the supervision of a physician on an outpatient basis. Under currently applicable U.S. law, certain therapeutics that are not usually self-administered (including injectable therapeutics) may be eligible for coverage under Medicare through Medicare Part

B. Medicare Part B is part of original Medicare, the federal health care program that provides health care benefits to the aged and disabled, and covers outpatient services and supplies, including certain pharmaceutical products that are medically necessary to treat a beneficiary's health condition. Specifically, Medicare Part B coverage may be available for eligible beneficiaries when the following, among other requirements, have been satisfied:

- the product is reasonable and necessary for the diagnosis or treatment of the illness or injury for which the product is administered according to accepted standards of medical practice;
- the product is typically furnished incident to a physician's services;
- the product has been approved by the FDA.

Under the Medicaid Drug Rebate Statute, a manufacturer must participate in the Medicaid Drug Rebate Program in order to receive payment for its covered outpatient drugs under Medicare Part B (the Medicare program that generally covers physician-administered, outpatient drugs). 42 U.S.C. § 1396r-8(a)(1). In addition, manufacturers who participate in the Medicaid Drug Rebate Program are also required to (1) sign the Pharmaceutical Pricing Agreement and participate in the 340B Drug Pricing Program, and (2) sign the VA Master Agreement for inclusion of the manufacturer's drugs on the Federal Supply Schedule ("FSS"). *Id*. The Medicaid Drug Rebate Program requires pharmaceutical manufacturers to enter into and have in effect a national rebate agreement with the Secretary of the Department of Health and Human Services as a condition for states to receive federal matching funds for the manufacturer's outpatient drugs furnished to Medicaid patients. Under the 340B Drug Pricing Program, the manufacturer must extend discounts to entities eligible to participate in the program. Average 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 therapeutics from countries where they may be sold at lower prices than in the U.S. Self-administered therapeutics are typically reimbursed under Medicare Part D, and therapeutics that are administered in an inpatient hospital setting are typically reimbursed under Medicare Part A under a bundled payment. It is difficult for us to predict how Medicare coverage and reimbursement policies will be applied to our therapeutics in the future and coverage and reimbursement under different federal healthcare programs are not always consistent. Medicare reimbursement rates may also reflect budgetary constraints placed on the Medicare program.

Commercial third-party payors often rely upon Medicare coverage policies and payment limitations in setting their own reimbursement rates. Our inability to promptly obtain coverage, and adequate reimbursement from both government-funded and private payors for new therapeutics we develop and for which we obtain regulatory approval could have a material adverse effect on our operating results, our ability to raise capital needed to commercialize products and our financial condition.

We believe that the efforts of governments and third-party payors to contain or reduce the cost of healthcare, and specifically, therapeutics, and legislative and regulatory proposals to broaden the availability of healthcare will continue to affect the business and financial condition of pharmaceutical and biotechnology companies. A number of legislative and regulatory changes in the healthcare system in the U.S. and other major healthcare markets have been proposed. These developments could, directly or indirectly, affect our ability to sell our therapeutics, if approved, at a favorable price.

For example, in the U.S., in 2010, the U.S. Congress passed the ACA, a sweeping law intended to broaden access to health insurance, reduce or constrain the growth of health spending, enhance remedies against fraud and abuse, add new transparency requirements for the healthcare and health insurance industries, impose new taxes and fees on the health industry and impose additional policy reforms.

Although the future of the ACA is uncertain, provisions of the ACA addressing coverage and reimbursement of pharmaceutical products that may be of importance to our potential therapeutic candidates include the following:

- Increases to pharmaceutical manufacturer rebate liability under the Medicaid Drug Rebate Program due to an increase in the minimum basic Medicaid rebate on most branded prescription drugs and the application of Medicaid rebate liability to drugs used in risk-based Medicaid managed care plans.

- The expansion of the 340B Drug Pricing Program to require discounts for "covered outpatient drugs" sold to certain children's hospitals, critical access hospitals, freestanding cancer hospitals, rural referral centers, and sole community hospitals.
- Requirements imposed on pharmaceutical companies to offer discounts on brand-name drugs to patients who fall within the Medicare Part D coverage gap, commonly referred to as the "Donut Hole." In February 2018, Congress passed the Bipartisan Budget Act of 2018, which, beginning in 2019, increased the discount to be paid by pharmaceutical companies from 50% to 70% of a brand-name drug's negotiated price and added biosimilars to the coverage gap discount program.
- Requirements imposed on pharmaceutical companies to pay an annual non-tax-deductible fee to the federal government based on each company's market share of prior year total sales of branded drugs to certain federal healthcare programs, such as Medicare, Medicaid, Department of Veterans Affairs, and Department of Defense. Since we currently expect our branded pharmaceutical sales to constitute a small portion of the total federal healthcare program pharmaceutical market, we do not currently expect this annual assessment to have a material impact on our financial condition.
- For therapeutic candidates classified as biologics, marketing approval for a follow-on biologic therapeutic may not become effective until 12 years after the date on which the reference innovator biologic therapeutic was first licensed by the FDA, with a possible six-month extension for pediatric therapeutics. After this exclusivity ends, it may be possible for biosimilar manufacturers to enter the market, which is likely to reduce the pricing for such therapeutics and could affect our profitability if our therapeutics are classified as biologics.

Separately, pursuant to the health reform legislation and related initiatives, the Centers for Medicare and Medicaid Services, or CMS, is working with various healthcare providers to develop, refine, and implement Accountable Care Organizations, or ACOs, and other innovative models of care for Medicare and Medicaid beneficiaries, including the Bundled Payments for Care Improvement Initiative, the Financial Alignment Initiative Demonstration, and other models. The continued development and expansion of ACOs and other innovative models of care will have an uncertain impact on any future reimbursement we may receive for approved therapeutics administered by such organizations.

Since its enactment, there have been numerous judicial, administrative, executive, and legislative challenges to certain aspects of the ACA, and we expect there will be additional challenges and amendments to the ACA in the future. Various portions of the ACA are currently undergoing legal and constitutional challenges in the Fifth Circuit Court and the United States Supreme Court; the Trump Administration has issued various Executive Orders which eliminated cost sharing subsidies and various provisions that would impose a fiscal burden on states or a cost, fee, tax, penalty or regulatory burden on individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices; and Congress has introduced several pieces of legislation aimed at significantly revising or repealing the ACA. It is unclear whether the ACA will be overturned, repealed, replaced, or further amended. We cannot predict what affect further changes to the ACA would have on our business.

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

In May 2018, the Trump Administration released a "Blueprint" to lower drug prices and reduce out of pocket costs of drugs that contains additional proposals to increase drug manufacturer competition, increase the negotiating power of certain federal healthcare programs, incentivize manufacturers to lower the list price of their products, and reduce the out of pocket costs of drug products paid by consumers. HHS has already started the process of soliciting feedback on some of these measures and, at the same time, is immediately implementing others

under its existing authority. For example, in May 2019, CMS issued a final rule to allow Medicare Advantage Plans the option of using step therapy for Part B drugs beginning January 1, 2020. Additionally, on December 18, 2019, FDA issued a notice of proposed rulemaking that, if finalized, would allow for the importation of certain prescription drugs from Canada. FDA also issued a draft guidance document outlining a potential pathway for manufacturers to obtain an additional National Drug Code, or NDC, for an FDA-approved drug that was originally intended to be marketed in a foreign country and that was authorized for sale in that foreign country. The regulatory and market implications of the notice of proposed rulemaking and draft guidance are unknown at this time. Such reforms could have an adverse effect on anticipated revenues from therapeutic candidates that we may successfully develop and for which we may obtain regulatory approval and may affect our overall financial condition and ability to develop therapeutic candidates.

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

In the European Union, similar political, economic and regulatory developments may affect our ability to profitably commercialize our therapeutic candidates, if approved. In addition to continuing pressure on prices and cost containment measures, legislative developments at the European Union or member state level may result in significant additional requirements or obstacles that may increase our operating costs. The delivery of healthcare in the European Union, including the establishment and operation of health services and the pricing and reimbursement of medicines, is almost exclusively a matter for national, rather than European Union, law and policy. National governments and health service providers have different priorities and approaches to the delivery of health care and the pricing and reimbursement of products in that context. In general, however, the healthcare budgetary constraints in most European Union member states have resulted in restrictions on the pricing and reimbursement of medicines by relevant health service providers. Coupled with ever-increasing European Union and national regulatory burdens on those wishing to develop and market products, this could prevent or delay marketing approval of our therapeutic candidates, restrict or regulate post-approval activities and affect our ability to commercialize our therapeutic candidates, if approved. In markets outside of the United States and European Union, reimbursement and healthcare payment systems vary significantly by country, and many countries have instituted price ceilings on specific products and therapies.

However, we cannot predict the ultimate content, timing or effect of any healthcare reform legislation or the impact of potential legislation on us. If we or any third parties we may engage are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we or such third parties are not able to maintain regulatory compliance, our current or any future therapeutic candidates we may develop may lose any regulatory approval that may have been obtained and we may not achieve or sustain profitability.

We face potential liability related to the privacy of health information we obtain from clinical trials sponsored by us.

Most healthcare providers, including research institutions from which we obtain patient health information, are subject to privacy and security regulations promulgated under HIPAA, as amended by the HITECH. We are not currently classified as a covered entity or business associate under HIPAA and thus are not directly subject to its requirements or penalties. However, any person may be prosecuted under HIPAA's criminal provisions either directly or under aiding-and-abetting or conspiracy principles. Consequently, depending on the facts and circumstances, we could face substantial criminal penalties if we knowingly receive individually identifiable health information from a HIPAA-covered healthcare provider or research institution that has not satisfied HIPAA's requirements for disclosure of individually identifiable health information. In addition, we may maintain sensitive personally identifiable information, including health information, that we receive throughout the clinical trial process, in the course of our research collaborations, and directly from individuals (or their healthcare providers) who enroll in our patient assistance programs. As such, we may be subject to state laws requiring notification of affected individuals and state regulators in the event of a breach of personal information, which is a broader class of information than the health information protected by HIPAA.

Furthermore, certain health privacy laws, data breach notification laws, consumer protection laws and genetic testing laws may apply directly to our operations and/or those of our collaborators and may impose restrictions on our collection, use and dissemination of individuals' health information. Patients about whom we or our collaborators obtain health information, as well as the providers who share this information with us, may have statutory or contractual rights that limit our ability to use and disclose the information. We may be required to expend significant capital and other resources to ensure ongoing compliance with applicable privacy and data security laws. Claims that we have violated individuals' privacy rights or breached our contractual obligations, even if we are not found liable, could be expensive and time- consuming to defend and could result in adverse publicity that could harm our business.

If we or third-party CMOs, CROs or other contractors or consultants fail to comply with applicable federal, state or local regulatory requirements, we could be subject to a range of regulatory actions that could affect our or our contractors' ability to develop and commercialize our therapeutic candidates and could harm or prevent sales of any affected therapeutics that we are able to commercialize, or could substantially increase the costs and expenses of developing, commercializing and marketing our therapeutics. Any threatened or actual government enforcement action could also generate adverse publicity and require that we devote substantial resources that could otherwise be used in other aspects of our business. Increasing use of social media could give rise to liability, breaches of data security or reputational damage.

Our ability to obtain services, reimbursement or funding from the federal government may be impacted by possible reductions in federal spending.

U.S. federal government agencies currently face potentially significant spending reductions. The Budget Control Act of 2011, or the BCA, established a Joint Select Committee on Deficit Reduction, which was tasked with achieving a reduction in the federal debt level of at least $1.2 trillion. That committee did not draft a proposal by the BCA's deadline. As a result, automatic cuts, referred to as sequestration, in various federal programs were scheduled to take place, beginning in January 2013, although the American Taxpayer Relief Act of 2012 delayed the BCA's automatic cuts until March 1, 2013. While the Medicare program's eligibility and scope of benefits are generally exempt from these cuts, Medicare payments to providers and Part D health plans are not exempt. The BCA did, however, provide that the Medicare cuts to providers and Part D health plans would not exceed two percent. President Obama issued the sequestration order on March 1, 2013, and cuts went into effect on April 1, 2013. Additionally, the Bipartisan Budget Act of 2018 extended sequestration for Medicare through fiscal year 2027.

The U.S. federal budget remains in flux, which could, among other things, cut Medicare payments to providers. Although the BBA passed in February 2018 enacts a two-year federal spending agreement and raises the federal spending cap on non-defense spending for fiscal years 2018 and 2019, the Medicare program is frequently identified as a target for spending cuts. The full impact on our business of any future cuts in Medicare or other programs is uncertain. In addition, we cannot predict any impact President Trump's administration and the U.S. Congress may have on the federal budget. If federal spending is reduced, anticipated budgetary shortfalls may also impact the ability of relevant agencies, such as the FDA or the National Institutes of Health, to continue to function at current levels. Amounts allocated to federal grants and contracts may be reduced or eliminated. These reductions may also impact the ability of relevant agencies to timely review and approve therapeutic research and development, manufacturing, and marketing activities, which may delay our ability to develop, market, and sell any therapeutics we may develop.

If any of our therapeutic candidates receives marketing approval and we or others later identify undesirable side effects caused by the therapeutic candidate, our ability to market and derive revenue from the therapeutic candidates could be compromised.

In the event that any of our therapeutic candidates receive regulatory approval and we or others identify undesirable side effects, adverse events or other problems caused by one of our therapeutics, any of the following adverse events could occur, which could result in the loss of significant revenue to us and materially and adversely affect our results of operations and business:

- regulatory authorities may withdraw their approval of the therapeutic or seize the therapeutic;

- we may need to recall the therapeutic or change the way the therapeutic is administered to patients;
- additional restrictions may be imposed on the marketing of the particular therapeutic or the manufacturing processes for the therapeutic or any component thereof;
- we may be subject to fines, restitution or disgorgement of profits or revenues, injunctions, or the imposition of civil penalties or criminal prosecution;
- regulatory authorities may require the addition of labeling statements, such as a "black box" warning or a contraindication;
- regulatory authorities may require us to implement a REMS, or to conduct post-marketing studies or clinical trials and surveillance to monitor the safety or efficacy of the therapeutic;
- we may be required to create a Medication Guide outlining the risks of such side effects for distribution to patients;
- we could be sued and held liable for harm caused to patients;
- the therapeutic may become less competitive; and
- our reputation may suffer.

Significant developments stemming from the United Kingdom's recent referendum on membership in the European Union could have a material adverse effect global economic conditions, financial markets and on our business.

On June 23, 2016, the United Kingdom held a referendum and voted in favor of leaving the European Union, commonly referred to as "Brexit." This referendum has created political and economic uncertainty, particularly in the United Kingdom and the European Union, and this uncertainty may last for years. The UK officially withdrew from the EU on January 31, 2020, however the effects of the departure on both the EU and the UK are still highly uncertain, as many details of the departure have yet to be addressed. Any business we conduct, now and in the future, in the United Kingdom, the European Union, and worldwide could be affected during this period of uncertainty, and perhaps longer, by the impact of the United Kingdom's referendum. The withdrawal could, among other outcomes, disrupt the free movement of goods, services and people between the UK and the EU, and result in increased legal and regulatory complexities, as well as potential higher costs of conducting business in Europe. This volatility could cause a slowdown in economic activity in the United Kingdom, Europe, or globally, which could adversely affect our operating results and growth prospects. In addition, our business could be negatively affected by new trade agreements between the United Kingdom and other countries, including the U.S., and by the possible imposition of trade or other regulatory barriers in the United Kingdom.

For example, Brexit could result in the UK or the EU significantly altering its regulations affecting the clearance or approval of our product candidates that are developed in the UK or the EU, and may lead to a disparity in the regulatory regimes for medicinal products as between the UK and the EU. Any new regulations could add time and expense to the conduct of our business, as well as the process by which our products receive regulatory approval in the UK, the EU and elsewhere. In addition, the announcement of Brexit and the withdrawal of the UK from the EU have had and may continue to have a material adverse effect on global economic conditions and the stability of global financial markets, and may significantly reduce global market liquidity and restrict the ability of key market participants to operate in certain financial markets. Any of these effects of Brexit, among others, could adversely affect our business, our results of operations, liquidity and financial condition.

Risks Related to Our Common Stock

An active trading market for our common stock may not develop or be sustainable. If an active trading market does not develop, investors may not be able to resell their shares at or above the price for which they were purchased and our ability to raise capital in the future may be impaired.

Our common stock was recently listed on the Nasdaq Capital Market and began trading on July 31, 2019. Although our common stock is listed on the Nasdaq Capital Market, an active trading market for our shares may never develop or, if developed, be maintained. If an active market for our common stock does not develop or is not maintained, it may be difficult for investors to sell shares without depressing the market price for the shares or at all. An inactive trading market may also impair our ability to raise capital to continue to fund operations by selling shares and may impair our ability to acquire other companies or technologies by using our shares as consideration.

Our stock price may be volatile and purchasers of our common stock could incur substantial losses.

If a market for our common stock develops, its market price could fluctuate substantially due to a variety of factors, including the other risks described in this section titled "Risk Factors" and the following:

- the success of competitive therapeutics or technologies;
- results of our preclinical studies and clinical trials of our therapeutic candidates, or those of our competitors, or any current or future collaborators;
- regulatory or legal developments in the U.S. and other countries, especially changes in laws or regulations applicable to our therapeutics;
- introductions and announcements of new therapeutics by us, our future commercialization partners, or our competitors, and the timing of these introductions or announcements;
- actions taken by regulatory agencies with respect to our therapeutics, clinical studies, manufacturing process or sales and marketing terms;
- actual or anticipated variations in our financial results or those of companies that are perceived to be similar to us;
- the success of our efforts to acquire or in-license additional technologies, therapeutics or therapeutic candidates;
- developments concerning any current or future collaborations, including but not limited to those with our sources of manufacturing supply and our commercialization partners;
- announcements by us or our competitors of significant acquisitions, strategic partnerships, joint ventures or capital commitments;
- developments or disputes concerning patents or other proprietary rights, including patents, litigation matters and our ability to obtain patent protection for our therapeutics;
- our ability or inability to raise additional capital and the terms on which we raise it;
- the recruitment or departure of key personnel;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors;
- actual or anticipated changes in earnings estimates or changes in stock market analyst recommendations regarding our common stock, other comparable companies or our industry generally;

- our failure or the failure of our competitors to meet analysts' projections or guidance that we or our competitors may give to the market;
- fluctuations in the valuation of companies perceived by investors to be comparable to us;
- announcement and expectation of additional financing efforts;
- speculation in the press or investment community;
- trading volume of our common stock;
- sales of our common stock by us or our stockholders;
- the concentrated ownership of our common stock;
- changes in accounting principles;
- terrorist acts, acts of war or periods of widespread civil unrest;
- natural disasters and other calamities; and
- general economic, industry and market conditions.

In addition, the stock markets in general, and the markets for pharmaceutical and biotechnology stocks in particular, have experienced extreme volatility that has been often unrelated to the operating performance of the issuer. These broad market and industry factors may seriously harm the market price of our common stock, regardless of our operating performance.

We may not be able to meet the continued listing requirements for the Nasdaq Capital Market or another nationally recognized stock exchange, which could limit investors' ability to make transactions in our securities and subject us to additional trading restrictions.

In connection with the August 2019 Offering, our common stock was approved for listing on the Nasdaq Capital Market under the symbol "XCUR" and began trading on July 31, 2019.

In order to remain listed on the Nasdaq Capital Market, we will be required to meet the continued listing requirements of the Nasdaq Capital Market or any other U.S. or nationally recognized stock exchange to which we may apply and be approved for listing. We may be unable to satisfy these continued listing requirements, and there is no guarantee that our common stock will remain listed on the Nasdaq Capital Market or any other U.S. or nationally recognized stock exchange. If, after listing, our common stock is delisted from the Nasdaq Capital Market or any other U.S. or nationally recognized stock exchange, we could face significant material adverse consequences, including:

- a limited availability of market quotations for our common stock;
- reduced liquidity with respect to the market for our common stock;
- a determination that our common stock is a "penny stock," which will require brokers trading in our common stock to adhere to different rules, possibly resulting in a reduced level of trading activity in the secondary trading market for our common stock;
- a limited amount of news and analyst coverage; and
- decreased ability to issue additional shares of our common stock or obtain additional financing in the future.

The future issuance of equity or of debt securities that are convertible into equity may dilute your investment and reduce your equity interest.

We may choose to raise additional capital in the future, depending on market conditions, strategic considerations and operational requirements. To the extent that we raise additional capital through the issuance of shares or other securities convertible into shares, our stockholders will be diluted. Future issuances of our common stock or other equity securities, or the perception that such sales may occur, could adversely affect the prevailing market price of our common stock and impair our ability to raise capital through future offerings of equity or equity-linked securities. For example, on December 23, 2019, we completed the sale of 10,000,000 shares of our common stock in the December 2019 Offering and on August 2, 2019 we completed the sale of 31,625,000 shares of our common stock in the August 2019 Offering. The issuance of shares in both the December 2019 Offering and August 2019 Offering were pursuant to a shelf registration statement on Form S-3 that was declared effective by the SEC on July 24, 2019. The shelf registration statement allows us to sell from time-to-time up to $125.0 million of common stock, preferred stock, debt securities, warrants, or units comprised of any combination of these securities, for our own account in one or more offerings; the remaining amount available under this shelf registration after the December 2019 Offering (inclusive of the exercise of the underwriters' option in January 2020 to purchase additional shares at the public offering price in connection with the December 2019 Offering) is approximately $31.3 million. The issuance of the shares pursuant to the December 2019 Offering and the August 2019 Offering and/or the resale of a substantial number of shares of our common stock in the public market could adversely affect the market price for our common stock and make it more difficult for you to sell shares of our common stock at times and prices that you feel are appropriate. Adverse market and price pressures that may result from the December 2019 Offering or the August 2019 Offering or an offering pursuant to the shelf registration statement may continue for an extended period of time and continued negative pressure on the market price of our common stock could have a material adverse effect on our ability to raise additional equity capital.

The employment agreements with our executive officers may require us to pay severance benefits to officers in connection with termination of employment or upon a change of control of us, which could harm our financial condition.

Each of David A. Giljohann, our Chief Executive Officer, David S. Snyder, our Chief Financial Officer, and Matthias G. Schroff, our Chief Operating Officer, is entitled to receive cash severance equal to twelve months, six months, and six months, respectively, of his base salary if his employment is terminated by us without cause (as such term is defined in his employment offer letter). In addition, our 2015 Plan, which was assumed by us in the Merger, generally provides for accelerated vesting of equity awards upon the involuntary termination of an employee within the twelve month period following a change in control (as defined under the plan) and accelerated vesting of equity awards upon a change of control (as defined under the plan) for each of our executive officers. This vesting acceleration is intended to provide each of our executive officers with the full benefit of their equity awards and reward them for a successful outcome for our stockholders. The accelerated vesting of equity awards could result in dilution to our existing stockholders and harm the market price of our common stock. The payment of these severance benefits could harm our financial condition. In addition, these potential severance payments may discourage or prevent third parties from seeking a business combination with us.

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

We are an "emerging growth company" as defined in the JOBS Act. For as long as we continue to be an emerging growth company, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including (1) not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, or the Sarbanes-Oxley Act, (2) reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements and (3) exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved. In addition, as an emerging growth company, we are only required to provide two years of audited financial statements and two years of selected financial data. We could be an emerging growth company for up to five years, although

circumstances could cause us to lose that status earlier, including if the market value of our common stock held by non-affiliates exceeds $700.0 million as of any June 30 before that time or if we have total annual gross revenue of $1.07 billion or more during any fiscal year before that time, in which cases we would no longer be an emerging growth company as of the following December 31, or if we issue more than $1.0 billion in non-convertible debt during any three-year period before that time, in which case we would no longer be an emerging growth company immediately. Even after we no longer qualify as an emerging growth company, we may still qualify as a "smaller reporting company" which would allow us to take advantage of many of the same exemptions from disclosure requirements including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act and reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements. We cannot predict if investors will find our common stock less attractive because we may rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our share price may be more volatile.

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

FINRA sales practice requirements may limit a stockholder's ability to buy and sell our stock.

The Financial Industry Regulatory Authority, or FINRA, has adopted rules requiring that, in recommending an investment to a customer, a broker-dealer must have reasonable grounds for believing that the investment is suitable for that customer. Prior to recommending speculative or low-priced securities to their non-institutional customers, broker-dealers must make reasonable efforts to obtain information about the customer's financial status, tax status, investment objectives and other information. Under interpretations of these rules, FINRA has indicated its belief that there is a high probability that speculative or low-priced securities will not be suitable for at least some customers. If these FINRA requirements are applicable to us or our securities, they may make it more difficult for broker-dealers to recommend that at least some of their customers buy our common stock, which may limit the ability of our stockholders to buy and sell our common stock and could have an adverse effect on the market for and price of our common stock.

If securities or industry analysts do not publish research or reports about our business, or if they issue an adverse or misleading opinion regarding our stock, our stock price and trading volume could decline.

The trading market for our common stock will be influenced by the research and reports that industry or securities analysts publish about us or our business. Our research coverage by securities and industry analysts is currently limited. In addition, because we did not become a reporting company by conducting an underwritten initial public offering of our common stock, security analysts of brokerage firms may not provide wider coverage of our Company. In addition, investment banks may be less likely to agree to underwrite secondary offerings on our behalf than they might if we became a public reporting company by means of an underwritten initial public offering, because they may be less familiar with our Company as a result of more limited coverage by analysts and the media, and because we became public at an early stage in our development. The failure to receive wider research coverage or support in the market for our shares will have an adverse effect on our ability to develop a liquid market for our common stock and the trading price for our stock would be negatively impacted.

In the event we obtain wider securities or industry analyst coverage, if any of the analysts who cover us issue an adverse or misleading opinion regarding us, our business model, our intellectual property or our stock performance, or if our target studies and operating results fail to meet the expectations of analysts, our stock price would likely decline. If one or more of these analysts cease coverage of us or fail to publish reports on us regularly, we could lose visibility in the financial markets, which in turn could cause our stock price or trading volume to decline.

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.

Based on the beneficial ownership of our common stock as of December 31, 2019, our executive officers and directors, together with holders of five percent or more of our outstanding common stock and their respective affiliates, will beneficially own approximately 45.3 percent of our outstanding common stock. As a result, these stockholders, if acting together, will continue to have significant influence over the outcome of corporate actions requiring stockholder approval, including the election of directors, any merger, consolidation or sale of all or substantially all of our assets and any other significant corporate transaction. The interests of these stockholders may not be the same as or may even conflict with your interests. For example, these stockholders could delay or prevent a change of control of our Company, even if such a change of control would benefit our other stockholders, which could deprive our stockholders of an opportunity to receive a premium for their common stock as part of a sale of our company or our assets and might affect the prevailing market price of our common stock. The significant concentration of stock ownership may adversely affect the trading price of our common stock due to investors' perception that conflicts of interest may exist or arise.

Anti-takeover provisions in our charter documents and under the General Corporation Law of the State of Delaware could make an acquisition of us more difficult and may prevent attempts by our stockholders to replace or remove our management.

Provisions in our amended and restated certificate of incorporation and our bylaws may delay or prevent an acquisition of us or a change in our management. These provisions include a classified board of directors, a prohibition on actions by written consent of our stockholders, and the ability of the board of directors to issue preferred stock without stockholder approval. In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, or the DGCL, which prohibits stockholders owning in excess of 15% of the outstanding combined organization voting stock from merging or combining with the combined organization. Although we believe these provisions collectively will provide for an opportunity to receive higher bids by requiring potential acquirers to negotiate with our board of directors, they would apply even if the offer may be considered beneficial by some stockholders. In addition, these provisions may frustrate or prevent any attempts by our stockholders to replace or remove then-current management by making it more difficult for stockholders to replace members of the board of directors, which is responsible for appointing the members of management.

Anti-takeover provisions in our charter documents could discourage, delay or prevent a change in control of us and may affect the trading price of our common stock.

Our corporate documents and the DGCL contain provisions that may enable our board of directors to resist a change in control of us even if a change in control were to be considered favorable by our stockholders. These provisions:

- stagger the terms of our board of directors and require 66 and 2/3% stockholder voting to remove directors, who may only be removed for cause;
- authorize our board of directors to issue "blank check" preferred stock and to determine the rights and preferences of those shares, which may be senior to our common stock, without prior stockholder approval;
- establish advance notice requirements for nominating directors and proposing matters to be voted on by stockholders at stockholders' meetings;
- prohibit our stockholders from calling a special meeting and prohibit stockholders from acting by written consent;
- require 66 and 2/3% stockholder voting to effect certain amendments to our certificate of incorporation and bylaws; and

- prohibit cumulative voting in the election of directors, which limits the ability of minority stockholders to elect director candidates.

These provisions could discourage, delay or prevent a transaction involving a change in control of us. These provisions could also discourage proxy contests and make it more difficult for stockholders to elect directors of their choosing and cause us to take other corporate actions our stockholders desire.

The requirements of being a public company may strain our resources and divert management's attention.

As a public company, we are subject to the reporting requirements of the Exchange Act, the Sarbanes-Oxley Act, the Dodd-Frank Act, the listing requirements of the Nasdaq Stock Market, and other applicable securities rules and regulations. Despite recent reforms made possible by the JOBS Act, compliance with these rules and regulations nonetheless increases our legal and financial compliance costs, makes some activities more difficult, time-consuming or costly, and increases demand on our systems and resources, particularly after we will no longer be an "emerging growth company." The Exchange Act requires, among other things, that we file annual, quarterly, and current reports with respect to our business and operating results.

As a result of disclosure of information in this report and in other filings required of a public company, our business and financial condition are more visible, which we believe may result in threatened or actual litigation, including by competitors and other third parties. If such claims are successful, our business and operating results could be harmed, and even if the claims do not result in litigation or are resolved in our favor, these claims, and the time and resources necessary to resolve them, could divert the resources of our management and adversely affect our business, brand and reputation and results of operations.

We also expect that being a public company and these new rules and regulations will make it more expensive for us to obtain director and officer liability insurance, and we may be required to accept reduced coverage or incur substantially higher costs to obtain coverage. These factors could also make it more difficult for us to attract and retain qualified members of our board of directors, particularly to serve on our audit committee and compensation committee, and qualified executive officers.

Because we do not anticipate paying any cash dividends on our capital stock in the foreseeable future, capital appreciation, if any, will be your sole source of gain.

We have never declared or paid cash dividends on our capital stock. We currently intend to retain all of our future earnings, if any, to finance the growth and development of our business. As a result, capital appreciation, if any, of our common stock will be your sole source of gain for the foreseeable future.

We may incur significant costs from class action litigation due to our expected stock volatility.

Our stock price may fluctuate for many reasons, including as a result of public announcements regarding the progress of our development efforts or the development efforts of current or future collaborators or competitors, the addition or departure of our key personnel, variations in our quarterly operating results and changes in market valuations of pharmaceutical and biotechnology companies. This risk is especially relevant to us because pharmaceutical and biotechnology companies have experienced significant stock price volatility in recent years. When the market price of a stock has been volatile as our stock price may be, holders of that stock have occasionally brought securities class action litigation against the company that issued the stock. If any of our stockholders were to bring a lawsuit of this type against us, even if the lawsuit is without merit, we could incur substantial costs defending the lawsuit. The lawsuit could also divert the time and attention of our management.

Our amended and restated certificate of incorporation designates the Court of Chancery of the State of Delaware as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers, employees or agents.

Our amended and restated certificate of incorporation provides that, unless we consent in writing to an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for any

derivative action or proceeding brought on our behalf, any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers, employees or agents to us or our stockholders, any action asserting a claim arising pursuant to any provision of the DGCL, our amended and restated certificate of incorporation or our amended and restated bylaws or any action asserting a claim that is governed by the internal affairs doctrine, in each case subject to the Court of Chancery having personal jurisdiction over the indispensable parties named as defendants therein and the claim not being one which is vested in the exclusive jurisdiction of a court or forum other than the Court of Chancery or for which the Court of Chancery does not have subject matter jurisdiction. Any person purchasing or otherwise acquiring any interest in any shares of our common stock shall be deemed to have notice of and to have consented to this provision of our amended and restated certificate of incorporation. This choice of forum provision may limit our stockholders' ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers, employees or agents, which may discourage such lawsuits against us and our directors, officers, employees and agents even though an action, if successful, might benefit our stockholders. Stockholders who do bring a claim in the Court of Chancery could face additional litigation costs in pursuing any such claim, particularly if they do not reside in or near Delaware. The Court of Chancery may also reach different judgments or results than would other courts, including courts where a stockholder considering an action may be located or would otherwise choose to bring the action, and such judgments or results may be more favorable to us than to our stockholders. Alternatively, if a court were to find this provision of our amended and restated certificate of incorporation inapplicable to, or unenforceable in respect of, one or more of the specified types of actions or proceedings, we may incur additional costs associated with resolving such matters in other jurisdictions, which could have a material adverse effect on our business, financial condition or results of operations.

Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited.

We have incurred substantial losses during our history and do not expect to become profitable in the near future and we may never achieve profitability. To the extent that we continue to generate taxable losses, unused losses will carry forward to offset future taxable income, if any, until such unused losses expire. Under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, if a corporation undergoes an "ownership change," generally defined as a greater than 50% change (by value) in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards, or NOLs, and other pre-change tax attributes (such as research tax credits) to offset its post-change income or taxes may be limited. The Merger, our prior equity offerings and other changes in our stock ownership may have resulted in ownership changes. In addition, we may experience ownership changes in the future as a result of subsequent shifts in our stock ownership, some of which are outside of our control. As a result, if we earn net taxable income, our ability to use our pre-change net operating loss carryforwards to offset U.S. federal taxable income may be subject to limitations, which could potentially result in increased future tax liability to us. In addition, at the state level, there may be periods during which the use of NOLs is suspended or otherwise limited, which could accelerate or permanently increase state taxes owed.

Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

Our corporate headquarters are located in Skokie, Illinois, where we lease approximately 12,000 square feet of office and laboratory space. The lease for our office and laboratory space in Skokie, Illinois commenced in March 2012 for a lease term of three years. In March 2014, we amended the lease agreement to extend the term for an additional six years, which expires in 2021. In May 2016, we amended the lease agreement to include additional space to be used primarily for administrative functions.

On February 28, 2020, we entered into a ten-year term lease for approximately 30,085 square feet of laboratory and office space in Chicago, Illinois. The location in Chicago will become the Company's corporate headquarters upon occupancy, currently anticipated to occur in the third quarter of 2020.

We believe that suitable additional or alternative space will be available in the future on commercially reasonable terms.

Item 3. Legal Proceedings.

From time to time, we may be subject to legal proceedings. We are not currently a party to or aware of any proceedings that we believe will have, individually or in the aggregate, a material adverse effect on our business, financial condition or results of operations.

Item 4. Mine Safety Disclosures.

Not applicable.

PART II

Item 5. Market For Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases.

Market Information for Common Stock

Our common stock was approved for listing on the Nasdaq Capital Market under the symbol "XCUR" and began trading on July 31, 2019. Our common stock was previously quoted on the OTC Market Group's OTCQB® Market quotation system under the ticker symbol "XCUR" effective at the market open on May 24, 2018.

On March 5, 2020, the last reported sale price of our common stock on the Nasdaq Capital Market was $2.15 per share.

Holders of Record

As of March 5, 2020, we have 87,150,447 shares of common stock outstanding held by 111 stockholders of record. Because many of our shares of common stock are held by brokers and other institutions on behalf of stockholders, we are unable to estimate the total number of beneficial stockholders represented by these record holders.

Dividend Policy

We currently intend to retain future earnings, if any, for use in the operation of our business and to fund future growth. We have never declared or paid cash dividends on our common stock and we do not intend to pay any cash dividends on our common stock for the foreseeable future. Any future determination related to our dividend policy will be made at the discretion of our board of directors in light of conditions then-existing, including factors such as our results of operations, financial condition and requirements, business conditions and covenants under any applicable contractual arrangements.

Securities Authorized for Issuance under Equity Compensation Plans

Information about our equity compensation plans is incorporated herein by reference to Part III, Item 12 of this Annual Report**.**

Performance Graph

Pursuant to the accompanying instructions, the information called for by Item 201(e) of Regulation S-K is not required.

Unregistered Sales of Equity Securities and Use of Proceeds

None.

Item 6. Selected Financial Data.

The following tables set forth selected financial data for us as of and for the years ended December 31, 2019, 2018, 2017, 2016, and 2015 and should be read together with the consolidated financial statements and the related notes and the sections of this Annual Report on Form 10-K entitled "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations" appearing elsewhere in this Annual Report on Form 10-K. The selected financial data in this section is not intended to replace our financial statements and related notes. The selected financial data as of and for the years ended December 31, 2019, 2018, 2017, 2016, and 2015 are derived from our audited consolidated financial statements. Our audited consolidated financial statements as of and for the years ended December 31, 2019 and 2018 are included elsewhere in this Annual Report on Form 10-K. Our historical results are not necessarily indicative of our future results.

	December 31,				
	2019	2018	2017	2016	2015
(in thousands)					
Balance Sheet Data					
Cash and cash equivalents	$ 48,460	$ 26,268	$ 25,764	$ 19,623	$ 18,731
Short-term investments	62,326	—	—	—	—
Current assets	112,776	27,663	27,638	20,041	19,204
Total assets	115,263	28,756	28,987	20,576	19,621
Current portion of long-term debt	4,965	—	—	1,213	—
Current liabilities	31,087	2,043	3,356	12,158	1,343
Long-term debt, net	—	4,925	4,855	4,454	—
Preferred stock warrant liability	—	—	—	201	—
Common stock warrant liability	414	797	523	—	—
Total liabilities	34,516	7,804	9,012	18,128	1,391
Non-redeemable preferred stock					
Series C	—	—	—	33,483	33,039
Series B-2	—	—	—	3,641	3,641
Series B-1	—	—	—	5,371	5,371
Series A	—	—	—	135	135
Common stock	9	4	4	—	—
Additional paid-in capital	162,062	75,942	53,586	(17,578)	(18,293)
Accumulated deficit	(81,297)	(54,994)	(33,615)	(22,604)	(5,663)
Total stockholders' equity	80,747	20,952	19,975	2,448	18,230

(in thousands except share and per share data)	Year Ended December 31,				
	2019	2018	2017	2016	2015
Statement of Operations Data					
Revenue:					
Collaboration revenue	$ 1,296	$ 118	$ 9,719	$ 690	$ —
Grant income	—	—	—	346	2,388
Total revenue	1,296	118	9,719	1,036	2,388
Operating expenses:					
Research and development expense	19,340	14,119	13,080	13,659	10,124
General and administrative expense	8,573	7,818	7,046	3,539	5,408
Total operating expenses	27,913	21,937	20,126	17,198	15,532
Operating loss	(26,617)	(21,819)	(10,407)	(16,162)	(13,144)
Other income (expense), net:					
Interest expense	(786)	(672)	(795)	(724)	—
Other income (loss), net	1,100	78	191	(55)	(7)
Total other income (loss), net	314	(594)	(604)	(779)	(7)
Net loss attributable to members of AuraSense Therapeutics, LLC	—	—	—	—	(7,488)
Net loss attributable to stockholders of Exicure, Inc.	(26,303)	(22,413)	(11,011)	(16,941)	(5,663)
Net loss attributable to members of AuraSense Therapeutics, LLC/stockholders of Exicure, Inc.	$ (26,303)	$ (22,413)	$ (11,011)	$ (16,941)	$ (13,151)
Basic and diluted loss per common share	$ (0.46)	$ (0.54)	$ (1.09)	$ (149.37)	$ (244.13)
Basic and diluted weighted-average common shares outstanding	57,671,734	41,189,177	10,119,569	113,418	53,870

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

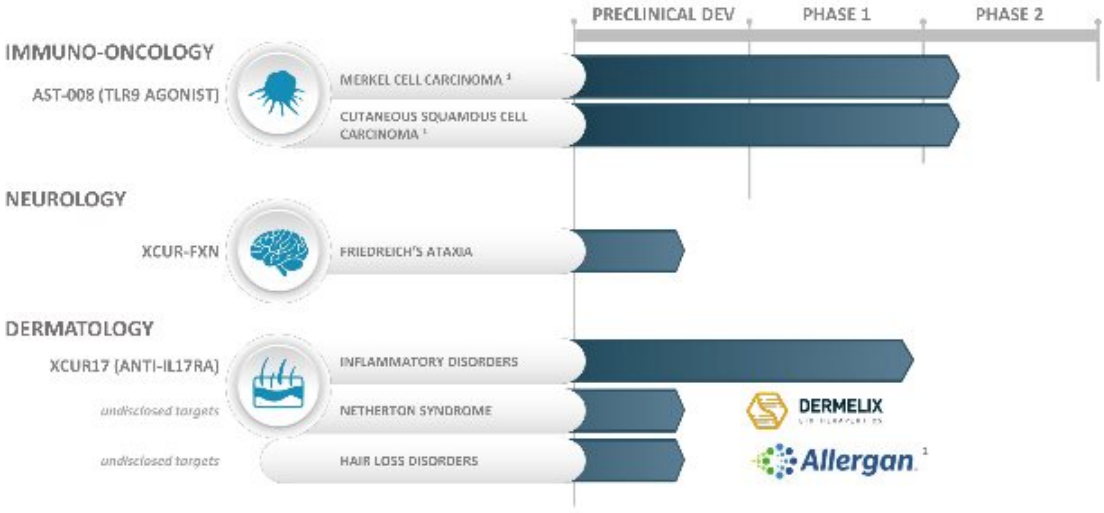
You should read the following discussion and analysis of our financial condition and results of operations together with our consolidated financial statements and the related notes and other financial information included elsewhere in this Annual Report on Form 10-K. Some of the information contained in this discussion and analysis or set forth elsewhere in this Annual Report on Form 10-K, including information with respect to our plans and strategy for our business, includes forward-looking statements that involve risks and uncertainties as described under the heading "Cautionary Note Regarding Forward-Looking Statements" elsewhere in this Annual Report on Form 10-K. You should review the disclosure under the heading "Risk Factors" in this Annual Report on Form 10-K for a discussion of important factors that could cause actual results to differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis.

Operating Overview

We are a clinical-stage biotechnology company developing therapeutics for immuno-oncology, genetic disorders and other indications based on our proprietary Spherical Nucleic Acid, or SNA, technology. SNAs are nanoscale constructs consisting of densely packed synthetic nucleic acid sequences that are radially arranged in three dimensions. We believe the design of our SNAs gives rise to distinct chemical and biological properties that may provide advantages over other nucleic acid therapeutics and enable therapeutic activity outside of the liver. We are working to advance our SNA therapeutic candidates through multiple clinical trials, including the ongoing Phase 1b/2 trial of AST-008 in cancer patients.

We believe that one of the key strengths of our proprietary SNAs is that they have the potential to enter a number of different cells and organs. We have shown in preclinical studies that SNAs may have therapeutic potential in neurology, ophthalmology, pulmonology, and gastroenterology. As a consequence, we have expanded our pipeline into neurology, and are conducting early stage research activities in ophthalmology, pulmonology, and gastroenterology.

The table below sets forth the state of development of our SNA therapeutic candidates as of March 5, 2020:



(1) In combination with checkpoint inhibitors.

(2) On October 14, 2019, the shareholders of Allergan plc voted to approve the acquisition of Allergan by AbbVie Inc., which is subject to customary regulatory approvals and other customary closing conditions.

Immuno-oncology, AST-008

AST-008 is an SNA consisting of toll-like receptor 9, or TLR9, agonists designed for immuno-oncology applications. TLR9 agonists bind to and activate TLR9 receptors. We believe AST-008 may be used for immuno-oncology applications in combination with checkpoint inhibitors. We have observed that, in preclinical studies in a variety of tumor models, AST-008, applied in combination with certain checkpoint inhibitors, exhibited anti-tumor responses and survival rates that were greater than those demonstrated by checkpoint inhibitors alone. We have also demonstrated that AST-008 was active when administered subcutaneously, intratumorally or intravenously, in both prevention and established mouse tumor models. The administration of AST-008 also produced localized as well as abscopal anti-tumor activity in mouse cancer models. Additionally, the administration of AST-008 in combination with certain checkpoint inhibitors conferred adaptive immunity in breast and colon cancer mouse models. In mouse tumor models, administration of AST-008 with anti-PD-1 antibodies suppresses regulatory T-cells, or Tregs, and myeloid-derived suppressor cells, or MDSCs, and increases the levels of CD8 effector T-cells. We believe these important results suggest that the combination of immuno-oncology SNAs and checkpoint inhibitors could potentially treat a larger proportion of cancer patients than checkpoint inhibitors alone.

During the first half of 2019, we opened five clinical trial sites and began recruiting and dosing patients for the Phase 1b/2 trial. The Phase 1b/2 is an open-label, multi-center trial designed to evaluate the safety, tolerability, pharmacokinetics, pharmacodynamics and preliminary efficacy of intratumoral AST-008 injections alone and in combination with intravenous pembrolizumab in patients with advanced solid tumors. We are recruiting patients with advanced or metastatic Merkel cell carcinoma, head and neck squamous cell carcinoma, cutaneous squamous cell carcinoma, and melanoma. The primary outcome measure is the safety and tolerability of AST-008 alone and in combination with pembrolizumab. Secondary outcomes include the recommended Phase 2 dose and disease assessment with RECIST 1.1. As of January 31, 2020, we have dosed 17 patients in the Phase 1b stage of the clinical trial. We have observed no treatment related serious adverse events, or SAEs, nor have we observed any dose-limiting toxicity, or DLT, among the treated subjects. The most common reported adverse event was injection site reactions. In December 2019, we received preliminary results from the Phase 1b/2 stage of the clinical trial showing potential signs of anti-tumor activity in patients with Merkel cell carcinoma. See “Recent Developments” section below for more information regarding these preliminary results. In the second quarter of 2020, we plan to initiate a Phase 2 dose expansion for intratumoral AST-008 in combination with approved checkpoint inhibitor to treat two cohorts of patients with advanced or metastatic Merkel cell carcinoma or cutaneous squamous cell carcinoma. Each cohort is expected to enroll up to 29 patients who have failed anti-PD-1/PD-L1, or programmed cell death protein 1/programmed death-ligand 1, therapy. We expect to open a total of up to 15 sites in the United States.

Neurology

We are investigating the utility of our SNA technology for the treatment of neurological conditions and have ongoing research programs underway. In the fall of 2018, we completed a biodistribution study in rats comparing nusinersen to nusinersen in SNA format. Nusinersen, marketed by Biogen Inc., as Spinraza® is a linear nucleic acid therapeutic approved by the FDA in late 2016 for the treatment of spinal muscular atrophy, or SMA. We found that more nusinersen in SNA format was retained in the rats’ brain and spinal cord compared to nusinersen retained in the rats’ brain and spinal cord at 24, 72 and 168 hours.

On June 26, 2019, we announced data from a preclinical study evaluating the biodistribution of SNAs in the non-human primate central nervous system. In our study, 7 mg of radio-labeled SNAs were injected intrathecally into cynomolgus monkeys. The biodistribution of the SNAs was followed for 14 days by PET/CT scans. SNAs were observed throughout the entire brain and were found both in the brain stem as well as inside the brain. High content of SNA was observed in all 46 regions of the brain examined. These key data indicate that the SNA platform may be well-suited for development of new therapeutics directed towards diseases of the central nervous system.

Friedreich’s ataxia

We are developing XCUR-FXN, an SNA-based therapeutic candidate for the treatment of Friedreich’s ataxia, or FA. FA is an autosomal recessive, neurodegenerative disease characterized by progressively impaired muscle coordination caused by the degeneration of neurons in the cerebellum and dorsal root ganglia in the spinal cord. FA patients may also experience impairment of visual, auditory and speech functions. FA patients also commonly suffer

from life-threatening heart conditions such as hypertrophic cardiomyopathy, myocardial fibrosis and heart failure. The typical age of onset for FA is between 5 and 15 years. An estimated 5,000 patients in the US and 15,000 patients worldwide are affected by FA. There are no FDA-approved treatments for FA.

We have conducted extensive preclinical research evaluating the suitability of our SNA technology for genetically defined neurological diseases, including efficacy studies in animal models, and biodistribution in rodent and non-human primates. Based on the results, we believe we can target FA at the genetic source and meet an important unmet medical need for FA patients. FA is driven by expansion of guanine-adenine-adenine bases of the DNA sequence, or GAA, triplet repeats in the first intron of frataxin, or FXN, gene. The expanded repeat of FXN forms an intramolecular triple-helix, which impairs transcription and reduces levels of frataxin protein. Our strategy will be to use a genetically-targeted SNA therapy to increase FXN protein. Our FA program, XCUR-FXN, will be designed and developed with guidance from and in collaboration with the Friedreich's Ataxia Research Alliance, or FARA, the non-profit, charitable organization dedicated to accelerating research leading to treatments and a cure for FA. We expect to initiate IND-enabling studies for XCUR-FXN in late 2020.

Other neurological indications

We are building on our proof-of-concept work with nusinersen and our therapeutic candidate XCUR-FXN to further explore new therapeutic applications of our SNA technology in neurology. We aim to address indications with great unmet medical need and where we believe the attributes of our SNA technology would lead to therapeutic and commercial advantages. In order to select new therapeutic indications, we expect to analyze a variety of attributes including: (i) indications where there is a known genetic basis for the disorder, (ii) disorders where we can target multiple genes, (iii) the existence of a patient registry or a patient advocacy group that can work with us for easier trial enrollment, (iv) the competitive therapeutic landscape including disorders not easily addressable by small molecules or antibodies, (v) indications with no approved therapies, and (vi) indications amenable to localized therapeutic administration. Based on these and other criteria, we are currently exploring additional neurological conditions, including spinocerebellar ataxia, Batten disease, amyotrophic lateral sclerosis (ALS), and Huntington's disease.

Ophthalmology

We believe that the eye may be an attractive organ for locally-applied SNAs because (i) it is a small and immune-privileged organ, (ii) there are established and non-invasive clinical assessment procedures, and (iii) effective trials can be designed by using a contralateral control eye. We believe that our preclinical data using SNA technology may provide proof-of-concept for expansion of our research and development activities into ophthalmological genetic disorders. Our preclinical data indicated that SNAs distributed to both posterior (retinal) and anterior (cornea) ocular structures, exhibited higher distribution and persisted longer compared to linear oligonucleotides, and did not cause inflammation in the eye.

We believe SNAs may possess key potential advantages over gene therapy in the eye. These key potential advantages include: (i) delivery via intravitreal injections which are safer and easier than subretinal injections, (ii) tunable and reversible control of target expression, and (iii) the ability to treat toxic gain-of-function diseases and target large genes. We believe, based on our internal analysis, that there are approximately 250 rare ophthalmological diseases with known genetic targets, such as CLN3 for Batten disease, BEST1 for vitelliform macular dystrophy, and USH2A for usher syndrome type 2A. As such, we intend to expand our preclinical research and development activities in ophthalmology in 2020 and beyond.

Dermatology

XCUR17

XCUR17 is an SNA that targets the mRNA that encodes interleukin 17 receptor alpha, or IL-17RA, a protein that is considered essential in the initiation and maintenance of psoriasis. Although the availability of inhibitors of TNF revolutionized the systemic treatment of severe psoriasis, studies of disease pathogenesis have shifted attention to the IL-17 pathway in which IL-17RA is a key driver of psoriasis. Our strategy is to reduce the levels of IL-17RA in the skin by topically applying XCUR17.

We filed a clinical trial authorization, or CTA, for a Phase 1 clinical trial of XCUR17 in patients with psoriasis in Germany in the third quarter of 2017, and we began dosing patients in April 2018. The Phase 1 clinical trial, which had final patient visits in the fourth quarter of 2018, was a randomized, double-blinded, placebo-controlled trial in 21 patients with mild to moderate chronic plaque psoriasis designed to assess the safety of XCUR17 formulated as a topical gel, and to evaluate early signs of efficacy. All patients received three strengths of XCUR17 gel, a vehicle gel, and an active comparator (Daivonex® cream), which were all applied on different areas of psoriatic skin within each individual patient.

In the fourth quarter of 2018, we reported results from the Phase 1 trial of XCUR17. In the case of XCUR17, of the 21 treated patients, 11 treated with the highest strength XCUR17 gel were observed to have a reduction in redness and improvement in healing as determined by blinded physician assessments. Further, the highest strength XCUR17 gel showed a statistically significant improvement in psoriasis symptoms versus the vehicle gel. By comparison, 17 of the 21 patients treated with the active comparator showed a clinical response, while four patients treated with the placebo vehicle had a clinical response.

We have observed no adverse safety events related to treatment with XCUR17 in the Phase 1 clinical trial to date. In addition to the safety, tolerability and clinical assessments, the trial measured psoriatic infiltrate thickness over the 26-day treatment period. No relevant changes in mean psoriatic infiltrate thickness were observed for the three XCUR17 gels or the active ingredient-free vehicle gel.

In October 2019, at the 15th Annual Meeting of the Oligonucleotide Therapeutics Society, we disclosed biomarker results from the skin biopsies collected from the 21 patients treated with XCUR17 in the Phase 1 trial. Clinical findings, correlated with psoriasis-related markers and histological changes from biopsies provided by the patients, showed that XCUR17:

- Resulted in a decrease in the levels of psoriasis and inflammation markers downstream of XCUR17's target, IL-17RA;
- Produced a statistically significant reduction in keratin 16 expression, a key marker of psoriasis ($p=0.002$);
- Resulted in reductions in the major inflammatory markers beta defensin 4A, interleukin 19, and interleukin 36A versus psoriatic skin at baseline; and
- Revealed clinical improvements that matched reductions in keratin 16 protein and epidermal thickness.

We believe these findings suggest that SNA-based drugs, such as XCUR17, may address clinical symptoms in patients with inflammatory diseases, such as psoriasis. We currently are not conducting additional clinical activities for XCUR17 and we seek to out-license the XCUR17 program.

Collaboration Programs

Allergan Collaboration Agreement

On November 13, 2019, we entered into a Collaboration, Option and License Agreement, or the Allergan Collaboration Agreement, with a wholly-owned subsidiary of Allergan plc, Allergan Pharmaceuticals International Limited, or Allergan. Pursuant to the Allergan Collaboration Agreement, we granted to Allergan exclusive access and options to license SNA based therapeutics arising from two collaboration programs related to the treatment of hair loss disorders. Under each such license, we grant to Allergan exclusive, royalty-bearing, sublicenseable, nontransferable, worldwide rights to develop, manufacture, use and commercialize such SNA therapeutics.

Under the terms of the Allergan Collaboration Agreement, we received an upfront payment of $25 million, and, if Allergan exercises any of its option rights under the agreement, Allergan will pay us an option exercise fee equal to $10 million for each exercised option, if such option is exercised during the initial option exercise period. Allergan may extend an option exercise period beyond the applicable initial exercise period for a particular program for an additional fee.

If Allergan exercises an option for a program, we are eligible to receive up to an aggregate of $55 million for development milestone payments and $132.5 million for product approval and launch milestones, per program. We are also eligible to receive up to $175 million in sales milestone payments, on a program by program basis, associated with aggregate worldwide sales. In the event a therapeutic candidate subject to the collaboration results in commercial sales, we are eligible to receive tiered royalties at percentages ranging from the mid-single digits to the mid-teens on future net product sales of such commercialized therapeutic candidates. A percentage of the aforementioned payments will be due to Northwestern University, or Northwestern, upon receipt, pursuant to our existing license agreements with Northwestern.

Dermelix Collaboration Agreement

On February 17, 2019, we entered into a License and Development Agreement, or the Dermelix License Agreement, with DERMELIX, LLC, d/b/a Dermelix Biotherapeutics. Under the terms of agreement, Dermelix licensed worldwide rights to research, develop, and commercialize Exicure's technology for the treatment of Netherton Syndrome, or NS, and, at Dermelix's option, up to five additional rare skin indications.

Dermelix will initially develop a targeted therapy for the treatment of NS. NS is a rare and severe autosomal recessive disorder caused by loss-of-function mutations in the *SPINK5* gene, which encodes the serine protease inhibitor LEKTI involved in skin barrier function. NS affects approximately one in 200,000 children born each year, and is characterized by severely inflamed, red, scaled, itchy skin, and patients are at increased risk of mortality in the first year of life due to recurrent infections and dehydration as a result of the impaired skin barrier. Currently, there are no approved treatments for NS patients and off-label use of standard of care treatments are of limited utility.

Under the terms of the Dermelix License Agreement, Exicure received an upfront payment of $1 million at closing of the transaction and will receive an additional $1 million upon the exercise of each of the five options granted to Dermelix. Exicure will be responsible for conducting the early-stage development for each indication up to IND enabling toxicology studies. Dermelix will assume subsequent development, commercial activities and financial responsibility for such indications. Dermelix will pay the costs and expenses of development and commercialization of any licensed products under the Dermelix License Agreement, including our expenses incurred in connection with development activities and in accordance with the development budget. For each of NS as well as any additional licensed product for which Dermelix exercises one of its options, Exicure is eligible to receive potential payments totaling up to $13.5 million upon achievement of certain development and regulatory milestones and up to $152.5 million upon achievement of certain sales milestones per indication in each of six indications. In addition, Exicure will receive low double-digit royalties on annual net sales for SNA therapeutics developed.

Purdue Collaboration Agreement

AST-005

AST-005 is an SNA targeting TNF for the treatment of mild to moderate psoriasis. In a completed Phase 1 clinical trial, AST-005, when topically administered, resulted in no drug associated adverse events, and demonstrated a reduction of TNF mRNA. The TNF mRNA reduction elicited by the highest strength of AST-005 gel was statistically significant when compared to the effects of the vehicle.

In 2016, we entered into a research collaboration, option and license agreement with Purdue Pharma L.P., under which a Phase 1b clinical trial evaluated the effect of AST-005 gel in patients with chronic plaque psoriasis. The trial demonstrated that AST-005 is safe and tolerable in patients at higher doses than previously studied, but did not result in a statistically significant decrease in echo lucent band thickness, one of the key indicators of efficacy. In 2018, Purdue declined to exercise its option to develop AST-005 at that time, but indicated its intent to retain rights relating to the TNF target and reserved its right to continue joint development, with Exicure, of new anti-TNF drug candidates and to retain its exclusivity and other rights in AST-005.

In 2019, Purdue, while re-asserting its right to develop new anti-TNF therapeutic candidates, indicated it will not select any collaboration targets. As a result, we will not receive any research, regulatory and commercial sales milestones contingent upon successful development of such collaboration targets. At this time, there are no active development activities underway for a new anti-TNF therapeutic candidate. As a consequence, we also believe that

it is highly unlikely that we will receive any research, regulatory and commercial sales milestones from Purdue for any anti-TNF therapeutic candidates.

Other operating, financing, and cash flow considerations

Since our inception in 2011, we have devoted substantial resources to the research and development of SNAs and the protection and enhancement of our intellectual property. We have no products approved for sale and all of our $16.9 million in revenue since inception through December 31, 2019 has been primarily earned through our research collaboration, license, and option agreement with Purdue, as a primary contractor or as a subcontractor on government grants, or through our research, collaboration, license and option agreement with Dermelix.

Since our inception and through December 31, 2019, we have primarily funded our operations through (i) sales of common stock in underwritten public offerings in 2019 with aggregate gross proceeds totaling $90.8 million, (ii) sales of common stock in a private placement transaction in 2018 with gross proceeds totaling $22.0 million, (iii) sales of common stock in a private placement transaction in 2017 with gross proceeds totaling $31.5 million, (iv) sales of preferred stock in private placements prior to 2017 with aggregate gross proceeds totaling $42.8 million, (v) debt financing in 2016 totaling $6.0 million, (vi) upfront payments and reimbursements received in connection with various collaboration agreements, and prior to 2017, (vii) amounts in connection with government grants of $5.0 million. In November 2019, we received an upfront payment of $25.0 million in connection with the Allergan Collaboration Agreement and in February 2019 we received an upfront payment of $1.0 million in connection with the Dermelix Collaboration Agreement. In December 2016, we received an upfront payment of $10.0 million in connection with the Purdue Collaboration Agreement. As of December 31, 2019, our cash, cash equivalents, and short-term investments were $110.8 million.

Since our inception, we have incurred significant operating losses. Our net loss was $26.3 million and $22.4 million for the years ended December 31, 2019 and 2018, respectively. As of December 31, 2019, we have generated an accumulated deficit of $100.1 million. Substantially all of our operating losses resulted from expenses incurred in connection with our research programs and from general and administrative costs associated with our operations.

We expect to continue to incur significant and increasing losses in the foreseeable future. Our net losses may fluctuate significantly from quarter to quarter and year to year. We anticipate that our expenses will increase substantially as we:

- advance AST-008 through clinical development for immuno-oncology applications;
- continue research and development in neurological applications;
- advance SNA platform in dermatological indications with suitable partners;
- increase research and development for the discovery and development of additional therapeutic candidates;
- advance other therapeutic candidates through preclinical and clinical development;
- increase our research and development to enhance our technology;
- procure clinical trial materials;
- seek regulatory approval for our therapeutic candidates that successfully complete clinical trials;
- maintain, expand and protect our intellectual property portfolio;
- add operational, financial and management information systems and personnel, including personnel to support our product development and planned future commercialization efforts; and
- operate as a public company.

We have not generated any commercial product revenue nor do we expect to generate substantial revenue from product sales unless and until we successfully complete development and obtain regulatory approval for one or more

of our therapeutic candidates. Successful therapeutic development and regulatory approval are subject to significant uncertainties and we expect such activities will take at least five years. If we obtain regulatory approval for any of our therapeutic candidates, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution. Other sources of revenue could include a combination of research and development payments, license fees and other upfront payments, milestone payments, and royalties in connection with our current and any future collaborations and licenses. Until such time, if ever, that we generate revenue from whatever source, we expect to finance our cash needs through a combination of public or private equity offerings, debt financings and research collaboration and license agreements. We may be unable to raise capital or enter into such other arrangements when needed or on favorable terms. Our failure to raise capital or enter into such other arrangements as and when needed would have a negative impact on our financial condition and our ability to develop our therapeutic candidates.

Basis of Presentation

The audited financial statements of Exicure, Inc. for the fiscal years ended December 31, 2019 and 2018, contained herein, include a summary of our significant accounting policies and should be read in conjunction with the discussion below.

Recent Developments

Allergan Collaboration Agreement

On November 13, 2019, we entered into the Allergan Collaboration Agreement. Refer to *Operating Overview - Collaboration Programs - Allergan Collaboration Agreement* above for more information.

AST-008

In December 2019, we received preliminary results from the Phase 1b/2 trial with AST-008 in patients with solid tumors. The primary objective of the dose escalation portion of the study was to evaluate the safety, tolerability, pharmacokinetics, and pharmacodynamics of AST-008 alone and in combination with pembrolizumab, and to produce a recommended Phase 2 dose. Fourteen patients were enrolled and dosed with AST-008. No treatment-related serious adverse events or dose-limiting toxicities have been observed. The most common reported adverse event was injection site reactions. The fifth and final dose escalation cohort is now open and enrolling.

The study enrolled five melanoma patients, four Merkel cell carcinoma, or MCC, patients, two cutaneous squamous cell carcinoma patients, two head and neck squamous cell carcinoma patients, and one mucosal melanoma patient. Most patients had progressive disease on anti-PD-1/PD-L1 antibodies prior to enrolling.

Available data from the study show that:

- AST-008 administration, alone or in combination with pembrolizumab, produced cytokine and chemokine expression and immune cell activation in patient blood indicative of desired immune activation;
- Of the four MCC patients, one patient, which had previously progressed on anti-PD-1 antibody therapy, has confirmed stable disease with decreased target lesion diameters for a period in excess of 12 weeks, while a second MCC patient experienced a target lesion complete response and a confirmed overall partial response longer than 24 weeks; and
- Nine patients had progressive disease, two patients have not yet been evaluated and one is not evaluable.

Detailed results of the study are expected to be presented at major upcoming oncology meetings. Based on these early results, showing positive biomarker data and initial tumor responses, we anticipate enrolling MCC patients, which have previously failed anti PD-1/PD-L1 therapy, in our Phase 2 study during the second quarter of 2020. We are also considering adding additional cohorts to the trial, including patients with cutaneous squamous cell carcinoma. We expect to open a total of up to 15 sites in the United States.

Friedreich's ataxia

In December 2019, we announced Friedreich's ataxia (FA) as the therapeutic indication for the company's first neurology development program. Refer to *Operating Overview—Neurology–Friedreich's ataxia* above for more information.

Sales of Common Stock

December 2019 Offering

On December 23, 2019, we completed the sale of 10,000,000 shares of our common stock at a public offering price of $2.75 per share in an underwritten public offering (the "December 2019 Offering"). We received gross proceeds of $27.5 million in the December 2019 Offering before deducting underwriting discounts and commissions and offering expenses of $2.2 million.

On January 6, 2020, we sold 1,081,184 shares of our common stock at a price of $2.75 per share pursuant to the exercise of the underwriters' option to purchase additional shares at the public offering price in connection with the December 2019 Offering. We received gross proceeds of $3.0 million in the December 2019 Offering before deducting underwriting discounts and commissions and offering expenses of $0.2 million.

August 2019 Offering

On August 2, 2019, we completed the sale of 31,625,000 shares of our common stock at a public offering price of $2.00 per share in an underwritten public offering, which included the exercise in full of the underwriters' option to purchase an additional 4,125,000 shares at the public offering price (the "August 2019 Offering"). We received gross proceeds of $63.3 million in the August 2019 Offering before deducting underwriting discounts and commissions and offering expenses of $4.4 million.

Trading of Common Stock

In connection with the August 2019 Offering, the Company's common stock was approved for listing on the Nasdaq Capital Market under the symbol "XCUR" and began trading on July 31, 2019.

Board of Director Appointments

On July 31, 2019, our Board of Directors (the "Board") approved an increase to the authorized number of members of the Board from eight to ten. Upon completion of the August 2019 Offering, the Board appointed Bali Muralidhar and Bosun Hau to the Board, effective immediately. Dr. Muralidhar serves as a Class I director, to hold office until the date of the annual meeting of stockholders following the year ending December 31, 2020 or until his earlier, death, resignation or removal. Mr. Hau serves as a Class III director, to hold office until the date of the annual meeting of stockholders following the year ending December 31, 2019 or until his earlier, death, resignation or removal.

On July 21, 2019, the Board, upon the recommendation of the Nominating and Corporate Governance Committee, appointed each of Timothy P. Walbert and Jeffrey L. Cleland to the Board, effective immediately. Each of Mr. Walbert and Dr. Cleland serves as a Class II director, to hold office until the date of the annual meeting of stockholders following the year ending December 31, 2021 or until his earlier death, resignation or removal.

Segment Reporting

We view our operations and manage our business as one segment, which is the discovery, research and development of treatments based on our SNA technology.

Critical Accounting Policies and Significant Judgments and Estimates

Our management's discussion and analysis of financial condition and results of operations is based on our financial statements, which have been prepared in accordance with 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 revenue and expenses incurred during the reported periods. 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 apparent from other sources. Changes in estimates are reflected in reported results for the period in which they become known. Actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are described in the notes to our financial statements appearing in this Annual Report on Form 10-K, we believe that the following critical accounting policies are most important to understanding and evaluating our reported financial results.

Revenue

Effective January 1, 2018, the Company adopted the provisions of Accounting Standards Codification ("ASC") 606, *Revenue from Contracts with Customers* using the modified retrospective method for all contracts not completed as of the date of adoption. The reported results for 2018 reflect the application of ASC 606 guidance.

Under ASC 606, the Company recognizes revenue when its customer obtains control of promised goods or services, in an amount that reflects the consideration which the Company expects to receive in exchange for those goods or services. To determine revenue recognition for arrangements that are within the scope of ASC 606, the Company performs the following five steps:

1. *Identify the contract with the customer.* A contract with a customer exists when (i) the Company enters into an enforceable contract with a customer that defines each party's rights regarding the goods or services to be transferred and identifies the related payment terms, (ii) the contract has commercial substance, and (iii) the Company determines that collection of substantially all consideration for goods and services that are transferred is probable based on the customer's intent and ability to pay the promised consideration. The Company applies judgment in determining the customer's intent and ability to pay, which is based on a variety of factors including the customer's historical payment experience, or in the case of a new customer, published credit and financial information pertaining to the customer.
2. *Identify the performance obligations in the contract.* Performance obligations promised in a contract are identified based on the goods and services that will be transferred to the customer that are both capable of being distinct, whereby the customer can benefit from the good or service either on its own or together with other available resources, and are distinct in the context of the contract, whereby the transfer of the good or service is separately identifiable from other promises in the contract. To the extent a contract includes multiple promised goods and services, the Company must apply judgment to determine whether promised goods and services are both capable of being distinct and distinct in the context of the contract. If these criteria are not met, the promised goods and services are accounted for as a combined performance obligation.
3. *Determine the transaction price.* The transaction price is determined based on the consideration to which the Company will be entitled in exchange for transferring goods and services to the customer. To the extent the transaction price includes variable consideration, the Company estimates the amount of variable consideration that should be included in the transaction price utilizing either the expected value method or the most likely amount method, depending on the nature of the variable consideration. Variable consideration is included in the transaction price if, in the Company's judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. Any estimates, including the effect of the constraint on variable consideration, are evaluated at each reporting period for any changes. Determining the transaction price requires significant judgment.
4. *Allocate the transaction price to performance obligations in the contract.* If the contract contains a single performance obligation, the entire transaction price is allocated to the single performance obligation. However, if a series of distinct services that are substantially the same qualifies as a single performance obligation in a contract with variable consideration, the Company must determine if the variable consideration is attributable to the entire contract or to a specific part of the contract. Contracts that contain multiple performance obligations require an allocation of the transaction price to each performance

obligation on a relative standalone selling price basis unless the transaction price is variable and meets the criteria to be allocated entirely to a performance obligation or to a distinct service that forms part of a single performance obligation. The consideration to be received is allocated among the separate performance obligations based on relative standalone selling prices.

5. *Recognize revenue when or as the Company satisfies a performance obligation.* The Company satisfies performance obligations either over time or at a point in time. Revenue is recognized over time if either (i) the customer simultaneously receives and consumes the benefits provided by the entity's performance, (ii) the entity's performance creates or enhances an asset that the customer controls as the asset is created or enhanced, or (iii) the entity's performance does not create an asset with an alternative use to the entity and the entity has an enforceable right to payment for performance completed to date. If the entity does not satisfy a performance obligation over time, the related performance obligation is satisfied at a point in time by transferring the control of a promised good or service to a customer. Examples of control are using the asset to produce goods or services, enhance the value of other assets, or settle liabilities, and holding or selling the asset.

Licenses of intellectual property: If the license to the Company's intellectual property is determined to be distinct from the other performance obligations identified in the arrangement, the Company recognizes revenues from consideration allocated to the license when the license is transferred to the customer and the customer is able to use and benefit from the licenses. For licenses that are combined with other promises, the Company utilizes judgment to assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, the appropriate method of measuring progress for purposes of recognizing revenue. The Company evaluates the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition.

Milestone payments: At the inception of each arrangement that includes development milestone payments, the Company evaluates the probability of reaching the milestones and estimates the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur in the future, the associated milestone value is included in the transaction price. Milestone payments that are not within the control of the Company or the licensee, such as regulatory approvals, are not considered probable of being achieved until those approvals are received and therefore revenue recognized is constrained as management is unable to assert that a reversal of revenue would not be possible. The transaction price is then allocated to each performance obligation on a relative standalone selling price basis, for which the Company recognizes revenue as or when the performance obligations under the contract are satisfied. At the end of each subsequent reporting period, the Company re-evaluates the probability of achievement of such development milestones and any related constraint, and if necessary, adjusts its estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect collaboration revenues and earnings in the period of adjustment. To date, the Company has not recognized any milestone payment revenue from any of its collaboration agreements.

Royalties: For arrangements that include sales-based royalties, including milestone payments based on levels of sales, and the license is deemed to be the predominant item to which the royalties relate, the Company recognizes revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied). To date, the Company has not recognized any royalty revenue resulting from any of its collaboration agreements.

Through December 31, 2019, the Company has primarily earned revenue under the collaboration agreements with Purdue and Dermelix (see Note 3 to the accompanying consolidated financial statements).

Equity-based compensation

We measure the cost of common stock option awards at fair value and record the cost of the awards, net of estimated forfeitures, on a straight-line basis over the requisite service period. We measure fair value for all common stock options using the Black-Scholes option-pricing model. For all common stock option awards, the fair value measurement date is the date of grant and the requisite service period is the period over which the option recipient is required to provide service in exchange for the common stock option awards, which is generally the vesting period.

The Black-Scholes option-pricing model requires the input of highly subjective assumptions, including: (1) the estimated grant date fair value of our common stock; (2) the option exercise price; (3) the expected term of the option in years; (4) the annualized volatility of the stock; (5) the risk-free interest rate; and (6) the annual rate of quarterly dividends on the stock.

Prior to the commencement of trading of the common stock of Exicure, Inc. on the OTC Market Group's OTCQB® Market quotation system under the ticker symbol "XCUR" effective at the market open on May 24, 2018, the Company's common stock had not yet been publicly traded, therefore the Company estimated the fair value of its common stock underlying its common stock options. The grant date fair value of the Company's common stock had been determined by the Board exercising their judgment in the consideration of a variety of factors. For financial reporting purposes, the Company had periodically estimated the per share fair value of Exicure's common stock at various dates using valuations performed in accordance with the guidance outlined in the American Institute of Certified Public Accountants Practice Aid, Valuation of Privately-Held Company Equity Securities Issued as Compensation (Practice Aid).

The expected term is based upon the "simplified method" as described in Staff Accounting Bulletin Topic 14.D.2. Currently, the Company does not have sufficient experience to provide a reasonable estimate of an expected term of its common stock options. The Company will continue to use the "simplified method" until there is sufficient experience to provide a more reasonable estimate in conformance with ASC 718-10-30-25 through 30-26. The risk-free interest rate assumptions were based on the U.S. Treasury bond rate appropriate for the expected term in effect at the time of grant. The expected volatility is based on calculated enterprise value volatilities for publicly traded companies in the same industry and general stage of development. The estimated forfeiture rates were based on historical experience for similar classes of employees. The dividend yield was based on expected dividends at the time of grant.

Common stock warrant liability

Freestanding warrants related to shares that are redeemable, contingently redeemable, or for purchases of common stock that are not indexed to the Company's own stock are classified as a liability on the Company's balance sheet. The common stock warrants are recorded at fair value, estimated using the Black-Scholes option-pricing model, and marked to market at each balance sheet date with changes in the fair value of the liability recorded in other income (expense), net in the statements of operations.

A 10% change in the estimate of expected volatility at December 31, 2019 would increase or decrease the fair value of the common stock warrant liability in an amount less than $0.1 million. A 10% change in the estimate of fair value of the common stock at December 31, 2019 would increase or decrease the fair value of the common stock warrant liability in an amount less than $0.1 million.

Recently adopted accounting pronouncements

Refer to Note 2 of the accompanying consolidated financial statements for a description of recently adopted accounting pronouncements.

Recent accounting pronouncements not yet adopted

Refer to Note 2 of the accompanying consolidated financial statements for a description of recent accounting pronouncements not yet adopted.

Components of Statements of Operations

Revenue

We have earned all of our revenue through December 31, 2019 through our research collaboration, license, and option agreement with Purdue, our license and development agreement with Dermelix, as a primary contractor or as a subcontractor on government grants, and, beginning in December 2019, through our collaboration, option, and license agreement with Allergan. We do not intend for government grants to be a principal commercial or strategic

focus, but will evaluate opportunities when consistent with our strategic priorities. We have not generated any commercial product revenue and do not expect to generate any product revenue for the foreseeable future.

In the future, we may generate revenue from partnership activities including a combination of research and development payments, license fees and other upfront payments, milestone payments, product sales and royalties, and reimbursement of certain research and development expenses, in connection with the Allergan Collaboration Agreement, the Dermelix Collaboration Agreement, or any future collaborations and licenses. We expect that any such revenue we generate will fluctuate in future periods as a result of the timing of achievement, if at all, of preclinical, clinical, regulatory and commercialization milestones, the timing and amount of any payments to us relating to such milestones and the extent to which any of our therapeutic candidates are approved and successfully commercialized by us or potential development partners. If we, or any potential development partner fails to develop therapeutic candidates in a timely manner or obtain regulatory approval for them, our ability to generate future revenue, and our results of operations and financial position, would be materially and adversely affected.

Research and development expense

Research and development expense consists of costs associated with our research activities, including basic research on our SNA platform, discovery and development of novel SNAs as prospective therapeutic candidates, preclinical and clinical development activities for SNAs we have nominated for clinical development as well as maintaining and protecting our intellectual property. Our research and development expenses include:

- employee-related expenses, including salaries, bonuses, benefits and equity-based compensation expense;
- early research and development expenses incurred under arrangements with third parties, such as contract research organizations, contract manufacturing organizations, and consultants;
- preclinical and clinical development expenses with third parties such as contract research organizations, contract manufacturing organizations, and consultants;
- costs of maintaining and protecting our intellectual property portfolio, including legal advisory fees, license fees, sublicense fees, patent maintenance and other similar fees;
- laboratory materials and supplies;
- facilities, depreciation and other allocated expenses, which include direct and allocated expenses for rent and maintenance of facilities, depreciation of leasehold improvements and equipment and laboratory and other supplies.

We expense research and development costs as they are incurred. A significant portion of our research and development costs are not tracked by project as they benefit multiple projects or our technology.

We expect our research and development expenses to increase for the foreseeable future as we advance our therapeutic candidates through preclinical studies and clinical trials. The process of conducting preclinical studies and clinical trials necessary to obtain regulatory approval is costly and time-consuming. We or future development partners may never succeed in obtaining marketing approval for any of our therapeutic candidates. The probability of success for each therapeutic candidate may be affected by numerous factors, including preclinical data, clinical data, competition, manufacturing capability and commercial viability.

All of our research and development programs are at an early stage and successful development of future therapeutic candidates from these programs is highly uncertain and may not result in approved products. Completion dates and completion costs can vary significantly for each future therapeutic candidate and are difficult to predict. We anticipate we will make determinations as to which therapeutic candidates to pursue and how much funding to direct to each therapeutic candidate on an ongoing basis in response to the early scientific, preclinical and clinical success of each therapeutic candidate, our ability to maintain or enter into development partnerships with respect to a given therapeutic candidate, as well as ongoing assessments of the commercial potential of therapeutic candidates.

We will need to raise additional capital to fund our research and development activities. We have entered into, and may in the future seek, collaborations, licensing or other commercial relationships with other companies in order to advance our various therapeutic candidates. Such collaborations may provide near-term cash payments from the collaborators to us in exchange for license rights or for expense reimbursement, but may also materially reduce the long-term economic benefits that could otherwise be realized from a therapeutic candidate subject to a collaboration in the event that such therapeutic candidate becomes commercially viable. Additional private or public financings may not be available to us on acceptable terms, or at all. Our failure to raise capital as and when needed would have a material adverse effect on our financial condition and our ability to pursue our business strategy.

General and administrative expense

General and administrative expense consists primarily of salaries and related benefits, including equity-based compensation, related to our executive, finance, legal, business development and support functions. Other general and administrative expenses include travel expenses, professional fees for auditing, tax and legal services and allocated facility-related costs not otherwise included in research and development expenses.

We expect that general and administrative expenses will increase in the future as we expand our operating activities and incur additional costs associated with being a growing, publicly-traded company. These increases will likely include legal, accounting and filing fees, directors' and officers' liability insurance premiums and fees associated with investor relations.

Dividend income

Dividend income consists of income earned on our money market funds that are recorded as cash equivalents on our consolidated balance sheets.

Interest income

Interest income consists of income earned on our available for sale securities that are recorded as short-term investments on our consolidated balance sheets, as well as income earned on our cash balances.

Interest expense

Interest expense consists of interest expense pursuant to the loan and security agreement with Hercules Technology Growth Capital, or Hercules, that we closed on February 17, 2016 with an initial advance of $6.0 million. On March 2, 2020, pursuant to the terms of the Hercules loan agreement and subsequent amendments thereto, we repaid all remaining outstanding obligations under the Hercules loan agreement, to include the outstanding principal balance of $5.0 million and a deferred end of term fee of $0.1 million.

Other income (loss), net

Other income (loss), net consists of fair value adjustments of our common stock warrant liabilities and gains and losses on foreign currency transactions.

Results of Operations

Comparison of the Year Ended December 31, 2019 and 2018

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

	Year Ended December 31,			
(dollars in thousands)	**2019**	**2018**	**Change**	
Revenue:				
Collaboration revenue	$ 1,296	$ 118	$ 1,178	998%
Total revenue	1,296	118	1,178	998%
Operating expenses:				
Research and development expense	19,340	14,119	5,221	37%
General and administrative expense	8,573	7,818	755	10%
Total operating expenses	27,913	21,937	5,976	27%
Operating loss	(26,617)	(21,819)	(4,798)	22%
Other income (expense), net:				
Dividend income	543	323	220	68%
Interest income	178	4	174	4,350%
Interest expense	(786)	(672)	(114)	17%
Other income (loss), net	379	(249)	628	n/m
Total other income (loss), net	314	(594)	908	n/m
Net loss	$ (26,303)	$ (22,413)	$ (3,890)	17%

Revenue

The following table summarizes our revenue earned during the periods indicated:

	Year Ended December 31,			
(dollars in thousands)	**2019**	**2018**	**Change**	
Collaboration revenue:				
Dermelix Collaboration Agreement	$ 1,125	$ —	$ 1,125	n/m
Allergan Collaboration Agreement	171	—	171	n/m
Purdue Collaboration Agreement	—	118	(118)	n/m
Total collaboration revenue	$ 1,296	$ 118	$ 1,178	998%
Total revenue	$ 1,296	$ 118	$ 1,178	998%

The collaboration revenue of $1.3 million during the year ended December 31, 2019 is mostly related to the reimbursable research and development activities performed under the Dermelix Collaboration Agreement, for which related costs are presented on a gross basis in the accompanying consolidated statement of operations. We expect to incur additional early stage development costs under the Dermelix Collaboration Agreement in 2020 and expect to be reimbursed by Dermelix for such costs under the terms of the Dermelix Collaboration Agreement. We will recognize both revenue and research and development expense for such costs on a gross basis during the period in which those costs are incurred. The collaboration revenue during the year ended December 31, 2019 also consisted of $0.2 million related to the Allergan Collaboration Agreement. In November 2019, we received an upfront payment of $25.0 million in connection with the Allergan Collaboration Agreement for which revenue has been deferred and will be recognized as revenue in future periods as we satisfy our obligations under the Allergan

Collaboration Agreement. Refer to Note 3 of the accompanying consolidated financial statements for more information regarding revenue recognition for the Allergan Collaboration Agreement.

We do not expect to generate any product revenue for the foreseeable future. However, future revenue may include amounts attributable to partnership activities including, a combination of research and development payments, license fees and other upfront payments, milestone payments, product sales and royalties, and reimbursement of certain research and development expenses, in connection with the Allergan Collaboration Agreement or the Dermelix License Agreement or any future collaboration and licenses.

Research and development expense

The following table summarizes our research and development expenses incurred during the periods indicated:

	Year Ended December 31,			
(dollars in thousands)	2019	2018	Change	
Platform and discovery-related expense	$ 8,442	$ 3,764	$ 4,678	124 %
Clinical development programs expense	5,025	5,607	(582)	(10)%
Employee-related expense	4,677	3,751	926	25 %
Facilities, depreciation, and other expenses	1,196	997	199	20 %
Total research and development expense	$ 19,340	$ 14,119	$ 5,221	37 %
Full time employees	29	20	9	

Research and development expense was $19.3 million for the year ended December 31, 2019 and $14.1 million for the year ended December 31, 2018, an increase of $5.2 million, or 37%. The increase in research and development expense of $5.2 million was primarily due to higher platform and discovery-related expense of $4.7 million, higher employee-related expenses of $0.9 million, and higher facilities, depreciation, and other expenses of $0.2 million, partially offset by a net decrease in costs related to our clinical development programs of $0.6 million.

The increase in platform and discovery-related expense of $4.7 million is mostly due to a license fee of $3.8 million paid in 2019 to Northwestern University in connection with the receipt of the $25.0 million upfront payment from Allergan. The increase in platform and discovery-related expenses in 2019 was also due to higher costs for materials, reagents, lab supplies, and contract research organizations, all in connection with increased research and development activities related to the Dermelix Collaboration and our discovery efforts for a therapeutic candidate for neurology conditions, partially offset by the absence of certain prior-year period costs related to use tax compliance.

The increase in employee-related expense of $0.9 million was due to higher compensation and related costs in connection with salary increases in 2019 for existing employees and the effect of new hires in 2019, as well as recruiting costs related to our search for certain open R&D executive positions. The increase in facilities, depreciation, and other expenses of $0.2 million was mostly due to higher shared corporate costs that were allocated to R&D expense as a result of a higher proportion of R&D employees as compared to G&A employees in the current year.

The net decrease in clinical development programs expense of $0.6 million was primarily due to lower clinical trial expense for XCUR17 incurred during 2019, partially offset by higher clinical trial expense for AST-008.

We expect our research and development expenses to increase in 2020 as we broaden our pipeline of SNA-based therapeutic candidates, continue spending on our clinical development programs, and further develop our SNA technology platform.

General and administrative expense

(dollars in thousands)	Year Ended December 31, 2019	2018	Change	
General and administrative expense	$ 8,573	$ 7,818	$ 755	10%
Full time employees	7	7	—	

General and administrative expense was $8.6 million for the year ended December 31, 2019 and $7.8 million for the year ended December 31, 2018, an increase of $0.8 million, or 10%. This increase is mostly due higher compensation and related costs in connection with salary increases in 2019, costs to recruit two new board members and an open executive position, Nasdaq listing costs, lease costs associated with our Cambridge, MA office lease, and higher D&O insurance expense, partially offset by lower legal fees of approximately $0.3 million related to a change in mix of transaction support.

Dividend income

The increase in dividend income of $0.2 million in 2019 was the result of higher average balances invested in money market funds during 2019 as compared to 2018.

Interest income

The increase in interest income of $0.2 million in 2019 was the result of higher average balances invested in available for sale securities during 2019 as compared to 2018.

Interest expense

Interest expense consists of interest expense pursuant to the loan and security agreement with Hercules that we closed on February 17, 2016 with an initial advance of $6.0 million. On March 2, 2020, pursuant to the terms of the Hercules loan agreement and subsequent amendments thereto, the Company repaid all remaining outstanding obligations under the Hercules loan agreement, to include the outstanding principal balance of $5.0 million and a deferred end of term fee of $0.1 million.

Other income (loss), net

Other income (loss), net consists of fair value adjustments of our common stock warrant liabilities and gains and losses on foreign currency transactions. The increase in other income (loss), net of $0.6 million is mostly due to the fair value adjustment of our common stock warrant liability. During the year ended December 31, 2019, we recognized a non-cash gain of $0.4 million as compared to a non-cash loss of $0.3 million during the year ended December 31, 2018 in connection with the fair value adjustment of our common stock warrant liability at the periods then ended.

Inflation

We do not believe that inflation has had a material adverse impact on our revenues or operations in any of the past three years.

Liquidity and Capital Resources

Overview

Since our inception and through December 31, 2019, we have primarily funded our operations through (i) sales of common stock in underwritten public offerings in 2019 with aggregate gross proceeds totaling $90.8 million, (ii) sales of common stock in a private placement transaction in 2018 with gross proceeds totaling $22.0 million, (iii) sales of common stock in a private placement transaction in 2017 with gross proceeds totaling $31.5 million, (iv) sales of preferred stock in private placements prior to 2017 with aggregate gross proceeds totaling $42.8 million, (v)

debt financing in 2016 totaling $6.0 million, (vi) upfront payments and reimbursements received in connection with various collaboration agreements, and prior to 2017, (vii) amounts in connection with government grants of $5.0 million. In November 2019, we received an upfront payment of $25.0 million in connection with the Allergan Collaboration Agreement and in February 2019 we received an upfront payment of $1.0 million in connection with the Dermelix Collaboration Agreement. In December 2016, we received an upfront payment of $10.0 million in connection with the Purdue Collaboration Agreement. As of December 31, 2019, our cash, cash equivalents, and short-term investments were $110.8 million.

In March 2019, we filed a shelf registration statement on Form S-3 with the SEC which was declared effective by the SEC on July 24, 2019. The shelf registration statement allows us to sell from time-to-time up to $125.0 million of common stock, preferred stock, debt securities, warrants, or units comprised of any combination of these securities, for our own account in one or more offerings; the remaining amount available under this shelf registration after the December 2019 Offering (inclusive of the exercise of the underwriters' option in January 2020 to purchase additional shares at the public offering price in connection with the December 2019 Offering) is approximately $31.3 million. The shelf registration statement is intended to provide us flexibility to conduct registered sales of our securities, subject to market conditions and our future capital needs. The terms of any offering under the shelf registration statement will be established at the time of such offering and will be described in a prospectus supplement filed with the SEC prior to the completion of any such offering.

On August 2, 2019, we completed the August 2019 Offering, pursuant to which we sold 31,625,000 shares of our common stock at a public offering price of $2.00 per share in an underwritten public offering, which included the exercise in full of the underwriters' option to purchase an additional 4,125,000 shares at the public offering price. We received gross proceeds of $63.3 million in the August 2019 Offering before deducting underwriting discounts and commissions and estimated offering expenses of approximately $4.4 million.

On December 23, 2019, we completed the sale of 10,000,000 shares of our common stock at a public offering price of $2.75 per share in the December 2019 Offering. We received gross proceeds of $27.5 million in the December 2019 Offering before deducting underwriting discounts and commissions and offering expenses of $2.2 million.

On January 6, 2020, we sold 1,081,184 shares of our common stock at a price of $2.75 per share pursuant to the exercise of the underwriters' option to purchase additional shares at the public offering price in connection with the December 2019 Offering. We received gross proceeds of $3.0 million in the December 2019 Offering before deducting underwriting discounts and commissions and offering expenses of $0.2 million.

Since our inception, we have not generated any product revenue and have incurred recurring net losses. Our Company is not profitable, and we cannot provide any assurance that we will ever be profitable. As of December 31, 2019, we have generated an accumulated deficit of $100.1 million. Based on our current operating plans, we believe that existing working capital at December 31, 2019 is sufficient to fund our operations into early 2022.

See "—Funding Requirements" below for additional information on our future capital needs.

Cash Flows

The following table shows a summary of our cash flows for the years ended December 31, 2019 and 2018:

	Years Ended December 31,	
(in thousands)	**2019**	**2018**
Net cash provided by (used in) operating activities	$ 1,317	$ (19,487)
Net cash used in investing activities	(63,432)	(94)
Net cash provided by financing activities	84,307	20,085
Net increase in cash and cash equivalents	$ 22,192	$ 504

Operating activities

Net cash provided by (used in) operating activities was $1.3 million and $19.5 million for the years ended December 31, 2019 and 2018, respectively. The increase in cash provided by operating activities of $20.8 million was primarily due to the receipt of a $25.0 million upfront payment in connection with the Allergan Collaboration Agreement, partially offset by the payment of $3.8 million to Northwestern University in connection with the receipt of the upfront payment from Allergan as well as higher cash used for working capital in 2019 as compared to 2018.

Investing activities

Net cash used in investing activities was $63.4 million and $0.1 million for the years ended December 31, 2019 and 2018, respectively. The increase in cash used in investing activities of $63.3 million is mostly due to the purchase of available for sale securities of $62.4 million in 2019, as well as increased purchases of scientific equipment.

Financing activities

Net cash provided by financing activities of $84.3 million for the year ended December 31, 2019 is primarily due to the sale of common stock in the December 2019 Offering and August 2019 Offering. In the December 2019 Offering, we completed the sale of 10,000,000 shares of our common stock at a public offering price of $2.75 per share, resulting in $27.5 million in gross proceeds to the Company. The aggregate net proceeds from the December 2019 Offering (after deducting underwriting discounts and commissions and expenses of the offering of $2.2 million) were approximately $25.3 million. In the August 2019 Offering, we completed the sale of 31,625,000 shares of our common stock at a public offering price of $2.00 per share, resulting in approximately $63.3 million of gross proceeds to the Company. The aggregate net proceeds from the August 2019 Offering (after deducting underwriting discounts and commissions and expenses of the offering of $4.4 million) were approximately $58.9 million.

Net cash provided by financing activities of $20.1 million for the year ended December 31, 2018 is primarily due to the sale of common stock in the August 2018 Private Placement. On August 22, 2018, we sold 4,889,217 shares of the Company's common stock at a purchase price of $4.50 per share, resulting in approximately $22.0 million in gross proceeds to the Company. The aggregate net proceeds from the August 2018 Private Placement (after deducting placement agent fees and expenses of the offering of $1.9 million) were $20.1 million.

Hercules Loan and Security Agreement

On February 17, 2016, we entered into a loan and security agreement with Hercules. The loan agreement provided for funding in an aggregate principal amount of up to $10.0 million in two separate tranches. The first tranche was funded on February 17, 2016 in the amount of $6.0 million. A second tranche of $4.0 million was available provided that we met certain milestones on or before December 31, 2016. We did not meet these milestones and, therefore, we did not draw the second tranche, the availability of which expired on December 31, 2016. The principal balance of the term loan under the Hercules loan facility bears interest at a floating per annum interest rate (based on a year consisting of 360 days) equal to the greater of either (i) 9.95% or (ii) the sum of (a) 9.95% plus (b) the prime rate (as reported in The Wall Street Journal) minus 3.50%. As of December 31, 2019, the interest rate on the term loan with Hercules was 11.20%. We were required to make interest-only payments through June 2017. Commencing on July 1, 2017, the loan began amortizing in equal monthly installments of principal and interest in an amount sufficient to fully amortize the outstanding principal balance of the loan over the remaining scheduled monthly payments due prior to the maturity date on September 1, 2019. Pursuant to an amendment dated January 15, 2018, amortization payments due for the thirteen (13) consecutive months commencing on December 1, 2017 through and including December 1, 2018 were deferred. Commencing on January 1, 2019 and continuing on the first business day of each month thereafter, the loan, including the deferred payments, was to begin amortizing in equal monthly installments of principal and interest based upon an amortization schedule equal to eighteen (18) consecutive months. Any remaining obligations under the loan agreement and other loan documents were due and payable on the maturity date. On December 28, 2018, the Company and Hercules further amended its loan agreement so that interest amounts were payable on the first day of each business month and any remaining obligations under the loan agreement and other loan documents were due and payable on the maturity date on

September 1, 2019. On the earliest to occur of the maturity date, the date we prepay the term loan in full or the date the loan otherwise becomes due and payable, we must pay the lender under the agreement an additional charge equal to 3.85% of the total amounts funded under the loan agreement. On September 1, 2019, we paid a deferred fee of $0.2 million to Hercules in accordance with our loan agreement and subsequent amendments.

On March 8, 2019, the Company and Hercules further amended its loan agreement so that the maturity date of its loan agreement is extended to March 1, 2020 ("New Maturity Date") and amortization payments are deferred to, and payable at, the New Maturity Date as well as a deferred end of term fee of $0.1 million to be payable at the New Maturity Date.

On March 2, 2020, pursuant to the terms of the Hercules loan agreement and subsequent amendments thereto, the Company repaid all remaining outstanding obligations under the Hercules loan agreement, to include the outstanding principal balance of $5.0 million and a deferred end of term fee of $0.1 million.

If we prepaid the term loan on or prior to February 1, 2017, we would have been required to pay a prepayment charge equal to 3% of the amount being prepaid, if we prepaid the term loan after February 1, 2017 but on or prior to February 1, 2018, we would have been required to pay a prepayment charge equal to 2% of the amount being prepaid, and if we prepaid the term loan after February 1, 2018, we would have been required to pay a prepayment charge of 1% of the amount being prepaid.

The term loan under the Hercules loan facility was secured by substantially all of our assets, other than intellectual property, which is the subject of a negative pledge. Under the loan agreement, we were subject to certain customary covenants that limited or restricted our ability to, among other things, incur additional indebtedness, grant any security interests, pay cash dividends, repurchase our common stock, make loans, or enter into certain transactions without Hercules' prior consent. The loan agreement was amended on October 10, 2016 to revise the language granting Hercules a contingent security interest in certain of our assets.

Under the loan agreement, Hercules or its affiliates had a right to participate in a single subsequent unregistered financing by us in an amount of up $1.0 million on the same terms, conditions and pricing afforded to others participating in such financing. Hercules did not exercise this right to participate which expired on the New Maturity Date.

Funding Requirements

We expect that our primary uses of capital will continue to be third-party clinical and research and development services, compensation and related expenses, laboratory and related supplies, legal and other regulatory expenses and general overhead costs. Based on our current operating plans, we believe that existing working capital at December 31, 2019 is sufficient to fund our operations into early 2022. However, we may require additional capital for the further development of our existing therapeutic candidates and may also need to raise additional funds sooner to pursue other development activities related to additional therapeutic candidates. We believe that we will be able to obtain additional working capital through equity financings, partnerships and licensing, or other arrangements to fund our current operating plans, which we believe will allow us to execute on the strategy and pipeline development as described in this Annual Report on Form 10-K. To the extent that we raise additional capital through future equity financings, the ownership interest of our stockholders will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our existing common stockholders. If we raise additional funds through the issuance of debt securities, these securities could contain covenants that would restrict our operations. We cannot assure you that such additional financing, if available, can be obtained on terms acceptable to us. If we are unable to obtain such additional financing, we would need to reevaluate our future operating plans.

Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement that involves risks and uncertainties, and actual results could vary materially as a result of a number of factors. We have based this estimate on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we currently expect. Our future capital requirements are difficult to forecast and will depend on many factors, including:

- the terms and timing of any other collaboration, licensing and other arrangements that we may establish;
- the initiation, progress, timing and completion of preclinical studies and clinical trials for our potential therapeutic candidates;
- the number and characteristics of therapeutic candidates that we pursue;
- the progress, costs and results of our preclinical studies and clinical trials;
- the outcome, timing and cost of regulatory approvals;
- delays that may be caused by changing regulatory requirements;
- the cost and timing of hiring new employees to support our continued growth;
- unknown legal, administrative, regulatory, accounting, and information technology costs as well as additional costs associated with operating as a public company;
- the costs involved in filing and prosecuting patent applications and enforcing and defending patent claims;
- the costs of filing and prosecuting intellectual property rights and enforcing and defending any intellectual property-related claims;
- the costs and timing of procuring clinical and commercial supplies of our therapeutic candidates;
- the extent to which we acquire or in-license other therapeutic candidates and technologies; and
- the extent to which we acquire or invest in other businesses, therapeutic candidates or technologies.

Please see the section titled "Risk Factors" elsewhere in this Annual Report on Form 10-K for additional risks associated with our substantial capital requirements.

Until such time, if ever, we generate product revenue, we expect to finance our cash needs through a combination of public or private equity offerings, debt financings and research collaboration and license agreements. We may be unable to raise capital or enter into such other arrangements when needed or on favorable terms or at all. Our failure to raise capital or enter into such other arrangements as and when needed would have a negative impact on our financial condition and our ability to develop our therapeutic candidates.

Contractual Obligations and Commitments

The following is a summary of our significant contractual obligations as of December 31, 2019 (in thousands):

	Payments Due by Period				
Contractual Obligations	**Total**	**Less than 1 Year**	**1-3 Years**	**3-5 Years**	**After 5 Years**
Long-term debt (1)	$ 5,000	$ 5,000	$ —	$ —	$ —
Operating lease obligations (2)	383	324	59	—	—
Interest payments on long-term debt	142	142	—	—	—
Total	$ 5,525	$ 5,466	$ 59	$ —	$ —

(1) Includes principal only, which we paid at maturity on March 2, 2020.
(2) Future minimum lease payments under our non-cancelable operating lease for our current office and lab space in Skokie, Illinois that expires in February 2021.

We enter into agreements in the normal course of business with contract research organizations and vendors for clinical trials, preclinical studies, and other services and products for operating purposes which are cancelable at any

time by us, generally upon 30 days prior written notice. We also have obligations to make future payments to Northwestern University that become due and payable on the achievement of certain commercial milestones. These payments are not included in this table of contractual obligations.

Off-balance Sheet Arrangements

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

JOBS Act

In April 2012, the Jumpstart Our Business Startups Act of 2012 (the "JOBS Act") was enacted by the federal government. Section 107 of the JOBS Act provides that an emerging growth company can take advantage of the extended transition period for complying with new or revised accounting standards. Thus, an emerging growth company can delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have irrevocably elected not to avail ourselves of this extended transition period and, as a result, we will adopt new or revised accounting standards on the relevant dates on which adoption of such standards is required for other public companies.

In addition, as an emerging growth company, we will not be required to provide an auditor's attestation report on our internal control over financial reporting in future annual reports on Form 10-K as otherwise required by Section 404(b) of the Sarbanes-Oxley Act.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk.

The primary objectives of our investment activities are to ensure liquidity and to preserve principal while at the same time maximizing the income we receive from our marketable securities without significantly increasing risk. Some of the securities that we invest in may have market risk related to changes in interest rates. As of December 31, 2019, we had cash and cash equivalents of $48.5 million, primarily held in money market funds, consisting of U.S. government-backed securities, and interest-bearing money market accounts. As of December 31, 2019, we had short-term investments of $62.3 million consisting of debt instruments of corporations, the U.S. Treasury, financial institutions, and U.S. government agencies with strong credit ratings and an investment grade rating at or above a long-term rating of Aa3/AA- and a short-term rating of P1/A1. Our primary exposure to market risk is interest rate sensitivity, which is affected by changes in the general level of U.S. interest rates. Due to the short-term maturities of our cash equivalents and the low risk profile of our investments, an immediate 100 basis point change in interest rates would not have a material effect on the fair market value of our cash equivalents. To minimize the risk in the future, we intend to maintain our portfolio of cash equivalents and short-term investments in a variety of securities, including commercial paper, money market funds, government and non-government debt securities and corporate obligations.

We are subject to interest rate risk in connection with our borrowings under the $6.0 million term loan with Hercules. The principal balance of the term loan under the Hercules loan facility bears interest at a floating per annum interest rate (based on a year consisting of 360 days) equal to the greater of (i) 9.95% or (ii) the sum of (a) 9.95% plus (b) the prime rate (as reported in The Wall Street Journal) minus 3.50% which bears interest at a variable per annum rate calculated for any day as the greater of (i) the prime rate plus 6.80%, and (ii) 10.55%. We currently do not engage in any interest rate hedging activity and we have no intention to do so in the foreseeable future. Based on the current interest rate of the term loan with Hercules and the scheduled payments thereunder, we believe a 100 basis point increase in interest rates would not have a material impact on our financial condition or results of operations.

While we contract with certain vendors internationally, substantially all of our total liabilities as of December 31, 2019 were denominated in the United States dollar and we believe that we do not have any material exposure to foreign currency exchange rate risk.

Item 8. Financial Statements and Supplementary Data.

EXICURE, INC.
INDEX TO FINANCIAL STATEMENTS

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors

Exicure, Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Exicure, Inc. and subsidiary (the Company) as of December 31, 2019 and 2018, the related consolidated statements of operations, comprehensive loss, changes in stockholders' equity, and cash flows for each of the years in the two-year period ended December 31, 2019, and the related notes (collectively, the consolidated financial statements). In our opinion, the consolidated 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 years in the two-year period ended December 31, 2019, in conformity with U.S. generally accepted accounting principles.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company has changed its method of accounting for leases as of January 1, 2019 due to the adoption of the Financial Accounting Standards Board Accounting Standards Codification (ASC) Topic 842, *Leases*.

Basis for Opinion

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

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits, we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

(signed) KPMG LLP

We have served as the Company's auditor since 2014.

Chicago, Illinois
March 9, 2020

EXICURE, INC.

CONSOLIDATED BALANCE SHEETS
(in thousands, except share and per share data)

	December 31,	
	2019	2018
ASSETS		
Current assets:		
Cash and cash equivalents	$ 48,460	$ 26,268
Short-term investments	62,326	—
Accounts receivable	16	—
Unbilled revenue receivable	19	3
Prepaid expenses and other assets	1,955	1,392
Total current assets	112,776	27,663
Property and equipment, net	2,099	1,061
Other noncurrent assets	388	32
Total assets	$ 115,263	$ 28,756
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Current portion of long-term debt	$ 4,965	$ —
Accounts payable	1,814	500
Accrued expenses and other current liabilities	2,435	1,543
Current portion of deferred revenue	21,873	—
Total current liabilities	31,087	2,043
Long-term debt, net	—	4,925
Common stock warrant liability	414	797
Deferred revenue non-current	2,956	—
Other noncurrent liabilities	59	39
Total liabilities	$ 34,516	$ 7,804
Stockholders' equity:		
Common stock, $0.0001 par value per share; 200,000,000 shares authorized, 86,069,263 issued and outstanding, December 31, 2019; 44,358,000 shares issued and outstanding, December 31, 2018	9	4
Additional paid-in capital	162,062	75,942
Accumulated other comprehensive loss	(27)	—
Accumulated deficit	(81,297)	(54,994)
Total stockholders' equity	80,747	20,952
Total liabilities and stockholders' equity	$ 115,263	$ 28,756

See Accompanying Notes to Consolidated Financial Statements.

EXICURE, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS
(in thousands, except share and per share data)

	Year Ended December 31,	
	2019	**2018**
Revenue:		
Collaboration revenue	$ 1,296	$ 118
Total revenue	1,296	118
Operating expenses:		
Research and development expense	19,340	14,119
General and administrative expense	8,573	7,818
Total operating expenses	27,913	21,937
Operating loss	(26,617)	(21,819)
Other income (expense), net:		
Dividend income	543	323
Interest income	178	4
Interest expense	(786)	(672)
Other income (loss), net	379	(249)
Total other income (loss), net	314	(594)
Net loss	$ (26,303)	$ (22,413)
Basic and diluted loss per common share	$ (0.46)	$ (0.54)
Basic and diluted weighted-average common shares outstanding	57,671,734	41,189,177

See Accompanying Notes to Consolidated Financial Statements.

EXICURE, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(in thousands, except share and per share data)

	Year Ended December 31,	
	2019	**2018**
Net loss	$ (26,303)	$ (22,413)
Other comprehensive loss, net of taxes		
Unrealized losses on available for sale securities, net of tax	(27)	—
Other comprehensive loss	(27)	—
Comprehensive loss	$ (26,330)	$ (22,413)

See Accompanying Notes to Consolidated Financial Statements.

EXICURE, INC.

CONSOLIDATED STATEMENTS OF CHANGES IN STOCKHOLDERS' EQUITY
(in thousands, except shares)

	Common Stock					
	Shares	$	Additional Paid-in- Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
Balance at December 31, 2017	**39,300,823**	**$ 4**	**$ 53,586**	**$ (33,615)**	**$ —**	**$ 19,975**
Adoption of new accounting standard - ASC 606	—	—	—	1,034	—	1,034
Balance at January 1, 2018	**39,300,823**	**$ 4**	**$ 53,586**	**$ (32,581)**	**$ —**	**$ 21,009**
Exercise of options	22,494	—	41	—	—	41
Equity-based compensation	—	—	1,809	—	—	1,809
Issuance of common stock to consultants, net	145,466	—	436	—	—	436
Issuance of common stock in private placement, net	4,889,217	—	20,070	—	—	20,070
Net loss	—	—	—	(22,413)	—	(22,413)
Balance at December 31, 2018	**44,358,000**	**$ 4**	**$ 75,942**	**$ (54,994)**	**$ —**	**$ 20,952**
Exercise of options	86,263	—	75	—		75
Equity-based compensation	—	—	1,840	—	—	1,840
Issuance of common stock in August 2019 Offering, net	31,625,000	4	58,862	—	—	58,866
Issuance of common stock in December 2019 Offering, net	10,000,000	1	25,343	—	—	25,344
Other comprehensive loss, net	—	—	—	—	(27)	(27)
Net loss	—	—	—	(26,303)	—	(26,303)
Balance at December 31, 2019	**86,069,263**	**$ 9**	**$ 162,062**	**$ (81,297)**	**$ (27)**	**$ 80,747**

See Accompanying Notes to Consolidated Financial Statements.

EXICURE, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended December 31,	
	2019	**2018**
Cash flows from operating activities:		
Net loss	$ (26,303)	$ (22,413)
Adjustments to reconcile net loss to cash used in operating activities:		
Depreciation and amortization	392	358
Equity-based compensation	1,840	1,809
Amortization of operating lease asset	332	—
Amortization of long-term debt issuance costs and fees	192	96
Other	36	400
Change in fair value of warrant liabilities	(383)	274
Changes in operating assets and liabilities:		
Unbilled revenue receivable and accounts receivable	(32)	10
Prepaid expenses and other current assets	(631)	505
Accounts payable	789	(557)
Accrued expenses and other current liabilities	578	270
Deferred revenue	24,829	—
Other noncurrent liabilities	(322)	(239)
Net cash provided by (used in) operating activities	1,317	(19,487)
Cash flows from investing activities:		
Purchase of available for sale securities	(62,350)	—
Capital expenditures	(1,082)	(94)
Net cash used in investing activities	(63,432)	(94)
Cash flows from financing activities:		
Proceeds from common stock offering	90,750	22,001
Proceeds from exercise of common stock options	75	41
Payment of long-term debt fees and issuance costs	(283)	(26)
Payment of common stock financing costs	(6,235)	(1,931)
Net cash provided by financing activities	84,307	20,085
Net increase in cash and cash equivalents	22,192	504
Cash and cash equivalents - beginning of period	26,268	25,764
Cash and cash equivalents - end of period	$ 48,460	$ 26,268
Supplemental disclosure of cash flow information		
Non-cash financing activities:		
Issuance of common stock for professional services	$ —	$ 436
Debt fees (accrued expenses)	100	—
Common stock issuance costs (accounts payable and accrued expenses)	305	—
Non-cash investing activities:		
Capital expenditures (accounts payable and accrued expenses)	348	8

See Accompanying Notes to Consolidated Financial Statements.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

1. Description of Business and Basis of Presentation

Description of Business

Exicure, Inc. (the "Company") is a clinical-stage biotechnology company developing therapeutics for immuno-oncology, genetic disorders and other indications based on its proprietary Spherical Nucleic Acid ("SNA") technology. The Company believes that the design of its SNAs gives rise to distinct chemical and biological properties that may provide advantages over other nucleic acid therapeutics and enable therapeutic activity outside of the liver. The Company is working to advance its SNA therapeutic candidates through multiple clinical trials, including the ongoing Phase 1b/2 trial of AST-008 in cancer patients. The Company intends to build a leading nucleic acid therapeutics company focused on the discovery and development of therapeutics based on the Company's proprietary SNA technology, either on its own or in collaboration with pharmaceutical partners.

In connection with the August 2019 Offering (see Note 8), the Company's common stock was approved for listing on the Nasdaq Capital Market under the symbol "XCUR" and began trading on July 31, 2019.

Throughout these consolidated financial statements, the terms "the Company" and "Exicure" refer to Exicure, Inc. and its 100% owned subsidiary, Exicure Operating Company. Exicure Operating Company holds all material assets, and conducts all business activities and operations, of the Company.

The Merger

On September 26, 2017, pursuant to the merger agreement, Max-1 Acquisition Sub, Inc., a wholly-owned subsidiary of Max-1 Acquisition Corporation ("Max-1"), merged with and into Exicure Operating Company (f/k/a Exicure, Inc.), a privately-held Delaware corporation referred to herein as Exicure OpCo, with Exicure OpCo remaining as the surviving entity and a wholly-owned operating subsidiary of Max-1 (the "Merger"). The Merger was effective as of September 26, 2017 (the "Effective Time"), upon the filing of a Certificate of Merger with the Secretary of State of the State of Delaware.

At the Effective Time, the legal existence of Max-1 Acquisition Sub, Inc. ceased. At the Effective Time, each share of Exicure OpCo common and preferred stock (other than shares of Exicure OpCo's Series C preferred stock) issued and outstanding immediately prior to the closing of the Merger was converted into 0.49649 shares of Max-1's common stock, and each share of Exicure OpCo's Series C preferred stock issued and outstanding immediately prior to the closing of the Merger was converted into 0.7666652 shares of Max-1's common stock. As a result, an aggregate of 26,666,627 shares of Max-1's common stock were issued to the holders of Exicure OpCo's capital stock, which is incremental to the 2,080,000 shares of Max-1 common stock that were outstanding immediately prior to the Merger. In addition, pursuant to the Merger Agreement, options to purchase 7,414,115 shares of Exicure OpCo common stock issued and outstanding immediately prior to the closing of the Merger were assumed by Max-1 and converted into options to purchase 3,680,997 shares of Max-1's common stock. After the filing of the Certificate of Merger with the Secretary of State of the State of Delaware, Max-1 changed its name to Exicure, Inc.

Basis of Presentation

The accompanying consolidated financial statements as of December 31, 2019 and 2018, and for the years then ended, have been presented in conformity with generally accepted accounting principles in the United States ("GAAP").

Principles of Consolidation

The accompanying consolidated financial statements include the accounts of Exicure, Inc. and its 100% owned subsidiary, Exicure Operating Company. All intercompany transactions and accounts are eliminated in consolidation.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

Liquidity Risk

As of December 31, 2019, the Company has generated an accumulated deficit of $100,134 since inception and expects to incur significant expenses and negative cash flows for the foreseeable future. Based on the Company's current operating plans, it believes that existing working capital at December 31, 2019 is sufficient to fund its current operating plans for at least the next 12 months. Management believes that it will be able to obtain additional working capital through equity financings, partnerships and licensing, or other arrangements, to fund operations. However, there can be no assurance that such additional financing will be available and, if available, can be obtained on terms acceptable to the Company.

Use of Estimates

The preparation of the financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Management bases its estimates on certain assumptions which it believes are reasonable in the circumstance and while actual results could differ from those estimates, management does not believe that any change in those assumptions in the near term would have a significant effect on the Company's financial position, results of operations or cash flows. Actual results in future periods could differ from those estimates.

2. Significant Accounting Policies

Cash, cash equivalents, and short-term investments

The Company considers all highly liquid investments with original maturities of three months or less to be cash equivalents. The Company's short-term investments have initial maturities of greater than three months from date of purchase. The Company classifies its marketable debt security investments as "available-for-sale" and carries them at fair market value based upon prices on the last day of the fiscal period for identical or similar items. The Company records unrealized gains and losses on marketable debt securities in other comprehensive loss as a component of stockholders' equity until realized. Any premium or discount arising at purchase is amortized and/or accreted to interest income and/or interest expense over the life of the of the underlying security. Realized gains and losses are included in other income (expense). The Company uses the specific identification method to determine the cost of securities sold.

Accounts receivable and unbilled revenue receivable

The Company makes judgments as to its ability to collect outstanding receivables and provides an allowance for receivables when collection becomes doubtful. The Company's receivables as of December 31, 2019 primarily relate to amounts reimbursed under its collaboration agreement with Dermelix, LLC ("Dermelix") and, as of December 31, 2018, with its collaboration agreement with Purdue Pharma L.P. ("Purdue"). The Company believes that credit risks associated with its collaboration partners is not significant and that these receivables are fully collectible. To date, the Company has not had any write-offs of uncollectible receivables, and the Company did not have an allowance for doubtful accounts as of December 31, 2019 and 2018.

Fair value of financial instruments

The Company has estimated the fair value of its financial instruments. The carrying amounts for cash, cash equivalents, accounts receivable, and accounts payable approximate their fair value due to the relatively short-term nature of these instruments. The Company records short-term investments at their estimated fair value based on quoted market prices for identical or similar instruments. The Company believes that the its long-term debt bears interest at the prevailing market rate for instruments with similar characteristics and, accordingly, the carrying value of long-term debt also approximates its fair value.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

Concentrations of credit risk and other risks and uncertainties

Financial instruments that potentially expose the Company to concentrations of credit risk consist primarily of cash, cash equivalents, short-term investments, and accounts receivable. The Company places its cash, cash equivalents, and short-term investments with reputable financial institutions. The Company primarily invests its excess cash in debt instruments of corporations, the U.S. Treasury, financial institutions, and U.S. government agencies with strong credit ratings and an investment grade rating at or above a long-term rating of Aa3/AA- and a short-term rating of P1/A1. The Company has established guidelines relative to diversification and maturities that maintain safety and liquidity. The Company periodically reviews and modifies these guidelines to maximize trends in yields and interest rates without compromising safety and liquidity. The Company has not experienced any credit losses in such accounts and does not believe it is exposed to any significant credit risk on these funds. The Company has no financial instruments with off-balance sheet risk of loss.

As of December 31, 2019, the Company's receivables primarily relate to amounts reimbursed under its collaboration agreement with Dermelix. For the year ended December 31, 2019, the Company's revenue was generated from its collaborations with Dermelix and Allergan.

The Company is currently not profitable and no assurance can be provided that it will ever be profitable. The Company's research and development activities have required significant investment since inception and operations are expected to continue to require cash investment in excess of its revenues. See also Note 1, *Liquidity Risk*, for more information.

The Company is subject to risks common in therapeutic development including, but not limited to, therapeutic candidates that appear promising in the early phases of development often fail because they prove to be inefficacious or unsafe, clinical trial results are unsuccessful, regulatory bodies may not approve the therapeutic or the therapeutic may not be economical in production or distribution. The Company is also subject to risks common to biotechnology firms including, but not limited to new and disruptive technological innovations, dependence on key personnel, protection of proprietary technology, the validity of and continued access to its owned and licensed intellectual property, limitations on the supply of critical materials, compliance with governmental regulations and market acceptance.

Property and equipment

Property and equipment are recorded at cost and depreciated using the straight-line method over the estimated useful lives of the various classes of property and equipment, which range from three to seven years. Leasehold improvements are amortized using the straight-line method over the shorter of the remaining terms of the respective leases or the estimated lives of the assets. Depreciation begins at the time the asset is placed in service.

Property and equipment are reviewed for impairment at least annually or whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. No impairment losses were recorded from inception in December 2011 through December 31, 2019.

Common stock warrant liability

Freestanding warrants related to shares that are redeemable, contingently redeemable, or for purchases of common stock that are not indexed to the Company's own stock are classified as a liability on the Company's balance sheet. The common stock warrants are recorded at fair value, estimated using the Black-Scholes option-pricing model, and marked to market at each balance sheet date with changes in the fair value of the liability recorded in other income (expense), net in the consolidated statements of operations.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

Revenue recognition

Effective January 1, 2018, the Company adopted the provisions of Accounting Standards Codification ("ASC") 606, *Revenue from Contracts with Customers* ("ASC 606") using the modified retrospective method for all contracts not completed as of the date of adoption. On January 1, 2018, in connection with the adoption of ASC 606, the Company recorded the unamortized deferred revenue of $1,034 related to the Purdue Collaboration Agreement as an adjustment to the beginning balance of retained deficit at January 1, 2018. The reported results for 2018 reflect the application of ASC 606 guidance.

Under ASC 606, the Company recognizes revenue when its customer obtains control of promised goods or services, in an amount that reflects the consideration which the Company expects to receive in exchange for those goods or services. To determine revenue recognition for arrangements that are within the scope of ASC 606, the Company performs the following five steps:

1. *Identify the contract with the customer.* A contract with a customer exists when (i) the Company enters into an enforceable contract with a customer that defines each party's rights regarding the goods or services to be transferred and identifies the related payment terms, (ii) the contract has commercial substance, and (iii) the Company determines that collection of substantially all consideration for goods and services that are transferred is probable based on the customer's intent and ability to pay the promised consideration. The Company applies judgment in determining the customer's intent and ability to pay, which is based on a variety of factors including the customer's historical payment experience, or in the case of a new customer, published credit and financial information pertaining to the customer.
2. *Identify the performance obligations in the contract.* Performance obligations promised in a contract are identified based on the goods and services that will be transferred to the customer that are both capable of being distinct, whereby the customer can benefit from the good or service either on its own or together with other available resources, and are distinct in the context of the contract, whereby the transfer of the good or service is separately identifiable from other promises in the contract. To the extent a contract includes multiple promised goods and services, the Company must apply judgment to determine whether promised goods and services are both capable of being distinct and distinct in the context of the contract. If these criteria are not met, the promised goods and services are accounted for as a combined performance obligation.
3. *Determine the transaction price.* The transaction price is determined based on the consideration to which the Company will be entitled in exchange for transferring goods and services to the customer. To the extent the transaction price includes variable consideration, the Company estimates the amount of variable consideration that should be included in the transaction price utilizing either the expected value method or the most likely amount method, depending on the nature of the variable consideration. Variable consideration is included in the transaction price if, in the Company's judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. Any estimates, including the effect of the constraint on variable consideration, are evaluated at each reporting period for any changes. Determining the transaction price requires significant judgment.
4. *Allocate the transaction price to performance obligations in the contract.* If the contract contains a single performance obligation, the entire transaction price is allocated to the single performance obligation. However, if a series of distinct services that are substantially the same qualifies as a single performance obligation in a contract with variable consideration, the Company must determine if the variable consideration is attributable to the entire contract or to a specific part of the contract. Contracts that contain multiple performance obligations require an allocation of the transaction price to each performance obligation on a relative standalone selling price basis unless the transaction price is variable and meets the criteria to be allocated entirely to a performance obligation or to a distinct service that forms part of a single performance obligation. The consideration to be received is allocated among the separate performance obligations based on relative standalone selling prices.

5. *Recognize revenue when or as the Company satisfies a performance obligation.* The Company satisfies performance obligations either over time or at a point in time. Revenue is recognized over time if either (i) the customer simultaneously receives and consumes the benefits provided by the entity's performance, (ii) the entity's performance creates or enhances an asset that the customer controls as the asset is created or enhanced, or (iii) the entity's performance does not create an asset with an alternative use to the entity and the entity has an enforceable right to payment for performance completed to date. If the entity does not satisfy a performance obligation over time, the related performance obligation is satisfied at a point in time by transferring the control of a promised good or service to a customer. Examples of control are using the asset to produce goods or services, enhance the value of other assets, or settle liabilities, and holding or selling the asset.

Licenses of intellectual property: If the license to the Company's intellectual property is determined to be distinct from the other performance obligations identified in the arrangement, the Company recognizes revenues from consideration allocated to the license when the license is transferred to the customer and the customer is able to use and benefit from the licenses. For licenses that are combined with other promises, the Company utilizes judgment to assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, the appropriate method of measuring progress for purposes of recognizing revenue. The Company evaluates the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition.

Milestone payments: At the inception of each arrangement that includes development milestone payments, the Company evaluates the probability of reaching the milestones and estimates the amount to be included in the transaction price using the most likely amount method. If it is probable that a significant revenue reversal would not occur in the future, the associated milestone value is included in the transaction price. Milestone payments that are not within the control of the Company or the licensee, such as regulatory approvals, are not considered probable of being achieved until those approvals are received and therefore revenue recognized is constrained as management is unable to assert that a reversal of revenue would not be possible. The transaction price is then allocated to each performance obligation on a relative standalone selling price basis, for which the Company recognizes revenue as or when the performance obligations under the contract are satisfied. At the end of each subsequent reporting period, the Company re-evaluates the probability of achievement of such development milestones and any related constraint, and if necessary, adjusts its estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect collaboration revenues and earnings in the period of adjustment. To date, the Company has not recognized any milestone payment revenue from any of its collaboration agreements.

Royalties: For arrangements that include sales-based royalties, including milestone payments based on levels of sales, and the license is deemed to be the predominant item to which the royalties relate, the Company recognizes revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied). To date, the Company has not recognized any royalty revenue resulting from any of its collaboration agreements.

To date, the Company has primarily earned revenue under the collaboration agreements with Purdue, Dermelix, and Allergan (see Note 3 for more information).

Equity-based compensation

The Company measures the cost of common stock option awards at fair value and records the cost of the awards, net of estimated forfeitures, on a straight-line basis over the requisite service period. The Company measures fair value for all common stock options using the Black-Scholes option-pricing model. For all common stock option awards, the fair value measurement date is the date of grant and the requisite service period is the period over which the option recipient is required to provide service in exchange for the common stock option awards, which is generally the vesting period.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

Segments and geographic information

The Company has determined it has one reporting segment. Disaggregating the Company's operations is impracticable because the Company's research and development activities and its assets overlap and management reviews its business as a single operating segment. Thus, discrete financial information is not available by more than one operating segment. All long-lived assets of the Company are located in the United States.

Leases

The Company determines if an arrangement is a lease at contract inception. Operating lease assets represent the Company's right to use an underlying asset for the lease term and operating lease liabilities represent the Company's obligation to make lease payments arising from the lease. Operating lease assets and liabilities are recognized on the balance sheet at the commencement date of the lease based upon the present value of lease payments over the lease term. When determining the lease term, the Company includes options to extend or terminate the lease when it is reasonably certain that the Company will exercise that option. The Company uses the implicit interest rate when readily determinable and uses the Company's incremental borrowing rate when the implicit rate is not readily determinable based upon the information available at the commencement date in determining the present value of the lease payments.

The lease payments used to determine the Company's operating lease assets may include lease incentives, stated rent increases and escalation clauses linked to rates of inflation when determinable. In addition, the Company's lease arrangements may contain lease and non-lease components. The Company combines lease and non-lease components, which are accounted for together as a single lease component. Variable lease payments, such as real estate taxes and facility maintenance costs that are allocated by the lessor to the lessee and are not based on an index or a rate, are excluded from the measurement of the lease liability.

Lease expense for minimum lease payments is recognized on a straight-line basis over the lease term. Short-term leases, defined as leases that have a lease term of twelve months or less at the commencement date, are excluded from this treatment and are recognized on a straight-line basis over the term of the lease. Costs for variable lease payments that are not included in the lease liability are recognized as expense as incurred.

Research and development expense

Research and development expenses are charged to expense as incurred in performing research and development activities in accordance with ASC 730, *Research and Development*. The costs include employee-related expenses including salaries, benefits, and stock-based compensation expense, costs of funding research performed by third parties that conduct research and development and preclinical and clinical activities on the Company's behalf, the cost of purchasing lab supplies and non-capital equipment used in preclinical and clinical activities and in manufacturing preclinical and clinical study materials, consultant fees, facility costs including rent, depreciation and maintenance expenses, fees for acquiring and maintaining licenses under third party licensing agreements, including any sublicensing or success payments made to the Company's licensors, and overhead and other expenses directly related to research and development operations. 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 Company's estimate, the accrual or prepaid is adjusted accordingly. The Company defers and capitalizes non-refundable advance payments made by the Company for research and development activities until the related goods are received or the related services are performed. In circumstances where amounts have been paid in excess of costs incurred, the Company records a prepaid expense.

Income taxes

From inception through July 9, 2015, the Company was a Delaware LLC for federal and state tax purposes and, therefore, all items of income or loss through July 9, 2015 flowed through to the members of AuraSense Therapeutics, LLC. Effective July 9, 2015, the Company converted from an LLC to a C corporation for federal and

state income tax purposes. Accordingly, prior to the conversion to a C corporation, the Company did not record deferred tax assets or liabilities or have any net operating loss carryforwards. The Company recognizes deferred tax assets and liabilities for temporary differences between the financial reporting basis and the tax basis of its assets and liabilities and the expected benefits of net operating loss carryforwards. The impact of changes in tax rates and laws on deferred taxes, if any, is applied during the years in which temporary differences are expected to be settled and is reflected in the financial statements in the period of enactment. The measurement of deferred tax assets is reduced, if necessary, if, based on weight of the evidence, it is more likely than not that some, or all, of the deferred tax assets will not be realized. At December 31, 2019 and 2018, the Company established a full valuation allowance against its deferred tax assets to an amount that is more likely than not to be realized.

Recently Adopted Accounting Pronouncements

Equity-based compensation

In June 2018, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") No. 2018-07, *Compensation-Stock Compensation: Improvements to Nonemployee Share-Based Payment Accounting* ("ASU 2018-07"), which aligns the measurement and classification guidance for share-based payment to non-employees with the guidance for share-based payments to employees. Under the new guidance, the measurement period for equity-classified non-employee awards will be fixed at the grant date. Prior to the adoption of ASU 2018-07, the Company remeasured fair value of stock option awards to nonemployees at each financial statement reporting date. The Company adopted the guidance of ASU 2018-07 in the first quarter of 2019 on a modified retrospective basis. The adoption of ASU 2018-07 did not have a material impact on the Company's financial statements.

Leases

In February 2016, FASB issued ASU 2016-02, *Leases (Topic 842)* (or "ASC 842), which replaces the guidance in ASC 840, *Leases* ("ASC 840") and requires lessees to recognize right-of-use assets and lease liabilities on the balance sheet. The Company adopted ASC 842 on the required effective date of January 1, 2019 utilizing the modified retrospective transition method with no restatement of prior periods or cumulative adjustment to accumulated deficit. The Company has elected the package of practical expedients, which allows the Company not to reassess (1) whether any expired or existing contracts as of the adoption date are or contain a lease, (2) lease classification for any expired or existing leases as of the adoption date and (3) initial direct costs for any existing leases as of the adoption date. The Company elected to combine lease and non-lease components, elected not to record leases with an initial term of twelve months or less on the balance sheet and will recognize the associated lease payments in the consolidated statements of operations on a straight-line basis over the lease term. The Company did not elect to apply the hindsight practical expedient when determining lease term and assessing impairment of right-of-use assets.

The adoption of ASC 842 on January 1, 2019 resulted in the recognition of an operating lease asset of approximately $613 and operating lease liabilities of approximately $623, with no impact to operating expense, net loss, or basic and diluted loss per common share for the year ended December 31, 2019. The impact to the consolidated balance sheet upon adoption of ASC 842 is as follows:

	As Previously Reported December 31, 2018	ASC 842 Adoption Adjustment	As Reported Under ASC 842 January 1, 2019
Prepaid expenses and other current assets	$ 1,392	$ (28)	$ 1,364
Other noncurrent assets	32	613	645
Accrued expenses and other current liabilities	1,543	243	1,786
Other noncurrent liabilities	39	342	381

See Note 7, *Leases*, for more information on leases.

Recent Accounting Pronouncements Not Yet Adopted

Financial Instruments - Credit Losses

In June 2016, the FASB issued ASU 2016-13, *Measurement of Credit Losses on Financial Instruments* ("ASU 2016-13). ASU 2016-13 is a new standard intended to improve reporting requirements specific to loans, receivables and other financial instruments. ASU 2016-13 requires that credit losses on financial assets measured at amortized cost be determined using an expected loss model, instead of the current incurred loss model, and requires that credit losses related to available-for-sale debt securities be recorded through an allowance for credit losses and limited to the amount by which carrying value exceeds fair value. ASU 2016-13 also requires enhanced disclosure of credit risk associated with financial assets. The effective date of ASU 2016-13 was deferred by ASU 2019-09, *Financial Instruments—Credit Losses (Topic 326), Derivatives and Hedging (Topic 815), and Leases (Topic 842)—Effective Dates* to the annual period beginning after December 15, 2022 for companies that (i) meet the definition of an SEC filer and (ii) are eligible to be smaller reporting companies, both as defined by the SEC, with early adoption permitted. The Company is currently assessing the impact of adoption of ASU 2016-13 to its consolidated financial statements.

3. Collaborative Research and License Agreements

Allergan Collaboration Agreement

Summary of Agreement

On November 13, 2019 (the "Effective Date"), the Company entered into a Collaboration, Option and License Agreement (the "Allergan Collaboration Agreement"), with a wholly-owned subsidiary of Allergan plc, Allergan Pharmaceuticals International Limited ("Allergan"). Pursuant to the Allergan Collaboration Agreement, the Company granted to Allergan exclusive access and options to license SNA based therapeutics arising from two collaboration programs related to the treatment of hair loss disorders (each, a "Collaboration Program"). Under each such license (obtained in connection with the exercise of an Option, as defined and discussed further below), the Company would grant to Allergan exclusive, royalty-bearing, sublicenseable, nontransferable, worldwide rights to develop, manufacture, use and commercialize such SNA therapeutics. Under the Allergan Collaboration Agreement, the Company will use commercially reasonable efforts to conduct two Collaboration Programs, each focused on one or more hair loss disorders to discover one or more SNA products that are directed to, bind to or inhibit one or more specific Collaboration Program targets (each, a "Program Target").

As of the Effective Date, the Company and Allergan have agreed upon a development plan for each Collaboration Program that describes the development activities and timelines required to advance such Collaboration Program through first IND filing (each, a "Development Plan"). The activities described in the Development Plan are conducted under the supervision of the Joint Development Committee (the "JDC") consisting of three members from each of the Company and Allergan. The Company is primarily responsible for performing early stage discovery and preclinical activities (the "Initial Development Activities") set forth in the Development Plan for each Collaboration Program and will be solely responsible for all costs and expenses related to the Initial Development Activities. Allergan may elect, in its sole discretion and at its sole cost and expense, to conduct formulation assessment and *in vivo* testing as set forth in a Development Plan.

Following the completion of all Initial Development Activities, the Company is required to deliver to Allergan a report that describes the results of the Initial Development Activities and identifies at least one SNA-based compound that satisfies certain criteria for such Collaboration Program as determined by the JDC (the "Initial Development Report"). Following the delivery of the Initial Development Report for a Collaboration Program, Allergan will have the ability for a defined period of time (the "Initial Option Exercise Period") to exercise an option (each an "Option") to obtain worldwide rights and license to the Company's SNA technology and the Company's interest in joint collaboration technology to make, have made, import, use, sell or offer for sale any product (each a

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

"Licensed Product") that results from such Collaboration Program during the term of the Allergan Collaboration Agreement.

At Allergan's sole option, Allergan may extend the Initial Option Exercise Period (the "Option Extension") and require the Company to perform IND-enabling activities described in the Development Plan (the "IND-Enabling Activities"), subject to the payment of additional consideration ("Extension Exercise"). If Allergan exercises the Option Extension, the Company would be responsible for conducting the IND-Enabling Activities and would be solely responsible for all costs and expenses associated with such activities. Upon completion of the IND-Enabling Activities, the Company is required to deliver a report that describes the results of the IND-Enabling Activities (the "IND-Enabling Activities Data Package") to Allergan. Following the delivery of IND-Enabling Activities Data Package, Allergan will have the ability for a defined period of time (the "Extended Option Exercise Period") to exercise an Option with respect to such Collaboration Program. After the exercise of an Option with respect to a Collaboration Program, Allergan will be responsible for all development, manufacturing, and commercialization activities, and costs and expense associated with such activities in connection with Licensed Products arising from such Collaboration Program.

The Company's obligation to conduct the activities defined in the Development Plan under the Allergan Collaboration Agreement commenced on November 13, 2019 and continues until the earlier of (i) the date Allergan exercises an Option, (ii) the date Allergan abandons a Collaboration Program and foregoes its Option to that Collaboration Program, or (iii) the fifth anniversary of the Effective Date (the "Research Term"). If the Initial Option Exercise Period or Extended Option Exercise Period is still in effect for a Collaboration Program or if the Company has not delivered a complete Initial Development Report or, if Allergan made an Extension Exercise for a Collaboration Program, a complete IND-Enabling Activities Data Package for such Collaboration Program, as determined by the JDC, then the Research Term will automatically extend by one-year increments until such obligation is satisfied, but in no event past the seventh anniversary of the Effective Date.

Under the terms of the Allergan Collaboration Agreement, the Company received a $25,000 upfront, non-refundable, non-creditable cash payment (the "Allergan Upfront Payment") related to the Company's research and development costs for conducting the Development Plan for two Collaboration Programs, each focused on one or more targets, and certain options to obtain exclusive, worldwide licenses under certain intellectual property rights owned or controlled by the Company to develop, manufacture and commercialize certain products resulting from each such Collaboration Programs. The option exercise fee during the Initial Option Exercise Period is $10,000 per Collaboration Program. If Allergan elects to extend the Initial Option Exercise Period, Allergan is required to pay an additional fee of $10,000. If Allergan elects to exercise its option during the Extended Option Exercise Period, Allergan must pay the Company the option exercise fee of $15,000.

Following the exercise by Allergan of an Option with respect to a Collaboration Program, Allergan would be required to make certain milestone payments to the Company upon the achievement of specified development, product approval and launch, and commercial events, on a Licensed Product by Licensed Product basis. On a Licensed Product by Licensed Product basis, for the first Licensed Product to achieve the associated milestone event, the Company is eligible to receive up to an aggregate of $55,000 for development milestone payments and $132,500 for product approval and launch milestone payments. The Company is also eligible for up to $175,000 in sales milestone payments on a Collaboration Program by Collaboration Program basis, associated with aggregate worldwide sales. Certain product approval milestones are subject to certain reductions under specified circumstances, including for payments required to be made by Allergan to obtain certain third party intellectual property rights.

In addition, to the extent there is any Licensed Product, the Company would be entitled to receive tiered royalty payments of mid-single digits to the mid-teens percentage on future net worldwide product sales of such Licensed Products, subject to certain reductions under specified circumstances. Royalties are due on a Licensed Product by Licensed Product and country by country basis from the date of the first commercial sale of each Licensed Product in a country until the latest to occur of: (i) the expiration date in such country of the last to expire valid claim within the licensed intellectual property covering the manufacture, use or sale of such Licensed Product in such country, (ii)

the tenth anniversary of the first commercial sale of such Licensed Product in such country, and (iii) the expiration of regulatory exclusivity for such Licensed Product in such country.

Allergan may terminate the Allergan Collaboration Agreement for any reason or no reason, either in its entirety or on a Collaboration Program by Collaboration Program basis, at any time on 90 days' prior written notice to the Company. Unless earlier terminated, the term of the Allergan Collaboration Agreement shall continue until (i) if both Option Exercise Periods expire without Allergan exercising either Option, the expiration of the later to expire Option Exercise Period, and (ii) if either or both Options are exercised on a Licensed Product-by-Licensed Product and country-by-country basis, the expiration of the royalty term for such Licensed Product in such country. Either party may terminate the Allergan Collaboration Agreement if the other party has materially breached or defaulted in the performance of any of its material obligations and such breach or default continues after the specified cure period.

Termination of the Allergan Collaboration Agreement for any reason will not release either party from any liability which, at the time of such termination, has already accrued to the other party or which is attributable to a period prior to such termination. In addition, termination of the Allergan Collaboration Agreement will not preclude either party from pursuing any rights and remedies it may have under the agreement or at law or in equity with respect to any breach of the Allergan Collaboration Agreement. If either party terminates the Allergan Collaboration Agreement, the license and rights granted to Allergan with respect to the terminated Collaboration Program or License Product shall terminate.

Accounting Analysis

The Company concluded that Allergan is a customer in this arrangement, and as such the arrangement falls within the scope of the revenue recognition guidance. Under the Allergan Collaboration Agreement, the Company has identified a single performance obligation that includes (i) the research and development activities during the Research Term (the "Allergan R&D Services"), and (ii) Joint Development Committee services during the Research Term (the "Allergan JDC Services"). The Company has concluded that the Allergan R&D Services is not distinct from the Allergan JDC Services during the Research Term. The JDC provides oversight and management of the overall Allergan Collaboration Agreement, and the members of the JDC from the Company have specialized industry knowledge, particularly as it relates to SNA technology. The JDC is meant to facilitate the early stage research being performed and coordinate the activities of both the Company and Allergan. Further, the JDC services are critical to the ongoing evaluation of a Collaboration Program and the drafting and evaluation of the Initial Development Report and the IND-Enabling Data Package. Accordingly, the Company's participation on the JDC is essential to Allergan receiving value from the Allergan R&D Services and as such, the Allergan JDC Services along with the Allergan R&D Services are considered one performance obligation (the "Collaboration Program Services"). In addition, the Company has concluded that the option to purchase two development and commercialization licenses is considered a marketing offer as the options did not provide any discounts or other rights that would be considered a material right in the arrangement, and thus, not a performance obligation at the onset of the agreement. The consideration for these options will be accounted for when they are exercised.

As of the Effective Date of the Allergan Collaboration Agreement, the total transaction price was determined to be $25,000, consisting solely of the Allergan Upfront Payment. The Company also utilized the most likely amount method to estimate any development and regulatory milestone payments to be received. As of the Effective Date of the Allergan Collaboration Agreement, there were no milestones included in the transaction price. The milestones were fully constrained due to the significant uncertainties surrounding such payments. The Company considered the stage of development and the risks associated with the remaining development required to achieve the milestone, as well as whether the achievement of the milestone is outside the control of the Company or Allergan. The Company has determined that any commercial milestones and sales-based royalties will be recognized when the related sales occur and therefore have also been excluded from the transaction price. The Company will re-evaluate the transaction price at the end of each reporting period and as uncertain events are resolved or other changes in circumstances occur. As of December 31, 2019, the Company determined that any development, regulatory, or commercial milestones continue to be constrained and therefore the related milestone payments continue to be excluded from the transaction price at December 31, 2019.

The Company will recognize revenue related to the Collaboration Program Services as the performance obligation is satisfied using an input method to measure progress. The Company believes the input method that most accurately depicts the measure of progress is the actual hours incurred to date relative to projected hours to complete the research service.

During the year ended December 31, 2019, the Company recognized revenue under the Allergan Collaboration Agreement of approximately $171. As of December 31, 2019, there was $24,829 of deferred revenue related to the Allergan Collaboration Agreement, of which $21,873 is classified as current and $2,956 is classified as noncurrent on the consolidated balance sheet.

During the three months ended December 31, 2019, the Company incurred $3,750 in license fees owed to Northwestern University in connection with the receipt of the Allergan Upfront Payment, which the Company recorded as research and development expenses during such period.

Dermelix Collaboration Agreement

Summary of Agreement

On February 17, 2019, Exicure entered into a License and Development Agreement with Dermelix (the "Dermelix Collaboration Agreement.") Pursuant to the Dermelix Collaboration Agreement, the Company granted to Dermelix exclusive, worldwide royalty-bearing license rights to, develop, manufacture, have manufactured, use and commercialize the Company's SNA technology for the treatment of Netherton Syndrome ("NS") and, at Dermelix's option, up to five additional specified orphan diseases that are within the dermatology field. Upon written notice to the Company, Dermelix may exercise its option at any time following the effective date of the Dermelix Collaboration Agreement until the date that is six (6) years from the date that the first collaboration SNA therapeutic achieves first dosing in humans in a Phase 1 clinical trial for NS.

Dermelix will initially seek to develop a targeted therapy for the treatment of NS. Under the terms of the Dermelix Collaboration Agreement, the Company will be responsible for conducting the early stage development for each indication up to IND enabling toxicology studies. Dermelix will assume subsequent development, commercial activities and financial responsibility for such indications. Dermelix will pay the costs and expenses of development and commercialization of any licensed products under the Dermelix Collaboration Agreement, including the Company's expenses incurred in connection with development activities and in accordance with the development budget. Under the terms of the Dermelix Collaboration Agreement, Exicure received an upfront payment of $1,000, to be applied against the initial $1,000 of the Company's development expenses. If Dermelix exercises any of its option rights for additional indications, Dermelix will pay an option exercise fee equal to $1,000 for each exercised option (each, an "Option Exercise Fee"). Any Option Exercise Fee will be applied against the Company's development expenses with respect to the particular indication for which the option was exercised.

Pursuant to the Dermelix Collaboration Agreement, the Company shall have the right to pursue the development and commercialization of SNA technology for the treatment of orphan diseases which are neither NS nor one of the additional specified orphan diseases selected by Dermelix pursuant to its option rights. If the Company commences development activities of SNA technology for the treatment of such an orphan disease, the Company will notify Dermelix in writing of such development and Dermelix will have thirty (30) days following receipt of such notice to use one of its remaining option rights on such orphan disease. If Dermelix does not use one of its remaining option rights on such orphan disease, or has no option rights remaining, then the Company will have no further obligations to Dermelix with respect to the development of SNA therapeutics for such orphan disease and shall be free to continue commercialization and development activities with respect thereto.

For each of NS as well as any additional licensed product for which Dermelix exercises one of its options, the Company shall be eligible to receive additional cash payments totaling up to $13,500 upon achievement of certain development and regulatory milestones and up to $152,500 upon achievement of certain sales milestones. The regulatory milestones are payable upon the initiation or completion of clinical trials, and regulatory approval in the

United States and outside the United States, per program. The commercial sales milestones are payable upon achievement of specified aggregate annual product sales thresholds. In the event a therapeutic candidate subject to the collaboration results in commercial sales, the Company will receive low double-digit royalties on annual net sales for such licensed products.

Accounting Analysis

The Company concluded that Dermelix is a customer in this arrangement, and as such the arrangement falls within the scope of the revenue recognition guidance. The Company identified performance obligations under the Dermelix Collaboration Agreement for the license of intellectual property for the NS therapeutic candidate and associated research and development services for the NS therapeutic candidate. The Company determined that the performance obligations were not separately identifiable and were not distinct or distinct within the context of the contract due to the specialized nature of the services to be provided by Exicure, specifically with respect to the Company's expertise related to SNA technology, and the interdependent relationship between the performance obligations. As such, the Company concluded that there is a single identified performance obligation.

The Company used the most likely amount method to estimate variable consideration and estimated that the most likely amount for each potential development and regulatory milestone, which is considered variable consideration, was zero, as the achievement of those milestones is uncertain and highly susceptible to factors outside of the Company's control. Accordingly, all such milestones were excluded from the transaction price. Management will re-evaluate the transaction price at the end of each reporting period and as uncertain events are resolved or other changes in circumstances occur and adjust the transaction price as necessary. Sales-based royalties, including commercial sales milestone payments based on the level of sales, were also excluded from the transaction price, as the license is deemed to be the predominant item to which the royalties relate. The Company will recognize such revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied).

Revenue associated with the performance obligation will be recognized as services are provided using a cost-to-cost measure of progress method. The transfer of control occurs over time and, in management's judgment, this input method is the best measure of progress towards satisfying the performance obligation under the Dermelix Collaboration Agreement and reflects a faithful depiction of the transfer of goods and services.

The Company initially recorded the upfront payment of $1,000 as deferred revenue related to its wholly unsatisfied performance obligation and reduces this balance by recognizing revenue as services are provided. The Company recognized $1,125 of revenue under the Dermelix Collaboration Agreement during the year ended December 31, 2019, which reflects full recognition of the upfront payment as revenue as well as reimbursement by Dermelix for additional costs incurred by Exicure for early stage development costs beyond the initial $1,000 upfront payment. The Company expects to incur additional early stage development costs and expects to be reimbursed by Dermelix for such costs under the terms of the Dermelix Collaboration Agreement. The Company will recognize both revenue and research and development expense for such costs on a gross basis during the period in which those costs are incurred.

Purdue Collaboration Agreement

On December 2, 2016, the Company entered into a research collaboration, option and license agreement with Purdue (the "Purdue Collaboration Agreement"). In April 2019, Purdue notified the Company that it will not be selecting any collaboration targets pursuant to the Purdue Collaboration Agreement. As a result, the Company will not receive any research, regulatory and commercial sales milestones contingent upon successful development of such collaboration targets. Purdue re-asserted its right to develop new anti-TNF therapeutic candidates. At this time, there are no active development activities underway for a new anti-TNF therapeutic candidate. As a consequence, the Company also believes that it is highly unlikely that it will receive any research, regulatory and commercial sales milestones for any anti-TNF therapeutic candidates. Revenue recognized in connection with the Purdue Collaboration Agreement was zero and $118 for the years ended December 31, 2019 and 2018, respectively.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

4. Supplemental Balance Sheet Information

Prepaid expenses and other current assets

	December 31	
	2019	2018
Prepaid insurance	$ 533	$ 353
Prepaid clinical, contract research and manufacturing costs	481	293
Interest receivable	236	—
Other	705	746
Prepaid expenses and other current assets	$ 1,955	$ 1,392

Property and equipment, net

	December 31,	
	2019	2018
Scientific equipment	$ 2,795	$ 1,979
Leasehold improvements	192	192
Furniture and fixtures	41	41
Computers and software	32	26
Construction in process	356	12
Property and equipment, gross	3,416	2,250
Less: accumulated depreciation	(1,317)	(1,189)
Property and equipment, net	$ 2,099	$ 1,061

Depreciation and amortization expense was $392 and $358, for the years ended December 31, 2019 and 2018, respectively.

Other noncurrent assets

	December 31,	
	2019	2018
Operating lease asset	$ 356	$ —
Other	32	32
Other noncurrent assets	$ 388	$ 32

Accrued expenses and other current liabilities

	December 31,	
	2019	2018
Accrued payroll-related expenses	$ 920	$ 899
Accrued clinical, contract research and manufacturing costs	515	102
Operating lease liability	292	—
Accrued legal expenses	254	189
Other accrued expenses	454	353
Accrued expenses and other current liabilities	$ 2,435	$ 1,543

Other noncurrent liabilities

	December 31,	
	2019	2018
Operating lease liability	$ 59	$ —
Other	—	39
Other noncurrent liabilities	$ 59	$ 39

5. Investments

As of December 31, 2019, the Company had primarily invested its excess cash in debt instruments of corporations, the U.S. Treasury, financial institutions, and U.S. government agencies with strong credit ratings and an investment grade rating at or above a long-term rating of Aa3/AA- and a short-term rating of P1/A1. The Company has established guidelines relative to diversification and maturities that maintain safety and liquidity. The Company periodically reviews and modifies these guidelines to maximize trends in yields and interest rates without compromising safety and liquidity.

The following table summarizes the contract maturity of the available-for-sale securities the Company held as of December 31, 2019:

One year or less	57%
After one year but within two years	43%
Total	100%

All of the Company's available-for-sale securities are available to the Company for use in Exicure's current operations. As a result, the Company categorizes all of these securities as current assets even though the stated maturity of some individual securities may be one year or more beyond the balance sheet date.

The amortized cost, gross unrealized holding gains, gross unrealized holding losses and fair value of cash equivalents and available-for-sale securities by type of security at December 31, 2019 were as follows:

	December 31, 2019			
	Amortized Costs	Gross Unrealized Holding Gains	Gross Unrealized Holding Losses	Fair Value
Commercial paper	$ 13,932	$ 1	$ (2)	$ 13,931
Corporate notes/bonds	36,620	1	(24)	36,597
U.S. Treasuries	4,513	—	(1)	4,512
U.S. Government agency securities	9,786	—	(2)	9,784
	$ 64,851	$ 2	$ (29)	$ 64,824

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

6. Debt

On February 17, 2016, the Company closed a $10,000 loan facility, with an initial advance against this loan facility of $6,000, with Hercules Technology Growth Capital ("Hercules"). The loan bears a floating interest rate equal to the greater of either (i) 9.95% or (ii) the sum of 9.95% plus the United States prime rate minus 3.50%. Total proceeds net of fees and issuance costs were $5,839. Fees and issuance costs of $161, as well as fees of $231 that are payable to the lender at maturity, are recorded as a reduction in the carrying amount of long-term debt on the Company's balance sheet and will be amortized to interest expense through the maturity date of September 1, 2019 using the effective interest method. Interest amounts were payable monthly beginning on March 1, 2016 through the maturity date of September 1, 2019. Initially, principal amounts were payable monthly beginning on April 1, 2017 through the maturity date. In 2016, the Company met certain terms in the loan agreement so that principal amounts became payable monthly beginning on July 1, 2017.

On January 15, 2018, the Company and Hercules amended its loan agreement so that amortization payments due for the thirteen (13) consecutive months commencing on December 1, 2017 through and including December 1, 2018 were deferred. Commencing on January 1, 2019, and continuing on the first business day of each month thereafter, the loan, including the deferred payments, was to begin amortizing in equal monthly installments of principal and interest based upon an amortization schedule equal to eighteen (18) consecutive months. Any remaining obligations under the loan agreement and other loan documents were due and payable on the maturity date on September 1, 2019.

On December 28, 2018, the Company and Hercules further amended its loan agreement so that interest amounts are payable on the first day of each business month and any remaining obligations under the loan agreement and other loan documents are due and payable on the maturity date on September 1, 2019.

On March 8, 2019, the Company and Hercules further amended its loan agreement so that the maturity date of its loan agreement is extended to March 1, 2020 and amortization payments are deferred to, and payable at, the new maturity date of March 1, 2020 ("Loan Amendment No. 4"). Fees of $52 paid to Hercules in connection with Loan Amendment No. 4, as well as a fee of $100 that is payable to Hercules at the new maturity date, are recorded as a reduction in the carrying amount of long-term debt on the Company's balance sheet and will be amortized to interest expense through the new maturity date of March 1, 2020 using the effective interest method.

The loan is collateralized by a security interest in all tangible assets. In addition, the Company is subject to certain financial reporting requirements and certain negative covenants requiring lender consent.

At December 31, 2019 and 2018, the aggregate carrying value of the current and noncurrent portion of long-term debt is $4,965 and $4,925, respectively.

At December 31, 2019, the principal maturities of the long-term debt were as follows:

	December 31, 2019
2020	$ 5,000
Principal balance outstanding	5,000
less: unamortized discount	(34)
less: unamortized debt issuance costs	(1)
Long-term debt	4,965
Current portion	4,965
Noncurrent portion	$ —

The Company paid interest on debt of $597 and $572 during the years ended December 31, 2019 and 2018, respectively.

On March 2, 2020, pursuant to the terms of the Hercules loan agreement and subsequent amendments thereto, the Company repaid all remaining outstanding obligations under the Hercules loan agreement. See Note 17, *Subsequent Events* for more information.

7. Leases

The Company's lease arrangements consist of (i) a lease for office and laboratory space at its headquarters in Skokie, IL that commenced in March 2012 and is scheduled to end in February 2021 (the "Skokie Lease"), (ii) a lease for office space at a multi-tenant facility in Cambridge, MA that commenced in March 2019 and is cancelable at any time (the "Cambridge Lease"), and (iii) leases for office equipment (the "Office Equipment Leases"). Each of these leases are classified as operating leases.

The Skokie Lease includes a renewal option which the Company concluded that it is not reasonably certain that the renewal option would be exercised. Lease payments for the Skokie Lease include a fixed payment amount as well as variable payments related to a proportionate share of operating and real estate expenses.

Due to the nature of the Cambridge Lease, the Company determined that this lease represented a short-term lease with an initial term of less than twelve months and, as such, the Cambridge Lease is not recorded on the balance sheet and related lease costs are recognized in the statement of operations as they are incurred. The Company has also elected to not record the Office Equipment Leases on the balance sheet since related payment amounts and lease costs are insignificant. Lease costs for the Office Equipment Leases are recognized in the statement of operations on a straight-line basis over the lease term.

The following table summarizes the presentation in the Company's consolidated balance sheets of its operating leases:

	December 31, 2019
Assets:	
Operating lease asset	$ 356
Liabilities:	
Operating lease liability	$ 292
Operating lease liability, noncurrent	59
Total operating lease liability	$ 351

Because the rate implicit in each lease is not readily determinable, the Company uses its incremental borrowing rate to determine the present value of the lease payments. Information related to the Company's operating lease asset and related operating lease liabilities were as follows:

	December 31, 2019
Remaining lease term [(1)]	1.2 years
Discount rate	16.1%

[(1)] Does not include a renewal term beyond February 28, 2021. Renewal terms are included in the lease term when it is reasonably certain that the Company will exercise the option.

The following table summarizes lease costs in the Company's consolidated statement of operations:

	December 31, 2019
Operating lease costs	$ 336
Short term lease costs	100
Variable lease costs	344
Total lease costs	$ 780

During the year ended December 31, 2019, the Company made cash payments of $847 for operating leases.

Maturities of the Company's lease liability as of December 31, 2019 were as follows:

Years Ending December 31,	Operating Leases
2020	$ 324
2021	59
Total	$ 383
Less: imputed interest	(32)
Total lease liability	$ 351

Current operating lease liability	$ 292
Noncurrent operating lease liability	59
Total lease liability	$ 351

Leases - ASC 840 Disclosures

Lease expense consisted of the following during the year ended December 31, 2018:

	December 31, 2018
Straight-line rent expense	$ 332
Contingent rent expense	298
Total rent expense	$ 630

The future minimum lease payments under the Company's operating leases as of December 31, 2018, were as follows:

Years Ending December 31,	Operating Leases
2019	$ 347
2020	353
2021	59
Total	$ 759

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

8. Stockholders' Equity

Preferred Stock

As of December 31, 2019 and 2018, the Company had 10,000,000 shares of preferred stock, par value $0.0001 authorized and no shares issued and outstanding.

Common Stock

As of December 31, 2019 and 2018, the Company had authorized 200,000,000 shares of common stock, par value $0.0001. As of December 31, 2019, the Company had 86,069,263 shares issued and outstanding. As of December 31, 2018, the Company had 44,358,000 shares issued and outstanding.

The holders of shares of the Company's common stock are entitled to one vote per share on all matters to be voted upon by Exicure stockholders and there are no cumulative rights. Subject to preferences that may be applicable to any outstanding preferred stock, the holders of shares of the Company's common stock are entitled to receive ratably any dividends that may be declared from time to time by Exicure's board of directors (the "Board") out of funds legally available for that purpose. In the event of the Company's liquidation, dissolution or winding up, the holders of shares of Exicure common stock are entitled to share ratably in all assets remaining after payment of liabilities, subject to prior distribution rights of preferred stock then outstanding. Exicure common stock has no preemptive or conversion rights or other subscription rights. There are no redemption or sinking fund provisions applicable to Exicure common stock. The outstanding shares of Exicure common stock are fully paid and non-assessable.

December 2019 Offering

On December 23, 2019, the Company completed the sale of 10,000,000 shares of its common stock at a public offering price of $2.75 per share in an underwritten public offering (the "December 2019 Offering"). The Company received gross proceeds of $27,500 in the December 2019 Offering before deducting underwriting discounts and commissions and offering expenses of $2,156.

On January 6, 2020, the Company sold 1,081,184 shares of its common stock at a price of $2.75 per share pursuant to the exercise of the underwriters' option to purchase additional shares at the public offering price in connection with the December 2019 Offering. The Company received gross proceeds of $2,973 in the December 2019 Offering before deducting underwriting discounts and commissions and offering expenses of $178.

The shares sold in the December 2019 Offering were sold pursuant to a shelf-registration the Company filed on Form S-3 with the SEC which was declared effective by the SEC on July 24, 2019.

August 2019 Offering

On August 2, 2019, the Company completed the sale of 31,625,000 shares of its common stock at a public offering price of $2.00 per share in an underwritten public offering, which included the exercise in full of the underwriters' option to purchase an additional 4,125,000 shares at the public offering price (the "August 2019 Offering"). The Company received gross proceeds of $63,250 in the August 2019 Offering before deducting underwriting discounts and commissions and offering expenses of $4,384.

The shares sold in the August 2019 Offering were sold pursuant to a shelf-registration the Company filed on Form S-3 with the SEC which was declared effective by the SEC on July 24, 2019.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

August 2018 Private Placement

On August 22, 2018, the Company entered into subscription agreements with several accredited investors, pursuant to which it agreed to issue and sell a total of 4,889,217 shares of the Company's common stock, at a purchase price of $4.50 per share, resulting in approximately $22,001 in gross proceeds to the Company (the "August 2018 Private Placement"). The aggregate net proceeds from the August 2018 Private Placement (after deducting placement agent fees and expenses of the offering of $1,931) were $20,070.

The Company also entered into a registration rights agreement with the investors in the August 2018 Private Placement, which required it to file a "resale" registration statement with the SEC covering the shares issued in the August 2018 Private Placement within 30 calendar days from the final closing of the August 2018 Private Placement Offering. The Company filed and caused to become effective a registration statement with the SEC on October 5, 2018 registering the resale of 5,034,683 shares of the Company's common stock, consisting of (i) 4,889,217 shares that were privately issued through the August 2018 Private Placement and (ii) 145,466 shares that were privately issued on February 1, 2018 in connection with consulting services.

In connection with the closing of the August 2018 Private Placement, the placement agents received an aggregate of $1,680 in cash placement fees, and the Company reimbursed up to $87 of expenses incurred by the placement agents in connection with the closing of the August 2018 Private Placement.

Common Stock Warrants

In connection with a private placement offering of common stock in 2017 (the "2017 Private Placement"), placement agents received warrants to purchase an aggregate of 413,320 shares of Exicure common stock in connection with all closings of the 2017 Private Placement (the "Warrants"). The Warrants expire on March 27, 2021, have an exercise price of $3.00 per share, and were issued on the same terms in all closings of the 2017 Private Placement. The Warrants are classified as a liability. The common stock warrant liability is remeasured each period at fair value. As of December 31, 2019, Warrants to purchase 413,320 shares of common stock remain outstanding. See Note 12, *Fair Value Measurements* for more information on the fair value of the common stock warrant liability.

Accumulated Other Comprehensive Loss

The following table summarizes the changes in each component of accumulated other comprehensive loss, net of tax, for 2019:

	Unrealized gains (losses) on short-term investments	Total
Balance at December 31, 2018	$ —	$ —
Other comprehensive income (loss) before reclassifications	(27)	(27)
Net current period other comprehensive loss	(27)	(27)
Balance at December 31, 2019	$ (27)	$ (27)

9. Equity-Based Compensation

On September 22, 2017, the Board adopted and Exicure's stockholders approved the Exicure, Inc. 2017 Equity Incentive Plan (the "2017 Plan"), which became effective on November 15, 2017. The 2017 Plan provides for the issuance of incentive awards of up to 5,842,525 shares of Exicure common stock, which includes 2,169,905 shares of Exicure common stock to be issued to officers, employees, consultants and directors, plus a number of shares not to exceed 3,683,817 that are subject to issued and outstanding awards under the Exicure OpCo 2015 Equity Incentive Plan (the "2015 Plan") and were assumed in the Merger. Awards that may be awarded under the 2017 Plan include non-qualified and incentive stock options, stock appreciation rights, bonus shares, restricted stock, restricted stock units, performance units and cash-based awards. The 2017 Plan also provides that the number of shares

reserved for issuance thereunder will be increased annually on the first day of each year beginning in 2020 by the least of 4,600,000 shares, five percent (5%) of the shares of Exicure common stock outstanding on the last day of the immediately preceding year, or a lesser number of shares as determined by the Company's compensation committee. No future awards will be made under the 2015 Plan upon the effectiveness of the 2017 Plan.

As of December 31, 2019, the aggregate number of common stock options available for grant under the 2017 Plan was 36,054. In connection with the approval on December 6, 2019 by the Company's compensation committee, effective January 1, 2020, the number of awards that may be awarded under the 2017 Plan was increased by 5% of the shares of Exicure common stock outstanding at December 31, 2019 (an increase of 4,303,463 awards available for grant under the 2017 Plan).

The common stock options are contingent on the participants' continued employment or provision of non-employee services and are subject to forfeiture if employment or continued service terminates for any reason. The initial stock option grant to an employee or consultant vests 25% on the first 12-month anniversary of the grant date and vests 1/48th monthly thereafter until fully vested at the end of 48 months. Subsequent stock option grants to employees or consultants vest 1/48th monthly until fully vested at the end of 48 months. The initial stock option grant to a non-employee director vests 1/36th monthly until fully vested at the end of 36 months. Subsequent stock option grants to a non-employee director vests 1/12th monthly until fully vested at the end of 12 months. The term of common stock option grants is ten years unless terminated earlier as described above.

Equity-based compensation expense is classified in the statements of operations as follows:

	Year Ended December 31,	
	2019	2018
Research and development expense	$ 535	$ 485
General and administrative expense	1,305	1,324
	$ 1,840	$ 1,809

Unamortized equity-based compensation expense at December 31, 2019 was $3,375, which is expected to be amortized over a weighted-average period of 2.7 years.

The Company utilizes the Black-Scholes option-pricing model to determine the fair value of common stock option grants. The Black-Scholes option-pricing model was developed for use in estimating the fair value of traded options that have no vesting restrictions and are fully transferable. The model also requires the input of highly subjective assumptions. In addition to an assumption on the expected term of the option grants as discussed below, application of the Black-Scholes model requires additional inputs for which the Company has assumed the values described in the table below:

	Year Ended December 31,	
	2019	2018
Expected term	5.3 to 6.1 years	5.3 to 6.0 years
Risk-free interest rate	1.55% to 2.56%; weighted avg. 1.94%	2.72% to 2.87%; weighted avg. 2.78%
Expected volatility	80.2% to 86.7%; weighted avg. 82.6%	78.1% to 82.4%; weighted avg. 80.6%
Forfeiture rate	5%	5%
Expected dividend yield	—%	—%

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

The expected term is based upon the "simplified method" as described in Staff Accounting Bulletin Topic 14.D.2. Currently, the Company does not have sufficient experience to provide a reasonable estimate of an expected term of its common stock options. The Company will continue to use the "simplified method" until there is sufficient experience to provide a more reasonable estimate in conformance with ASC 718-10-30-25 through 30-26. The risk-free interest rate assumptions were based on the U.S. Treasury bond rate appropriate for the expected term in effect at the time of grant. The expected volatility is based on calculated enterprise value volatilities for publicly traded companies in the same industry and general stage of development. The estimated forfeiture rates were based on historical experience for similar classes of employees. The dividend yield was based on expected dividends at the time of grant.

The fair value of the underlying common stock and the exercise price for the common stock options granted during the years ended December 31, 2019 and 2018 are summarized in the table below:

Common Stock Options Granted During Period Ended:	Fair Value of Underlying Common Stock	Exercise Price of Common Stock Option
Year ended December 31, 2019	$2.32 to $3.05; weighted avg. $2.86	$2.32 to $3.05; weighted avg. $2.86
Year ended December 31, 2018	$3.00 to $5.82; weighted avg. $3.45	$3.00 to $5.82; weighted avg. $3.45

The weighted-average grant date fair value of common stock options granted in the years ended December 31, 2019 and 2018 was $2.01 and $2.40 per common stock option, respectively.

A summary of common stock option activity as of the periods indicated is as follows:

	Options	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term (years)	Aggregate Intrinsic Value (thousands)
Outstanding - December 31, 2018	4,891,588	$ 2.22	7.3	$ 7,330
Granted	1,244,009	2.86		
Exercised	(86,263)	0.87		
Forfeited	(351,620)	2.90		
Outstanding - December 31, 2019	5,697,714	$ 2.34	6.7	$ 4,625
Exercisable - December 31, 2019	3,972,087	$ 2.01	5.7	$ 4,550
Vested and Expected to Vest - December 31, 2019	5,577,282	$ 2.32	6.7	$ 4,620

The aggregate intrinsic value of common stock options exercised during the years ended December 31, 2019 and 2018 was $172 and $44, respectively.

10. Income Taxes

Pretax loss before income taxes was $26,303 and $22,413 for the years ended December 31, 2019 and 2018, respectively, which consists entirely of losses in the U.S. and resulted in no provision for income tax expense during the years then ended.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

The differences between income taxes computed using the U.S. federal income tax rate and the provision for income taxes are as follows:

	Year Ended December 31,			
	2019		2018	
Federal income tax expense at statutory rate	$ (5,524)	21.0 %	$ (4,707)	21.0 %
State income tax expense at statutory rate	(1,934)	7.3	(1,595)	7.1
Permanent differences	113	(0.4)	243	(1.1)
Change in valuation allowance	7,345	(27.9)	6,059	(27.0)
	$ —	— %	$ —	— %

The Company's effective income tax rate for the years ended December 31, 2019 and 2018 is 0% because the Company has generated tax losses and has provided a full valuation allowance against its deferred tax assets to an amount that is more likely than not to be realized.

The significant components of the Company's net deferred tax assets are as follows:

	December 31,	
	2019	2018
Deferred Tax Assets		
Net operating losses	$ 22,340	$ 14,827
Intangibles	169	187
Accrued expenses	80	271
Operating lease liability	108	—
Equity-based compensation	1,023	796
Other	5	204
Less: Valuation allowance	(23,567)	(16,225)
Total deferred tax assets	158	60
Deferred Tax Liabilities		
Fixed assets and other	(57)	(60)
Operating lease asset	(101)	—
Total deferred tax liabilities	(158)	(60)
Deferred taxes, net	$ —	$ —

The Company has recorded a full valuation allowance against its deferred tax assets to an amount that is more likely than not to be realized at December 31, 2019 and 2018. This determination is based on significant negative evidence, including:

- *Cumulative losses:* The Company has been in a significant cumulative loss position since its inception in 2011.
- *Projected realization of net operating loss carry forward amounts:* Projections of future pre-tax book loss and taxable losses based on the Company's recent actual performance and current industry data indicate it is more likely than not that the benefits will not be recognized.

At December 31, 2019, the Company has federal net operating loss carryforwards of $78,987, of which $31,809 will begin to expire in 2035 and $47,178 which do not expire and may be carried forward indefinitely. At December 31, 2019, the Company has $76,651 of state net operating loss carryforwards which will begin to expire in 2027.

As provided by Section 382 of the Internal Revenue Code of 1986 ("Section 382"), and similar state provisions, utilization of net operating losses and tax credit carryforwards may be subject to substantial annual limitations due to ownership change limitations that have previously occurred or that could occur in the future. Ownership changes may limit the amount of net operating losses and tax credit carryforwards that can be utilized annually to offset future taxable income and tax, respectively. In general, an ownership change, as defined by Section 382, results from transactions that increase the ownership of five percent stockholders in the stock of a corporation by more than 50 percent in the aggregate over a three-year period. The Company completed a review of its changes in ownership through December 31, 2019 and determined that the August 2019 Offering resulted in an ownership change during the year ended December 31, 2019, as defined by Section 382. However, the Company does not expect that the Section 382 limitation resulting from the August 2019 ownership change will place a material restriction on the Company's ability to utilize its net operating losses and tax credit carryforwards. There could be additional ownership changes after December 31, 2019 that could limit the amount of net operating losses and tax credit carryforwards that the Company can utilize in the future.

At December 31, 2019 and 2018, the Company had no unrecognized tax benefits. The Company's estimate of the potential outcome of any uncertain tax position is subject to management's assessment of relevant risks, facts and circumstances existing at that time. The Company evaluates uncertain tax positions to determine if it is more-likely-than-not that they would be sustained upon examination. The Company recognizes interest and penalties related to unrecognized tax benefits in the provision for income taxes.

The Company is subject to taxation in the U.S. and various state jurisdictions. The Company remains subject to examination by U.S. federal and state tax authorities for the years 2015 through 2019. There are no pending examinations in any jurisdiction.

11. Loss Per Common Share

Basic loss per common share is calculated by dividing net loss by the weighted-average number of shares of common stock outstanding during the period. Diluted loss per common share is calculated using the treasury share method by giving effect to all potentially dilutive securities that were outstanding. Potentially dilutive options and warrants to purchase common stock that were outstanding during the periods presented were excluded from the diluted loss per share calculation because such shares had an anti-dilutive effect due to the net loss reported in those periods. Therefore, basic and diluted loss per common share is the same for each of the years ended December 31, 2019 and 2018.

The following is the computation of loss per common share for the years ended December 31, 2019 and 2018:

	Year Ended December 31,	
	2019	2018
Net loss	$ (26,303)	$ (22,413)
Weighted-average basic and diluted common shares outstanding	57,671,734	41,189,177
Loss per share - basic and diluted	$ (0.46)	$ (0.54)

The outstanding securities presented below were excluded from the calculation of net loss per common share, because such securities would have been anti-dilutive due to the Company's net loss per share during the periods ending on the dates presented:

	December 31,	
	2019	2018
Options to purchase common stock	5,697,714	4,891,588
Warrants to purchase common stock	413,320	413,320

12. Fair Value Measurements

ASC Topic 820, *Fair Value Measurement*, establishes a three-tier fair value hierarchy, which prioritizes the inputs used in measuring fair value, as follows: Level 1 Inputs - unadjusted quoted prices in active markets for identical assets or liabilities accessible to the reporting entity at the measurement date; Level 2 Inputs - other than quoted prices included in Level 1 inputs that are observable for the asset or liability, either directly or indirectly, for substantially the full term of the asset or liability; and Level 3 Inputs - unobservable inputs for the asset or liability used to measure fair value to the extent that observable inputs are not available, thereby allowing for situations in which there is little, if any, market activity for the asset or liability at measurement date.

Assets and liabilities measured at fair value on a recurring basis as of December 31, 2019 are as follows:

	Total	Level 1	Level 2	Level 3
Assets				
Cash equivalents:				
Money market funds	$ 31,078	$ 31,078	$ —	$ —
Commercial paper	2,498	—	2,498	—
Short-term investments:				
Commercial paper	11,433	—	11,433	—
Corporate notes/bonds	36,597	—	36,597	—
U.S. Treasuries	4,512	—	4,512	—
U.S. Government agency securities	9,784	—	9,784	—
Total financial assets	$ 95,902	$ 31,078	$ 64,824	$ —
Liabilities				
Common stock warrant liability	$ 414	$ —	$ —	$ 414
Total financial liabilities	$ 414	$ —	$ —	$ 414

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

Assets and liabilities measured at fair value on a recurring basis as of December 31, 2018 are as follows:

	Total	Level 1	Level 2	Level 3
Assets				
Cash equivalents:				
Money market funds	$ 21,459	$ 21,459	$ —	$ —
Total financial assets	$ 21,459	$ 21,459	$ —	$ —
Liabilities				
Common stock warrant liability	$ 797	$ —	$ —	$ 797
Total financial liabilities	$ 797	$ —	$ —	$ 797

The Company uses the market approach and Level 1 and Level 2 inputs to value its cash equivalents and Level 2 inputs to value its short-term investments.

The Company's common stock warrant liability (refer to Note 8, *Stockholders' Equity*, for more information) is classified within Level 3 of the fair value hierarchy. The fair value of the common stock warrant liability was determined using the Black-Scholes option-pricing model.

The fair value of the common stock warrant liability is based significantly on the fair value of the Company's common stock. At the date of issuance, the common stock warrant liability was determined using the following weighted-average assumptions: expected term of 2.0 years, risk-free interest rate of 1.53%, expected volatility of 78.97%, and no expected dividends.

The following weighted-average assumptions were used to estimate the fair value of the common stock warrant liability at December 31, 2019:

	December 31, 2019
Expected term	1.3
Risk-free interest rate	1.58%
Expected volatility	81.84%
Expected dividend yield	—%

A 10% change in the estimate of expected volatility at December 31, 2019 would increase or decrease the fair value of the common stock warrant liability in the amount of $39. A 10% change in the estimate of fair value of the common stock at December 31, 2019 would increase or decrease the fair value of the common stock warrant liability in the amount of $81.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

The following is a reconciliation of the Company's liabilities measured at fair value on a recurring basis using unobservable inputs (Level 3) for the years ended December 31, 2019 and 2018:

	Fair Value Measurements Using Significant Unobservable Inputs (Level 3)	
	Common Stock Warrant Liability	
Balance at December 31, 2017	$	523
Gain included in other income (expense), net		274
Balance at December 31, 2018	$	797
Loss included in other income (expense), net		(383)
Balance at December 31, 2019	$	414

13. Defined Contribution Plan

Exicure maintains a defined contribution savings plan for the benefit of its employees. During 2018, Exicure began contributing to the defined contribution plan. Company contributions are determined under various formulas. The expense recognized for this plan was $185 and $107 for the years ended December 31, 2019 and 2018, respectively.

14. Commitments and Contingencies

Leases

Refer to Note 7, *Leases*, for a discussion of the commitments associated with the Company's lease agreements.

Northwestern University License Agreements

On December 12, 2011, (1) AuraSense, LLC, the Company's former parent, assigned to the Company all of its worldwide rights and interests under AuraSense, LLC's 2009 license agreement with Northwestern University ("NU") in the field of the use of nanoparticles, nanotechnology, microtechnology or nanomaterial-based constructs as therapeutics or accompanying therapeutics as a means of delivery, but expressly excluding diagnostics (the "assigned field"); (2) in accordance with the terms and conditions of this assignment, the Company assumed all liabilities and obligations of AuraSense, LLC as set forth in its license agreement in the assigned field; and (3) in order to secure this assignment and the patent rights from NU, the Company agreed (i) to pay NU an annual license fee, which may be credited against any royalties due to NU in the same year, (ii) to reimburse NU for expenses associated with the prosecution and maintenance of the license patent rights, (iii) to pay NU royalties based on any net revenue generated by the Company's sale or transfer of any licensed product, (iv) to pay NU, in the event the Company grants a sublicense under the licensed patent rights, the greater of a percentage of all sublicensee royalties or a percentage of any net revenue generated by a sublicensee's sale or transfer of any licensed product, and (v) to pay NU a percentage of all other sublicense payments received by the Company. In August 2015, the Company entered into a restated license agreement with NU (the "Restated License Agreement"). In February 2016, the Company obtained exclusive license as to NU's rights in certain SNA technology it jointly owns with NU (the "Co-owned Technology License"). The Company's license to NU's rights is limited to the assigned field, however the Company has no such limitation as to its own rights in this jointly owned technology. In June 2016, the Company entered into an exclusive license with NU to obtain worldwide rights to certain inhibitors of glucosylceramide synthase and their use in wound healing in diabetes (the "Wound Healing License"). The Company's rights and obligations in the Co-owned Technology License and the Wound Healing License agreements are substantially the same as in the Restated License Agreement from August 2015 (collectively referred to as "the Northwestern University License Agreements"). As of December 31, 2019, all pending patent applications under the Wound Healing License have been abandoned. As of December 31, 2019, the Company has paid to NU an aggregate of $8,179 in consideration of each of the obligations described above.

EXICURE, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(in thousands, except share and per share data)

15. Related-Party Transactions

The Company received consulting services from, and paid fees to, one of its co-founders who is not an employee but serves as a member of the Board. The Company paid $100 in each of the years ended December 31, 2019 and 2018 in connection with these consulting services and these amounts are recognized as an expense in the accompanying consolidated statement of operations.

16. Quarterly Financial Data (Unaudited)

Selected quarterly financial data for the years ended December 31, 2019 and 2018 are as follows:

	2019			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Revenue	$ 25	$ 434	$ 527	$ 310
Net loss (1) (2)	(5,286)	(5,220)	(5,816)	(9,981)
Basic and diluted loss per common share	$ (0.12)	$ (0.12)	$ (0.09)	$ (0.13)

	2018			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Revenue	$ 36	$ 19	$ 57	$ 6
Net loss (1)	(5,509)	(6,825)	(5,324)	(4,755)
Basic and diluted loss per common share	$ (0.14)	$ (0.17)	$ (0.13)	$ (0.11)

(1) - Net loss includes a non-cash unrealized gain (loss) related to the fair value adjustment of the common stock warrant liability of $370, $(113), $103, $24 in the three months ended March 31, 2019, June 30, 2019, September 30, 2019, and December 31, 2019 and ($128), ($915), $581, and $186 in the three months ended March 31, 2018, June 30, 2018, September 30, 2018, and December 31, 2018, respectively.

(2) - Net loss in the three months ended December 31, 2019 includes $3,750 of research and development expense related to license fees owed to Northwestern University in connection with the receipt of the Allergan Upfront Payment during that period. Refer to Note 3, *Collaborative Research and License Agreements* for more information on the Allergan Upfront Payment and Note 14, *Commitments and Contingencies* for more information on the Northwestern University License Agreements.

17. Subsequent Events

The Company has evaluated subsequent events which may require adjustment to or disclosure in the accompanying consolidated financial statements and has concluded that, other than entering into a lease for a new headquarters in Chicago and the Hercules loan maturity discussed below, there are no subsequent events or transactions that occurred subsequent to the balance sheet date that would require recognition or disclosure in the accompanying consolidated financial statements.

Chicago lease

On February 28, 2020, the Company entered into a non-cancelable real property lease agreement with 2430 N. Halsted LLC (the “Landlord”), for approximately 30,085 square feet of laboratory and office space (the “Premises”)

in Chicago, Illinois (the “Chicago Lease”). The Company intends to move its corporate headquarters and research facility to the Premises upon occupancy, which is expected to occur in the third quarter of 2020.

The original term (the “Original Term”) of the Chicago Lease is 10 years, commencing on the date on which the Premises are ready for occupancy under the terms of the Chicago Lease (the "Anticipated Commencement Date"). The Company has options to extend the term of the Chicago Lease for two additional successive periods of five years each (the “Extension Periods”) at the then prevailing effective market rental rate.

The initial annual base rent during the Original Term is $37.00 per square foot per year, or approximately $1,113 for the first 12-month period of the Original Term, payable in monthly installments beginning on the Anticipated Commencement Date. Base rent thereafter is subject to annual increases of 3%, for an aggregate amount of $12,761 over the Original Term. The Company must also pay its proportionate share of certain operating expenses and taxes for each calendar year during the term. During the first 12-month period of the Original Term, the base rent and the Company's proportionate share of operating expenses and taxes are subject to certain abatements.

The Landlord will contribute a maximum of $3,159 toward tenant improvements. In connection with the Chicago Lease, the Company will maintain a letter of credit for the benefit of the Landlord in an initial amount of $1,200, which amount is subject to reduction over time. Upon execution of the Chicago Lease, the Company paid to the Landlord the first installment of base rent and the estimated monthly amount of its pro rata share of taxes and its pro rata share of operating expenses in the aggregate amount of $87, which amount had been adjusted for the abatement as set forth in the lease agreement.

The Chicago Lease contains customary representations, warranties, covenants, indemnification provisions, default provisions, and termination provisions for a lease of this nature.

Hercules loan maturity

On March 2, 2020, pursuant to the terms of the Hercules loan agreement and subsequent amendments thereto, the Company repaid all remaining outstanding obligations under the Hercules loan agreement, to include the outstanding principal balance of $5,000 and an end of term fee of $100.

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 that are designed to ensure that information required to be disclosed in our periodic and current reports that we file with the SEC under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, and that such information is accumulated and communicated to our management, including our principal executive officer and principal financial officer, as appropriate, to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures.

As of the end of the period covered by this Annual Report on Form 10-K, we carried out an evaluation, under the supervision and with the participation of our management, including the principal executive officer and the principal financial officer, of the effectiveness of the design and operation of our disclosure controls and procedures pursuant to Exchange Act Rule 13a-15. Based upon, and as of the date of, this evaluation, our principal executive officer and our principal financial officer concluded that our disclosure controls and procedures were effective. Accordingly, management believes that the financial statements included in this report fairly present in all material respects our financial condition, results of operations and cash flows for the periods presented.

Management's Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) of the Exchange Act). Under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting as of December 31, 2019 based on the guidelines established in Internal Control—Integrated Framework 2013 issued by the Committee of Sponsoring Organizations of the Treadway Commission. Our internal control over financial reporting includes policies and procedures that provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external reporting purposes in accordance with U.S. generally accepted accounting principles.

Based on that evaluation, management concluded that our internal control over financial reporting was effective as of December 31, 2019.

Attestation Report of the Registered Public Accounting Firm

This Annual Report on Form 10-K does not include an attestation report of our independent registered public accounting firm as we are a smaller reporting company and an "emerging growth company" as of December 31, 2019, as defined in the Jumpstart Our Business Startups Act of 2012.

Our compliance with Section 404 of the Sarbanes-Oxley Act first became subject to management's assessment regarding internal control over financial reporting in connection with the filing of our Annual Report on Form 10-K for the fiscal year ending December 31, 2018, and we will not be required to have an independent registered public accounting firm attest to the effectiveness of our internal control over financial reporting until the filing of our first Annual Report on Form 10-K after we lose emerging growth company status, which may not be until the 2022 Annual Report on Form 10-K.

Changes in Internal Control over Financial Reporting

We continuously seek to improve the efficiency and effectiveness of our internal controls. There was no change in our internal control over financial reporting identified in connection with the evaluation required by Rule 13a-15(d) and 15d-15(d) of the Exchange Act during the fiscal quarter ended December 31, 2019 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information.

None

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

The information required by this item and not set forth below will be set forth in the definitive proxy statement for our 2020 Annual Meeting of Stockholders to be filed with the SEC pursuant to Regulation 14A , or the Proxy Statement, not later than 120 days after the end of the fiscal year covered by this Annual Report on Form 10-K, and is incorporated herein by reference.

We have adopted a Code of Business Conduct and Ethics applicable to all employees, including the principal executive officer, principal financial officer and principal accounting officer or controller, or persons performing similar functions. The Code of Business Conduct and Ethics is posted on our website at *www.exicuretx.com*. Amendments to, and waivers from, the Code of Business Conduct and Ethics that apply to any of these officers, or persons performing similar functions, and that relate to any element of the code of ethics definition enumerated in Item 406(b) of Regulation S-K will be disclosed at the website address provided above and, to the extent required by applicable regulations, on a current report on Form 8-K.

Item 11. Executive Compensation.

The information required by this item will be set forth in our Proxy Statement and is incorporated herein by reference.

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

The information required by this item will be set forth in our Proxy Statement and is incorporated herein by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

The information required by this item will be set forth in our Proxy Statement and is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services.

The information required by this item will be set forth in our Proxy Statement and is incorporated herein by reference.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

(a) The following documents are filed as part of this report:

1. Financial Statements

See Index to Financial Statements on page 112 of this Annual Report on Form 10-K.

2. Financial Statement Schedules

All schedules are omitted because they are not applicable or the required information is shown in the financial statements or notes thereto.

3. Exhibits

Except as so indicated in Exhibit 32.1, the following exhibits are filed as part of, or incorporated by reference into, this Annual Report on Form 10-K.

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
2.1†	Agreement and Plan of Merger and Reorganization, dated September 26, 2017, by and among Max-1 Acquisition Corporation, Max-1 Acquisition Sub, Inc., a Delaware corporation and wholly-owned subsidiary of the Company, and Exicure OpCo, a Delaware corporation.		8-K (Exhibit 2.1)	10/2/2017	000-55764
3.1	Certificate of Merger relating to the merger of Max-1 Acquisition Sub., Inc. with and into Exicure OpCo, filed with the Secretary of State of the State of Delaware on September 26, 2017.		8-K (Exhibit 3.1)	10/2/2017	000-55764
3.2	Certificate of Amendment to Certificate of Incorporation, filed with the Secretary of State of the State of Delaware on September 26, 2017.		8-K (Exhibit 3.2)	10/2/2017	000-55764
3.3	Form of Amended and Restated Certificate of Incorporation, as filed with the Secretary of State of the State of Delaware on November 15, 2017.		8-K (Exhibit 3.3)	10/2/2017	000-55764
3.4	Amended and Restated Bylaws, as currently in effect.		8-K (Exhibit 3.4)	10/2/2017	000-55764
4.1	Form of Warrant to Purchase Shares of Common Stock issued to Placement Agent.		8-K (Exhibit 4.1)	10/2/2017	000-55764
4.2	Form of Registration Rights Agreement by and among the Company and the persons named therein.		8-K (Exhibit 4.2)	10/2/2017	000-55764
4.3	Form of Registration Rights Agreement by and among the Company and the persons named therein.		8-K (Exhibit 4.1)	8/28/2018	000-55764
4.4	Description of Securities	X			
10.1+	2015 Equity Incentive Plan and forms of awards thereunder, assumed in the Merger.		8-K (Exhibit 10.1)	10/2/2017	000-55764
10.2+	2017 Equity Incentive Plan and forms of award agreements thereunder.		8-K (Exhibit 10.2)	10/2/2017	000-55764
10.3+	2017 Employee Stock Purchase Plan.		8-K (Exhibit 10.3)	10/2/2017	000-55764
10.4+	Form of Indemnification Agreement by and between the Company and each of its directors and executive officers.		8-K (Exhibit 10.4)	10/2/2017	000-55764
10.5	Form of Subscription Agreement by and between the Company and each investor in the initial closing of the 2017 Private Placement.		8-K (Exhibit 10.5)	10/2/2017	000-55764

10.6+	Form of Amended and Restated Board Member Service Agreement by and between Exicure OpCo and each of its non-executive directors.		8-K (Exhibit 10.6)	10/2/2017	000-55764
10.7+	Employment Agreement dated as of February 2, 2016 by and between Exicure OpCo and David A. Giljohann, Ph.D.		8-K (Exhibit 10.7)	10/2/2017	000-55764
10.8+	Amended and Restated Employment Agreement dated as of February 2, 2016 by and between Exicure OpCo and David S. Snyder.		8-K (Exhibit 10.8)	10/2/2017	000-55764
10.9+	Amended and Restated Employment Agreement as of December 10, 2019 by and between Exicure, Inc. and Matthias G. Schroff, Ph.D.	X			
10.10+	Separation Agreement dated as of February 1, 2019 by and among Exicure, Inc., Exicure Operating Company, and Ekambar Kandimalla.		10-Q/A (Exhibit 10.3)	5/14/2019	000-55764
10.11+	Consulting Agreement dated as of October 1, 2011 by and between AuraSense Therapeutics, LLC and Chad A. Mirkin, Ph.D.		8-K (Exhibit 10.11)	10/2/2017	000-55764
10.12	Lease Agreement dated as of February 13, 2012 by and between AuraSense Therapeutics, LLC and FC Skokie SPE, LLC.		8-K (Exhibit 10.12)	10/2/2017	000-55764
10.13	Letter dated as of March 12, 2012 regarding the Lease Agreement by and between AuraSense Therapeutics, LLC and FC Skokie SPE, LLC.		8-K (Exhibit 10.13)	10/2/2017	000-55764
10.14	First Amendment to Lease dated as of March 31, 2014 by and between AuraSense Therapeutics, LLC and FC Skokie PQ, LLC, as successor in interest to FC Skokie SPE, LLC.		8-K (Exhibit 10.14)	10/2/2017	000-55764
10.15	Second Amendment to Lease dated as of May 26, 2016 by and between Exicure OpCo and FC Skokie PQ, LLC, as successor in interest to FC Skokie SPE, LLC.		8-K (Exhibit 10.15)	10/2/2017	000-55764
10.16	Loan and Security Agreement dated as of February 17, 2016 by and between Exicure OpCo and Hercules.		8-K (Exhibit 10.16)	10/2/2017	000-55764
10.17	Amendment No. 1 to Loan and Security Agreement dated as of October 10, 2016 by and between Exicure OpCo and Hercules.		8-K (Exhibit 10.17)	10/2/2017	000-55764
10.17.1	Amendment No. 2 to Loan and Security Agreement dated as of January 15, 2018 by and between Exicure OpCo and Hercules.		S-1/A (Exhibit 10.17.1)	1/26/2018	333-221791
10.17.2	Amendment No. 3 to Loan and Security Agreement dated as of December 28, 2018 by and between Exicure OpCo and Hercules.		10-K (Exhibit 10.18.2)	3/8/2019	000-55764
10.17.3	Amendment No. 4 to Loan and Security Agreement dated as of March 8, 2019 by and between Exicure OpCo and Hercules.		8-K (Exhibit 10.1)	3/14/2019	000-55764
10.18+	Form of Pre-Merger Indemnity Agreement.		8-K (Exhibit 10.18)	10/2/2017	000-55764
10.19	Form of Common Stock Purchase Agreement.		8-K (Exhibit 10.1)	6/19/2017	000-55764
10.20*	Restated License Agreement between Exicure OpCo and Northwestern University dated as of August 15, 2015.		8-K/A (Exhibit 10.20)	11/7/2017	000-55764
10.21*	Amendment One to the Amended Restated License Agreement between Exicure OpCo and Northwestern University dated as of September 27, 2016.		8-K/A (Exhibit 10.23)	11/7/2017	000-55764
10.22*	Amendment Two to the Amended Restated License Agreement between Exicure OpCo and Northwestern University dated as of November 30, 2017.	X			
10.23*	Amendment Three to the Amended Restated License Agreement between Exicure OpCo and Northwestern University dated as of January 1, 2019.	X			
10.24	Amendment Four to the Amended Restated License Agreement between Exicure OpCo and Northwestern University dated as of November 13, 2019.	X			

10.25*	License Agreement between Exicure OpCo and Northwestern University dated as of February 10, 2016 and effective as of May 27, 2014.		8-K/A (Exhibit 10.21)	11/7/2017	000-55764
10.26*	Amendment One dated and effective as of June 11, 2018 to the License Agreement between Exicure OpCo and Northwestern University dated as of February 10, 2016 and effective as of May 27, 2014.	X			
10.27	Amendment Two dated and effective as of November 13, 2019 to the License Agreement between Exicure OpCo and Northwestern University dated as of February 10, 2016 and effective as of May 27, 2014.	X			
10.28*	License Agreement between Exicure OpCo and Northwestern University dated as of June 17, 2016.		8-K/A (Exhibit 10.22)	11/7/2017	000-55764
10.29*	Amendment One dated and effective June 11, 2018 to the License Agreement between Exicure OpCo and Northwestern University dated as of June 17, 2016.	X			
10.30*	Research Collaboration, Option and License Agreement between Exicure OpCo and Purdue Pharma L.P. dated as of December 2, 2016.		8-K/A (Exhibit 10.24)	11/7/2017	000-55764
10.31*	License and Development Agreement between Exicure, Inc. and DERMELIX LLC dated February 17, 2019.		10-Q (Exhibit 10.2)	5/8/2019	000-55764
10.32	Side Agreement to Northwestern Agreements by and among Exicure OpCo, Northwestern University and Purdue Pharma L.P. dated as of October 11, 2016.		8-K/A (Exhibit 10.25)	11/7/2017	000-55764
10.33*	Collaboration, Option and License Agreement between Exicure, Inc. and Allergan Pharmaceuticals International Limited dated as of November 13, 2019	X			
10.34	Side Agreement to Northwestern Agreements by and among Exicure Inc., Northwestern University and Allergan Pharmaceuticals International Limited dated as of November 13, 2019.	X			
10.35	Form of Subscription Agreement by and between the Company and each investor in connection with the subsequent closings of the 2017 Private Placement.		8-K (Exhibit 10.1)	11/2/2017	000-55764
10.36	Form of Purchaser Rights Letter to be delivered by the Company to each investor in the initial closing of the 2017 Private Placement.		8-K (Exhibit 10.2)	11/2/2017	000-55764
10.37	Form of Subscription Agreement by and between the Company and each investor in connection with the initial closing of the August 2018 Private Placement.		8-K (Exhibit 10.1)	8/28/18	000-55764
21.1	Subsidiaries of Exicure, Inc.	X			
23.1	Consent of KPMG LLP, independent registered public accounting firm.	X			
24.1	Power of Attorney (included on the signature page hereto).	X			
31.1	Certification of Principal Executive Officer Pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934, As Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.	X			
31.2	Certification of Principal Financial Officer Pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934, As Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.	X			
32**	Certifications of Principal Executive Officer and Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, As Adopted Pursuant to Section 906 of the 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.	X
101.LAB	XBRL Taxonomy Extension Label Linkbase Document.	X
101.PRE	XBRL Taxonomy Presentation Linkbase Document.	X

† Annexes, schedules and/or exhibits have been omitted pursuant to Item 601(b)(2) of Regulation S-K. We hereby undertake to furnish supplementally a copy of any of the omitted schedules and exhibits to the SEC on a confidential basis upon request.

+ Indicates a management contract or compensatory plan.

* Indicates that certain confidential portions of this exhibit have been omitted.

** Furnished herewith.

Item 16. Form 10-K Summary.

None.

SIGNATURES

Pursuant to the requirements of Section 13 or Section 15(d) of the Securities Exchange Act of 1934, as amended, the registrant has duly caused this Annual Report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Skokie, State of Illinois, on March 9, 2020.

EXICURE, INC.

By: /s/ David A. Giljohann

David A. Giljohann, Ph.D.

Chief Executive Officer and Director (*principal executive officer)*

By: /s/ David S. Snyder

David S. Snyder

Chief Financial Officer

(*principal financial officer and principal accounting officer*)

POWER OF ATTORNEY

We, the undersigned directors and officers of Exicure, Inc., hereby severally constitute and appoint David A. Giljohann and David S. Snyder, and each of them singly, our true and lawful attorneys-in-fact, with full power to them, and to each of them singly, to sign for us and in our names in the capacities indicated below, any and all amendments to this Annual Report on Form 10-K and to file or cause to be filed 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 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 each of them might or could do in person, and hereby ratifying and confirming all that said attorneys-in-fact, and each of them, or their substitute or substitutes, shall do or cause to be done by virtue of this Power of Attorney. This Power of Attorney does not revoke any power of attorney previously granted by the undersigned, or any of them.

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

SIGNATURE	TITLE	DATE
/s/ David A. Giljohann David A. Giljohann, Ph.D.	Chief Executive Officer and Director (*principal executive officer)*	March 9, 2020
/s/ David S. Snyder David S. Snyder	Chief Financial Officer (*principal financial officer and principal accounting officer*)	March 9, 2020
/s/ Chad A. Mirkin Chad A. Mirkin, Ph.D.	Director and Chairman of the Board of Directors	March 9, 2020
/s/ Jeffrey L. Cleland Jeffrey L. Cleland	Director	March 9, 2020
/s/ Bosun Hau Bosun Hau	Director	March 9, 2020
/s/ Helen S. Kim Helen S. Kim	Director	March 9, 2020
/s/ Bali Muralidhar Bali Muralidhar, M.D., Ph.D.	Director	March 9, 2020
/s/ Jay R. Venkatesan Jay R. Venkatesan, M.D.	Director	March 9, 2020
/s/ Timothy P. Walbert Timothy P. Walbert	Director	March 9, 2020
/s/ David R. Walt David R. Walt, Ph.D.	Director	March 9, 2020

DESCRIPTION OF CAPITAL STOCK

The following description of the capital stock of Exicure, Inc. ("us," "our," "we" or the "Company") is a summary of the rights of our common stock and certain provisions of our amended and restated certificate of incorporation and our amended and restated bylaws currently in effect. This summary does not purport to be complete and is qualified in its entirety by the provisions of our amended and restated certificate of incorporation, as amended, and amended and restated bylaws, each previously filed with the Securities and Exchange Commission and incorporated by reference as an exhibit to the Annual Report on Form 10-K of which this Exhibit 4.4 is a part, as well as to the applicable provisions of the Delaware General Corporation Law (the "DGCL"). We encourage you to read our amended and restated certificate of incorporation, amended and restated bylaws and the applicable portions of the DGCL carefully.

Authorized Capital Stock

Our authorized capital stock consists of 200,000,000 shares of common stock, par value $0.0001 per share, and 10,000,000 shares of preferred stock, par value $0.0001 per share, all of which shares of preferred stock are undesignated.

Common Stock

The holders of our common stock are entitled to one vote per share on all matters to be voted upon by our stockholders. The holders of our common stock do not have any cumulative voting rights. Subject to preferences that may be applicable to any outstanding preferred stock, the holders of shares of our common stock are entitled to receive ratably any dividends that may be declared from time to time by our board of directors out of funds legally available for that purpose. We have never paid cash dividends on our common stock. Moreover, we do not anticipate paying periodic cash dividends on our common stock for the foreseeable future. Any future determination about the payment of dividends will be made at the discretion of our board of directors and will depend upon our earnings, if any, capital requirements, operating and financial conditions and on such other factors as our board of directors deems relevant. Our common stock has no preemptive or conversion rights or other subscription rights. There are no redemption or sinking fund provisions applicable to our common stock.

In the event of our liquidation, dissolution or winding up, the holders of shares of our common stock are entitled to share ratably in all assets remaining after payment of liabilities, subject to prior distribution rights of preferred stock then outstanding.

Preferred Stock

Our board of directors has the authority, without further action by the stockholders, to issue up to 10,000,000 shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions granted to or imposed upon the preferred stock. Any or all of these rights may be greater than the rights of our common stock. Our board of directors may specify the following characteristics of any preferred stock:

- the maximum number of shares;
- the designation of the shares;
- the annual dividend rate, if any, whether the dividend rate is fixed or variable, the date or dates on which dividends will accrue, the dividend payment dates, and whether dividends will be cumulative;
- the price and the terms and conditions for redemption, if any, including redemption at our option or at the option of the holders, including the time period for redemption, and any accumulated dividends or premiums;
- the liquidation preference, if any, and any accumulated dividends upon the liquidation, dissolution or winding up of our affairs;
- any sinking fund or similar provision, and, if so, the terms and provisions relating to the purpose and operation of the fund;
- the terms and conditions, if any, for conversion or exchange of shares of any other class or classes of our capital stock or any series of any other class or classes, or of any other series of the same class, or any other securities or assets, including the price or the rate of conversion or exchange and the method, if any, of adjustment;
- the voting rights; and
- any or all other preferences and relative, participating, optional or other special rights, privileges or qualifications, limitations or restrictions.

Our board of directors, without stockholder approval, can issue preferred stock with voting, conversion or other rights that could negatively affect the voting power and other rights of the holders of our common stock. Preferred stock could thus be

issued quickly with terms calculated to delay or prevent a change in control of us or make it more difficult to remove our management.

We currently have no shares of preferred stock outstanding.

Anti-Takeover Effects of Our Certificate of Incorporation and Bylaws and Delaware Law

Our amended and restated certificate of incorporation and amended and restated bylaws include a number of provisions that may have the effect of delaying, deferring or preventing another party from acquiring control of us and encouraging persons considering unsolicited tender offers or other unilateral takeover proposals to negotiate with our board of directors rather than pursue non-negotiated takeover attempts. These provisions include the items described below.

Board composition and filling vacancies

Our amended and restated certificate of incorporation provides for our board of directors to be divided into three classes serving staggered terms. Approximately one-third of the board of directors will be elected each year. The provision for a classified board could prevent a party who acquires control of a majority of our outstanding voting stock from obtaining control of our board of directors until the second annual stockholders meeting following the date the acquirer obtains the controlling stock interest. The classified board provision could discourage a potential acquirer from making a tender offer or otherwise attempting to obtain control of us and could increase the likelihood that incumbent directors will retain their positions. Our amended and restated certificate of incorporation provides that directors may be removed only for cause by the affirmative vote of the holders of at least two-thirds of the voting power of all of our outstanding stock. The classification of directors, together with the limitations on removal of directors, has the effect of making it more difficult for stockholders to change the composition of our board of directors.

No written consent of stockholders

Our amended and restated certificate of incorporation and amended and restated bylaws do not allow our stockholders to act by written consent without a meeting. Without the availability of stockholder action by written consent, a holder controlling a majority of our capital stock would not be able to amend our amended and restated bylaws or remove directors without holding a stockholders' meeting. This limit may lengthen the amount of time required to take stockholder actions and would prevent the amendment of our bylaws or removal of directors by our stockholders without holding a meeting of stockholders.

Exclusive Forum

Our amended and restated certificate of incorporation also provides that, unless we consent in writing to an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for any derivative action or proceeding brought on our behalf, any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers, employees or agents to us or our stockholders, any action asserting a claim arising pursuant to any provision of the DGCL, our amended and restated certificate of incorporation or our amended and restated bylaws or any action asserting a claim that is governed by the internal affairs doctrine, in each case subject to the Court of Chancery having personal jurisdiction over the indispensable parties named as defendants therein and the claim not being one which is vested in the exclusive jurisdiction of a court or forum other than the Court of Chancery or for which the Court of Chancery does not have subject matter jurisdiction. However, this exclusive forum provision would not apply to suits brought to enforce a duty or liability created by the Securities Exchange Act of 1934. Furthermore, this provision applies to Securities Act of 1933 ("Securities Act") claims and Section 22 of the Securities Act creates concurrent jurisdiction for federal and state courts over all suits brought to enforce any duty or liability created by the Securities Act or the rules and regulations thereunder. Accordingly, there is uncertainty as to whether a court would enforce such provision, and our stockholders will not be deemed to have waived our compliance with the federal securities laws and the rules and regulations thereunder. This exclusive-forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage lawsuits against us and our directors, officers and other employees.

Meetings of stockholders

Our amended and restated bylaws provide that a special meeting of our stockholders may be called only by our corporate secretary and at the direction of our board of directors by resolution adopted by a majority of our board of directors. Because our stockholders do not have the right to call a special meeting, a stockholder could not force stockholder consideration of a proposal over the opposition of our board of directors by calling a special meeting of stockholders prior to such time as a majority of our board of directors, the chairperson of our board of directors, the president or the chief executive officer believed

the matter should be considered or until the next annual meeting provided that the requestor met the notice requirements. The restriction on the ability of stockholders to call a special meeting means that a proposal to replace our board of directors also could be delayed until the next annual meeting.

Stockholder proposals

Our amended and restated bylaws establish an advance notice procedure for stockholder proposals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to our board of directors. At an annual meeting, stockholders may only consider proposals specified in the notice of meeting or brought before the meeting by or at the direction of our board of directors. Additionally, at an annual meeting, stockholders may only consider nominations brought before the meeting by or at the direction of our board of directors. Stockholders may also consider a proposal or nomination by a person who was a stockholder at the time of giving notice and at the time of the meeting, who is entitled to vote at the meeting and who has complied with the notice requirements of our amended and restated bylaws in all respects. The amended and restated bylaws do not give our board of directors the power to approve or disapprove stockholder nominations of candidates or proposals regarding other business to be conducted at a special or annual meeting of our stockholders. However, our amended and restated bylaws may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed. These provisions may also discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer's own slate of directors or otherwise attempting to obtain control of our company.

Advance notice requirements

Our amended and restated bylaws establish advance notice procedures with regard to stockholder proposals relating to the nomination of candidates for election as directors or new business to be brought before meetings of our stockholders. These procedures provide that notice of stockholder proposals must be timely given in writing to our corporate secretary prior to the meeting at which the action is to be taken. Generally, to be timely, notice must be received at our principal executive offices not less than 90 days nor more than 120 days prior to the first anniversary date of the annual meeting for the preceding year. Our bylaws specify the requirements as to form and content of all stockholders' notices. These requirements may preclude stockholders from bringing matters before the stockholders at an annual or special meeting.

Amendment to our charter documents

Any amendment of our amended and restated certificate of incorporation must first be approved by a majority of our board of directors, and if required by law or our amended and restated certificate of incorporation, must thereafter be approved by a majority of the outstanding shares entitled to vote on the amendment and a majority of the outstanding shares of each class entitled to vote thereon as a class, except that the amendment of the provisions relating to stockholder action, board composition, limitation of liability, exclusive-forum and requirements for amendment of our amended and restated certificate of incorporation must be approved by the affirmative vote of the holders of at least two-thirds of the voting power of all of the then-outstanding shares of our capital stock entitled to vote generally in the election of directors, voting together as a single class. Our amended and restated bylaws may be amended by the affirmative vote of a majority of the authorized directors, subject to any limitations set forth in our amended and restated bylaws; and may also be amended by the affirmative vote of a majority of the outstanding shares entitled to vote on the amendment, voting together as a single class; *provided that*, in addition to any vote of the holders of any class or series of our stock required by law or by our amended and restated certificate of incorporation, such action by stockholders shall require the affirmative vote of the holders of at least two-thirds of the voting power of all of the then-outstanding shares of our capital stock entitled to vote at an election of directors. These provisions could discourage a potential acquirer from making a tender offer or otherwise attempting to obtain control of our company and could delay changes in management.

Undesignated preferred stock

Our amended and restated certificate of incorporation provides for 10,000,000 authorized shares of preferred stock. The existence of authorized but unissued shares of preferred stock may enable our board of directors to discourage an attempt to obtain control of us by means of a merger, tender offer, proxy contest or otherwise. For example, if in the due exercise of its fiduciary obligations, our board of directors were to determine that a takeover proposal is not in the best interests of our stockholders, our board of directors could cause shares of preferred stock to be issued without stockholder approval in one or more private offerings or other transactions that might dilute the voting or other rights of the proposed acquirer or insurgent stockholder or stockholder group. In this regard, our amended and restated certificate of incorporation grants our board of directors broad power to establish the rights and preferences of authorized and unissued shares of preferred stock. The issuance of shares of preferred stock could decrease the amount of earnings and assets available for distribution to holders of shares of

common stock. The issuance may also adversely affect the rights and powers, including voting rights, of these holders and may have the effect of delaying, deterring or preventing a change in control of us.

Section 203 of the Delaware General Corporation Law

We are subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions:

- before the stockholder became interested, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances, but not the outstanding voting stock owned by the interested stockholder; or
- at or after the time the stockholder became interested, the business combination was approved by our board of directors and authorized at an annual or special meeting of the stockholders by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Section 203 defines a business combination to include:

- any merger or consolidation involving the corporation and the interested stockholder;
- any sale, transfer, lease, pledge or other disposition involving the interested stockholder of 10% or more of the assets of the corporation;
- subject to exceptions, any transaction that results in the issuance or transfer by the corporation of any stock of the corporation to the interested stockholder;
- subject to exceptions, any transaction involving the corporation that has the effect of increasing the proportionate share of the stock of any class or series of the corporation beneficially owned by the interested stockholder; and
- the receipt by the interested stockholder of the benefit of any loans, advances, guarantees, pledges, or other financial benefits provided by or through the corporation.

In general, Section 203 defines an interested stockholder as any entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by the entity or person.

Nasdaq Global Select Market Listing

Our common stock is listed on the Nasdaq Capital Market under the trading symbol "XCUR."

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company, LLC.

AMENDED AND RESTATED EMPLOYMENT AGREEMENT

THIS AMENDED AND RESTATED EMPLOYMENT AGREEMENT (the "Agreement") between **Exicure, Inc.,** a Delaware corporation (the "Company"), and Dr. **Matthias Schroff,** Ph.D. (the "Executive") (each of the Executive and the Company, a "Party," and collectively, the "Parties"), amends and restates in its entirety the Employment Agreement between the Company and Executive entered into as of January 18, 2018. This Agreement is effective as of December 10, 2019 (the "Effective Date").

WHEREAS, the Company desires to continue to employ the Executive as its Chief Operating Officer;

WHEREAS, the Company and the Executive previously entered into an agreement dated as of January 18, 2018, pursuant to which the Executive served as Chief Operating Officer of the Company (the "Prior Agreement");

WHEREAS, the Executive desires to continue to be employed by the Company as Chief Operating Officer and to perform his duties to the Company on the terms and conditions hereinafter set forth; and

WHEREAS, the Parties wish to amend and restate the terms of the Prior Agreement as set forth in this Agreement.

Now, THEREFORE, in consideration of the mutual covenants contained herein and other valid consideration, the sufficiency of which is acknowledged, the Parties hereto agree as follows:

1. Employment. Executive's employment with the Company commenced on April 1, 2018 ("Start Date") and shall continue until the termination of Executive's employment under this Agreement. The period from the Start Date until the termination of Executive's employment under this Agreement is referred to as the "Employment Period."

2. Position and Duties. Subject to the terms and conditions of this Agreement, Executive shall continue to serve as the Chief Operating Officer of the Company and shall have the duties, responsibilities and authority of an executive serving in such position, reporting and subject to the direction of the Chief Executive Officer of the Company or other duly authorized executive. Executive shall devote his full business time and efforts to the business and affairs of the Company and its subsidiaries. Executive shall not become a director of any for-profit entity without first receiving the approval of the Nominating and Corporate Governance Committee of the Board.

3. Compensation and Benefits.

(a) Base Salary. As compensation for Executive's performance of Executive's duties hereunder, Executive's current base salary shall remain unchanged, payable in accordance with the normal payroll practices of the Company, less required deductions for state and federal withholding tax, social security and all other employment taxes and payroll deductions. The Base Salary shall be reviewed for adjustments by the Compensation Committee of the Board (the "Compensation Committee") in good faith, based upon Executive's performance and the Company's pay philosophy, not less often than annually, provided, that Executive's Base Salary may be decreased as part of an across-the-board reduction in base salaries of all Company executive officers so long as the percentage reduction in Executive's Base Salary is not greater than the percentage reduction applicable to other executive officers. The term "Base Salary" shall refer to the Base Salary as may be in effect from time to time.

(b) Annual Incentive Compensation. Executive shall be eligible to participate in the annual cash bonus program maintained for executive officers of the Company (the "Annual Incentive Program"). Executive's current target under the Annual Incentive Program shall remain unchanged. Executive's minimum target annual bonus shall be equal to at least 25% of Base Salary for each year during the Employment Period in which Executive participates in the Annual Incentive Program. The actual amount of the annual bonus earned by and payable to Executive in any year shall be determined upon the satisfaction of goals and objectives established by the Compensation Committee and communicated to Executive, and shall be subject to such other terms and conditions of the Annual Incentive Program as in effect from time to time. Except as otherwise provided herein, Executive must be employed by the Company on the day a bonus is paid in order to earn such bonus. Each bonus paid under the Annual Incentive Program shall be paid to Executive no later than March 15th of the calendar year following the calendar year to which the bonus relates.

(c) Other Benefits.

(i) Savings and Retirement Plans. Except as otherwise limited by applicable law, Executive shall be entitled to participate in all qualified and non-qualified savings and retirement plans applicable generally to other senior executive officers of the Company, in accordance with the terms of the plans, as may be amended from time to time.

(ii) Welfare Benefit Plans. Except as otherwise limited by applicable law, Executive and/or his eligible dependents shall be eligible to participate in and shall receive all benefits under the Company's welfare benefit plans and programs applicable generally to other senior executive officers of the Company, in accordance with the terms of the plans, as may be amended from time to time.

(iii) Perquisites. Except as otherwise limited by applicable law, Executive shall be entitled to such perquisites as may be available generally from time to time to other senior executive officers of the Company, but at levels commensurate with executive's position as Chief Operating Officer.

(iv) Business Expenses. Subject to Section 14, Executive shall be reimbursed for reasonable travel and other expenses incurred in the performance of Executive's duties on behalf of the Company in a manner consistent with the Company's policies regarding such reimbursements, as may be in effect from time to time.

4. Termination of Employment.

(a) Executive's employment under this Agreement shall terminate upon the earliest to occur of: (i) Termination due to Disability (as defined below); (ii) termination of Executive's employment by the Company for any reason other than Termination due to Disability;
(iii) Executive's death; or (iv) termination of Executive's employment by Executive for any reason. Upon the termination of Executive's employment with the Company for any reason, Executive shall be deemed to have resigned from all positions with the Company or any of its affiliates held by Executive as of the date immediately preceding his termination of employment.

(b) If Executive's employment ends for any reason, except as otherwise contemplated in this Section 4, Executive shall cease to have any rights to salary, bonus (if any) or other benefits, other than (i) the earned but unpaid portion of Executive's Base Salary

through the date of termination or resignation, (ii) a lump-sum payment in respect of accrued but unused vacation days at the Executive's per-business-day Base Salary rate, (iii) any unpaid expense or other reimbursements due to Executive, and (iv) any other amounts or benefits required to be paid or provided by law or under any plan, program, policy or practice of the Company, provided that Executive shall not be entitled to any payment or benefit under any severance plan maintained by the Company.

(c) Termination without Cause or for Good Reason. If Executive's employment hereunder shall be terminated by the Company without Cause, or by Executive for Good Reason, then in addition to the payments and benefits described in Section 4(b) and subject to Executive's execution and non-revocation of the release contemplated in Section 4(£) of this Agreement and Executive's continuing compliance with the Confidentiality and Work Product Assignment Agreement (as defined below):

(i) the Company shall pay Executive continuation of six (6) months of Executive's annual Base Salary, as in effective immediately prior to Executive's termination of employment hereunder, payable during the 6-month period following Executive's termination of employment in the form of salary continuation in accordance with the Company's normal payroll practices;

(ii) the Company shall pay Executive an annual cash bonus for the year of termination, payable at the same time as annual cash bonuses are paid to senior management, based on actual achievement of performance targets (as if Executive had remained employed through the end of the applicable performance period), subject, however, to proration based on the number of days in the applicable performance period that had elapsed prior to the date of termination; and

(iii) if the Executive timely elects to receive continued coverage under the Company's group health care plan pursuant to the Consolidated Omnibus Budget Reconciliation Act of 1985, as amended ("COBRA"), the Company shall pay the employer portion of applicable COBRA premium payments for the Executive's and, as applicable, Executive's dependents', continued health coverage under such plan (as in effect or amended from time to time) (the "COBRA Subsidy") until the earlier of: (1) twelve (12) months following the Executive's termination of employment, or (2) the date upon which the Executive obtains or becomes eligible for other health care coverage from a new employer or otherwise (such period referred to as the "COBRA Subsidy Period"). The Executive shall promptly inform the Company in writing when Executive obtains or becomes eligible for any such other health care coverage. The Executive shall be responsible for paying a share of such COBRA premiums during the COBRA Subsidy Period at active employee rates as in effect from time to time, and shall be responsible for the full unsubsidized costs of such COBRA coverage thereafter.

(d) Termination without Cause or for Good Reason in Connection with a Change in Control. If Executive's employment hereunder shall be terminated by the Company without Cause, or by Executive for Good Reason, in either case within 12 months following a Change in Control, then, subject to Executive's execution and non-revocation of the release contemplated in Section 4(f) of this Agreement and Executive's continuing compliance with the Confidentiality and Work Product Assignment Agreement (as defined below), in addition to the payments and benefits described in Section 4(c) of this Agreement:

(i) the Company shall pay Executive's full target bonus under the Annual Incentive Program for the year in which the termination of employment occurs. This full target bonus will be paid in full with the first salary continuation payment made

pursuant to Section 4(c) of this Agreement; and

(ii) notwithstanding anything to the contrary in any applicable option agreement or other stock-based award agreement, all time-based stock options and other stock-based awards subject to time-based vesting held by Executive (the "Time-Based Equity Awards") shall immediately accelerate and become fully exercisable or nonforfeitable as of the later of (i) the date of termination or (ii) the effective date of the release contemplated in Section 4(f) of this Agreement (the "Accelerated Vesting Date"); *provided* that any termination or forfeiture of the unvested portion of such Time-Based Equity Awards that would otherwise occur on the date of termination in the absence of this Agreement will be delayed until the effective date of the release and will only occur if the vesting pursuant to this subsection does not occur due to the absence of the release becoming fully effective within the time period set forth therein. Notwithstanding the foregoing, no additional vesting of the Time-Based Equity Awards shall occur during the period between Executive's date of termination and the Accelerated Vesting Date.

(e) Section 280G. Notwithstanding anything to the contrary in this Agreement, Executive expressly agrees that if the payments and benefits provided for in this Agreement or any other payments and benefits which Executive has the right to receive from the Company and its affiliates (collectively, the "Payments"), would constitute a "parachute payment" (as defined in Section 280G(b)(2) of the Code), then the Payments shall be either (a) reduced (but not below zero) so that the present value of the Payments will be one dollar ($1.00) less than three times Executive's "base amount" (as defined in Section 280G(b)(3) of the Code) and so that no portion of the Payments received by Executive shall be subject to the excise tax imposed by Section 4999 of the Code or (b) paid in full, whichever produces the better net after-tax position to Executive. The reduction of Payments, if any, shall be made by reducing first any Payments that are exempt from Section 409A of the Code and then reducing any Payments subject to Section 409A of the Code in the reverse order in which such Payments would be paid or provided (beginning with such payment or benefit that would be made last in time and continuing, to the extent necessary, through to such payment or benefit that would be made first in time). The determination as to whether any such reduction in the Payments is necessary shall be made by the Compensation Committee in good faith. If a reduced Payment is made or provided and, through error or otherwise, that Payment, when aggregated with other payments and benefits from Company (or its affiliates) used in determining if a "parachute payment" exists, exceeds one dollar ($1.00) less than three times Executive's base amount, then Executive shall immediately repay such excess to the Company.

(f) Release. Executive's execution of a complete and general release of any and all of Executive's potential claims (other than for benefits and payments described in this Agreement or any other vested benefits with the Company and/or its affiliates) against the Company, any of its affiliated companies, and their respective successors and any officers, employees, agents, directors, attorneys, insurers, underwriters, and assigns of the Company or its affiliates and/or successors, is an express condition of Executive's right to receive the payments and benefits set forth in Section 4(c) and Section 4(d), as applicable. Executive shall be required to execute within 45 days after Executive's termination of employment a general waiver and release agreement in a form reasonably satisfactory to the Company.

(g) Certain Definitions.

"Cause" shall mean the occurrence of any one of the following:

(i) gross negligence or willful misconduct in the performance of, or

Executive's abuse of alcohol or drugs rendering Executive unable to perform, the material duties and services required for Executive's position with the Company;

(ii) Executive's conviction or plea of nolo contendere for any crime involving moral turpitude or a felony;

(iii) Executive's commission of an act of deceit or fraud intended to result in personal and unauthorized enrichment of Executive at the expense of the Company or any of its affiliates; or

(iv) Executive's material violation of the written policies of the Company or any of its affiliates (including ethics and compliance policies, as in effect from time to time), Executive's material breach of a material obligation of Executive to the Company pursuant to Executive's duties and obligations under the Company's Bylaws, or Executive's material breach of a material obligation of Executive to the Company or any of its affiliates pursuant to this Agreement or any award or other agreement between Executive and the Company or any of its affiliates.

"Change in Control" shall be deemed to have occurred upon the occurrence of any of the following events:

(i) The acquisition, other than from the Company, by any individual, entity or group (within the meaning of Section 13(d)(3) or 14(d)(2) of the Securities Exchange Act of 1934, as amended (the "Exchange Act")) of beneficial ownership (within the meaning of Rule 13d-3 promulgated under the Exchange Act) of 50% or more of either the then outstanding shares of the Company or the combined voting power of the then outstanding voting securities of the Company entitled to vote generally in the election of directors, but excluding, for this purpose, any such acquisition by the Company or any of its subsidiaries, or any employee benefit plan (or related trust) of the Company or its subsidiaries, or any corporation with respect to which, following such acquisition, more than 50% of, respectively, the then outstanding shares of such corporation and the combined voting power of the then outstanding voting securities of such corporation entitled to vote generally in the election of all or substantially all directors is then beneficially owned, directly or indirectly, by the individuals and entities who were the beneficial owners, respectively, of shares and voting securities of the Company immediately prior to such acquisition in substantially the same proportion as their ownership, immediately prior to such acquisition, of the then outstanding shares of the Company or the combined voting power of the then outstanding voting securities of the Company entitled to vote generally in the election of directors, as the case may be;

(ii) The consummation of a reorganization, merger or consolidation of the Company, in each case, with respect to which all or substantially all of the individuals and entities who were the respective beneficial owners of shares and voting securities of the Company immediately prior to such reorganization, merger or consolidation do not, following such reorganization, merger or consolidation, beneficially own, directly or indirectly, more than 50% of, respectively, the then outstanding shares and the combined voting power of the then outstanding voting securities entitled

to vote generally in the election of directors, as the case may be, of the corporation resulting from such reorganization, merger or consolidation;

(iii) During any twenty-four (24) month period, individuals who, as of the beginning of such period, constitute the Board (the "Incumbent Directors") cease for any reason to constitute at least a majority of the Board, provided that any person becoming a director subsequent to the beginning of such period whose election or nomination for election was approved by a vote of at least a majority of the Incumbent Directors then on the Board (either by a specific vote or by approval of the proxy statement of the Company in which such person is named as a nominee for director, without written objection to such nomination) shall be an Incumbent Director; provided, however, that no individual initially elected or nominated as a director of the Company as a result of an actual or threatened election contest with respect to directors or as a result of any other actual or threatened solicitation of proxies by or on behalf of any person other than the Board shall be deemed to be an Incumbent Director; or

(iv) a complete liquidation or dissolution of the Company or of the sale or other disposition of all or substantially all of the assets of the Company.

In no event shall a Change in Control include the initial public offering of the Company registered on Form S-1 (or any successor form under the Securities Act of 1933, as amended) (the "Initial Public Offering") or any bona fide primary or secondary public offering following the occurrence of the Initial Public Offering.

"Good Reason" shall mean the existence of any of the following:

(i) a material diminution in Executive's authority, duties, or responsibilities from those applicable to him as of the Effective Date;

(ii) a material diminution in Executive's annual Base Salary, except to the extent contemplated by Section 3(b) of this Agreement;

(iii) a relocation of Executive's principal place of employment by more than 50 miles, which for purposes of this Agreement shall mean the Company requiring Executive to be permanently based in a location that is more than 50 miles outside the city limits of Skokie, Illinois; or

(iv) a material breach by the Company of any provision of this Agreement.

Notwithstanding the foregoing or any other provision in this Agreement to the contrary, any assertion by Executive of a Good Reason termination shall not be effective unless all of the following conditions are satisfied:

(i) the conditions described in the preceding sentence giving rise to Executive's termination of employment must have arisen without Executive's written consent;

(ii) Executive must provide written notice to the Company of such condition and Executive's intent to terminate employment within 90 days after the initial existence of the condition;

(iii) the condition specified in such notice must remain uncorrected for 30 days after receipt of such notice by the Company; and

(iv) the date of Executive's termination of employment must occur within 90 days after the notice provided by Executive pursuant to clause (ii).

"Termination due to Disability" shall mean Executive's termination of employment as a result of Executive becoming incapacitated for a period of at least 180 days by accident, sickness or other circumstance that renders Executive mentally or physically incapable of performing the material duties as Chief Operating Officer.

5. Confidentiality and Work Product Assignment Agreement. Executive agrees to continue to be bound by that certain Confidentiality, Non-Hire, Non-Disparagement, and Work Product Agreement by and between the Company and Executive, dated as of August 21, 2019 (the "Confidentiality and Work Product Assignment Agreement").

6. Survival. Sections 5, 6, 8, 9 and 14 hereof shall survive and continue in full force and effect in accordance with their respective terms, notwithstanding any termination of the Employment Period.

7. Notices. Any notice provided for in this Agreement shall be in writing and shall be delivered (i) personally, (ii) by certified mail, postage prepaid, (iii) by Federal Express or other reputable courier service regularly providing evidence of delivery (with charges paid by the party sending the notice), or (iv) by facsimile or a PDF or similar attachment to an email, provided that such telecopy or email attachment shall be followed within one (1) business day by delivery of such notice pursuant to clause (i), (ii) or (iii) above. Any such notice to a party shall be addressed at the address set forth below (subject to the right of a party to designate a different address for itself by notice similarly given):

If to the Company:

Exicure, Inc.
8045 Lamon Avenue
Suite 410
Skokie, Illinois 60077

If to Executive:

Matthias Schroff
At the most recent address on file with the Company.

8. Entire Agreement. This Agreement, including the Confidentiality and Work Product Assignment Agreement, constitutes the entire agreement and understanding between the parties with respect to the subject matter hereof and supersedes and preempts any prior understandings, agreements or representations by or between the parties, written or oral, which may have related in any manner to the subject matter hereof. For the avoidance of doubt, any equity awards and applicable equity documents governing such equity awards shall remain in full force and effect in accordance with their terms.

9. No Conflict. Executive represents and warrants that Executive is not bound by any employment contract, restrictive covenant, or other restriction preventing Executive from carrying out Executive's responsibilities for the Company, or which is in any way inconsistent with the terms of this Agreement. Executive further represents and warrants that Executive

shall not disclose to the Company or induce the Company to use any confidential or proprietary information or material belonging to any previous employer or others.

10. Successors and Assigns. This Agreement shall inure to the benefit of and be enforceable by Executive and his heirs, executors and personal representatives, and the Company and its successors and assigns. Any successor or assignee of the Company shall assume the liabilities of the Company hereunder.

11. Governing Law. This Agreement shall be governed by the internal laws (as opposed to the conflicts of law provisions) of the State of Illinois.

12. Amendment and Waiver. The provisions of this Agreement may be amended or waived only with the prior written consent of the Company and Executive, and no course of conduct or failure or delay in enforcing the provisions of this Agreement shall affect the validity, binding effect or enforceability of this Agreement.

13. Withholding. All payments and benefits under this Agreement are subject to withholding of all applicable taxes.

14. Code Section 409A. This Agreement is intended to comply with the requirements of Section 409A of the Code, and shall be interpreted and construed consistently with such intent. The payments to Executive pursuant to this Agreement are also intended to be exempt from Section 409A of the Code to the maximum extent possible, under either the separation pay exemption pursuant to Treasury regulation §1.409A-l(b)(9)(iii) or as short-term deferrals pursuant to Treasury regulation§1.409A-l(b)(4), and for such purposes, each payment to Executive under this Agreement shall be considered a separate payment. In the event the terms of this Agreement would subject Executive to taxes or penalties under Section 409A of the Code ("409A Penalties"), the Company and Executive shall cooperate diligently to amend the terms of the Agreement to avoid such 409A Penalties, to the extent possible. To the extent any amounts under this Agreement are payable by reference to Executive's "termination of employment" such term and similar terms shall be deemed to refer to Executive's "separation from service," within the meaning of Section 409A of the Code. Notwithstanding any other provision in this Agreement, to the extent any payments made or contemplated hereunder constitute nonqualified deferred compensation, within the meaning of Section 409A, then (i) each such payment which is conditioned upon Executive's execution of a release and which is to be paid or provided during a designated period that begins in one taxable year and ends in a second taxable year, shall be paid or provided in the later of the two taxable years and (ii) if Executive is a specified employee (within the meaning of Section 409A of the Code) as of the date of Executive's separation from service, each such payment that is payable upon Executive's separation from service and would have been paid prior to the six-month anniversary of Executive's separation from service, shall be delayed until the earlier to occur of (A) the first day of the seventh month following Executive's separation from service or (B) the date of Executive's death. Any reimbursement payable to Executive pursuant to this Agreement shall be conditioned on the submission by Executive of all expense reports reasonably required by Company under any applicable expense reimbursement policy, and shall be paid to Executive within 30 days following receipt of such expense reports, but in no event later than the last day of the calendar year following the calendar year in which Executive incurred the reimbursable expense. Any amount of expenses eligible for reimbursement, or in-kind benefit provided, during a calendar year shall not affect the amount of expenses eligible for reimbursement, or in-kind benefit to be provided, during any other calendar year. The right to any reimbursement or in-kind benefit pursuant to this Agreement shall not be subject to liquidation or exchange for any other benefit.

15. Clawbacks. The payments to Executive pursuant to this Agreement are subject

to forfeiture or recovery by the Company or other action pursuant to any clawback or recoupment policy which the Company may adopt from time to time, including without limitation any such policy or provision that the Company has included in any of its existing compensation programs or plans or that it may be required to adopt under the Dodd-Frank Wall Street Reform and Consumer Protection Act and implementing rules and regulations thereunder, or as otherwise required by law.

16. Company Policies. Executive shall be subject to additional Company policies as they may exist from time-to-time , including policies with regard to stock ownership by senior executives and policies regarding trading of securities, provided such policies are not intended to be contractual in nature and may be changed or rescinded at any time by the Company in its sole discretion.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first written above.

EXICURE, INC.

/s/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.
President and Chief Executive Officer

As Authorized by the Board of Directors

/s/ Matthias Schroff

Matthias Schroff

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

November 30, 2017

David A Giljohann, Ph.D.
Chief Executive Officer
Exicure, Inc.
8045 Lamon Ave.
Skokie, IL 60077

Re: Amendment Two to the Amended Restated License Agreement effective December 12, 2011 between Exicure, Inc. ("Exicure") and Northwestern University ("Northwestern') (the "Agreement").

Dear David:

This letter agreement memorializes the understanding reached between Northwestern and Exicure regarding the Second Amendment to the Agreement ("Amendment Two). Unless otherwise defined In this Amendment Two, capitalized terms shall have the meaning assigned to them in the Agreement.

Subject to the terms and conditions of the Agreement and Exicure's compliance therewith, the parties hereby agree as follows:

1. Appendix A of the Agreement is amended and incorporated herein by reference.
2. All other terms and conditions of the Agreement shall remain in full force and effect as amended hereby.

By signing below, the parties hereby execute this valid and binding agreement effective as of the date listed above.

NORTHWESTERN UNIVERSITY

/s/ Alicia Löffler, Ph.D.

Alicia Löffler, Ph.D.
Associate Vice President for Research
and Executive Director, INVO

EXICURE, INC.

/s/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.
Chief Executive Officer

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

Exhibit A:

NU ID	Filing Date	Application Number	Patent Number	Type	Country	Status	Title
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

NU ID	Filing Date	Application Number	Patent Number	Type	Country	Status	Title
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****

BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

NU ID	Filing Date	Application Number	Patent Number	Type	Country	Status	Title
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****

SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

NU ID	Filing Date	Application Number	Patent Number	Type	Country	Status	Title
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****		*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

January 1, 2019

David A Giljohann, Ph.D.
Chief Executive Officer
Exicure, Inc.
8045 Lamon Ave.
Skokie, IL 60077

Re: Amendment Three to the Restated License Agreement with an effective date of December 12, 2011 between Exicure, Inc. ("Exicure") and Northwestern University ("Northwestern") as previously amended on November 30, 2017, and on September 27, 2016 (collectively the "Agreement".)

Dear David:

This letter agreement memorializes the understanding reached between Northwestern and Exicure regarding the third amendment to the Agreement ("Amendment Three"). Unless otherwise defined in this Amendment Three, capitalized terms shall have the meaning assigned to them in the Agreement.

Subject to the terms and conditions of the Agreement and Exicure's compliance therewith, the parties hereby agree as follows:

1. Exhibit A of the Agreement is amended and incorporated herein by reference.

2. Section 9.2 shall be replaced in its entirety with the following:
Licensee shall obtain and carry in full force and effect commercial, general liability insurance which shall protect Licensee and Northwestern with respect to events covered by Section 9.1 above. Such insurance shall be written by a reputable insurance company authorized to do business in the State of Illinois, naming Northwestern as an additional insured thereunder, shall be endorsed to include product liability coverage and shall require thirty (30) days written notice to be given to Northwestern prior to any cancellation or material change thereof. By the time of commencement of human clinical trials of any Licensed Product, the limits of such insurance shall not be less than Three Million Dollars ($3,000,000) per occurrence with an aggregate of Three Million Dollars ($3,000,000) for personal injury or death, and property damage insurance coverage in such amounts as is reasonable at the time for similarly situated companies engaged in similar business. Licensee shall provide Northwestern with Certificates of Insurance evidencing the same.

3. All other terms and conditions of the Agreement shall remain in full force and effect as amended hereby.

By signing below, the parties hereby execute this valid and binding agreement effective as of the date listed above.

NORTHWESTERN UNIVERSITY	**EXICURE, INC.**
/s/ Alicia Löffler, Ph.D.	/s/ David A. Giljohann, Ph.D.
Alicia Löffler, Ph.D.	**David A. Giljohann, Ph.D.**
Associate Vice President for Research and Executive Director, INVO	Chief Executive Officer

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

Exhibit A:

NU ID	Filing Date	Application Number	Patent Number	Type	Country	Status	Title
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

NU ID	Filing Date	Application Number	Patent Number	Type	Country	Status	Title
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

Innovation and New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

NU ID	Filing Date	Application Number	Patent Number	Type	Country	Status	Title
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

NU ID	Filing Date	Application Number	Patent Number	Type	Country	Status	Title
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE “COMMISSION”) PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH “*****”.

AMENDMENT NO. 4

TO

2011 RESTATED LICENSE AGREEMENT

This Amendment No. 4 (this "**Amendment**") is entered into as of November 13, 2019 (the "**Amendment Effective Date**"), by and between Northwestern University, an Illinois not-for-profit corporation with a principal place of business at 633 Clark Street, Evanston, Illinois, 60208 ("**Northwestern**"), and Exicure, Inc., a Delaware corporation with a principal place of business at 8045 Lamon Avenue, Skokie, Illinois, 60077 ("**Exicure**").

RECITALS

A. Northwestern and Exicure are parties to that certain Restated License Agreement restated on August 15, 2015 and effective as of December 12, 2011, as amended on September 27, 2016, November 30, 2017 and January 1, 2019 (the "**2011 Agreement**").

B. Pursuant to the 2011 Agreement, Northwestern granted certain licenses and rights to Exicure under the Patent Rights and the Know-How.

C. The parties now desire to enter into this Amendment for the purpose of amending certain terms and conditions of the 2011 Agreement.

NOW, THEREFORE, in consideration of the mutual promises contained herein, the parties agree as follows:

1. Definitions. Except as defined in this Amendment, the capitalized terms used herein shall have the same meanings as ascribed to them in the 2011 Agreement.

2. Amendment. Northwestern and Exicure agree to amend the 2011 Agreement as follows:

2.1. The definition of "Field" in Section 1.3 of the 2011 Agreement is hereby deleted in its entirety and replaced by the following:

> "1.3 "**Field"** shall mean the use of nano-particles, nanotechnology, microtechnology or nano-material-based constructs (including, for clarity, the use of liposome technology constructs): (a) as therapeutics or accompanying therapeutics as a means of delivery; and
> (b) as cosmetics or accompanying cosmetics as a means of delivery. The Field specifically excludes: (i) all subject matter not expressly provided for in the foregoing as those terms are understood in the art as of September 23, 2009; (ii) diagnostics, including without limitation, theradiagnostics; and (iii) all Restricted Subject Matter even if such Restricted Subject Matter would otherwise fall within the Field."

2.2. The phrase "in the Field" is hereby deleted from the first sentence of Section 1.9 of the 2011 Agreement.

3. Effect of Amendment. All of the terms and conditions of the 2011 Agreement shall continue in full force and effect except as modified by the terms of this Amendment. In the event of any inconsistency between the terms and conditions of this Amendment and the terms and conditions of the 2011 Agreement, the terms and conditions of this Amendment shall control and govern.

4. Counterparts. This Amendment may be executed in two or more counterparts, each of which will be deemed an original, but all of which together shall constitute one and the same instrument. Once signed, any reproduction of this Amendment made by reliable means (e.g., photocopy, facsimile) is considered an original.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the parties have caused this Amendment to be executed and delivered by their duly authorized representatives as of the Amendment Effective Date.

NORTHWESTERN UNIVERSITY

/s/ Alicia Löffler, Ph.D.

Alicia Löffler, Ph.D.

Assoc. Professor, Executive Director

EXICURE, INC.

/s/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.

Chief Executive Officer

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

June 11, 2018

David A Giljohann, Ph.D.
Chief Executive Officer
Exicure, Inc.
8045 Lamon Ave.
Skokie, IL 60077

Re: Amendment One to the License Agreement titled NU Exicure Liposomal Particles License Agreement dated May 27, 2014 ('Agreement") between Exicure, Inc("Exicure") and Northwestern University ("Northwestern').

Dear David:

The following letter memorializes the understanding reached between Northwestern and Exicure regarding the First Amendment to the Agreement ("Amendment One NU- Exicure Liposomal). Unless otherwise defined In this Agreement, capitalized terms shall have the meaning assigned to them in the Agreement.

Subject to the terms and conditions of the Agreement and Exicure's compliance therewith, the parties hereby agree as follows:

1. Exhibit A of the License Agreement is amended and incorporated herein by reference.
2. All other terms and conditions of the Agreement shall remain in full force and effect as amended hereby.

By signing below, the parties hereby execute this valid and binding agreement effective as of the date listed above.

NORTHWESTERN UNIVERSITY

/s/ Alicia Löffler, Ph.D.

Alicia Löffler, Ph.D.
Associate Vice President for Research
and Executive Director
INVO, Northwestern University

EXICURE, INC.

/s/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.
Chief Executive Officer
Exicure, Inc.

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

Exhibit A:

NU#	Serial Application Number	Application Title	Application Type	Status	Country Code	File Date
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE “COMMISSION”) PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH “*****”.

AMENDMENT NO. 2

TO

2014 LICENSE AGREEMENT

This Amendment No. 2 (this "**Amendment**") is entered into as of November 13, 2019 (the "**Amendment Effective Date**"), by and between Northwestern University, an Illinois not-for-profit corporation with a principal place of business at 633 Clark Street, Evanston, Illinois, 60208 ("**Northwestern**"), and Exicure, Inc., a Delaware corporation with a principal place of business at 8045 Lamon Avenue, Skokie, Illinois, 60077 ("**Exicure**").

RECITALS

A. Northwestern and Exicure are parties to that certain License Agreement effective as of May 27, 2014, as amended on June 11, 2018 (the "**2014 Agreement**").

B. Pursuant to the 2014 Agreement, Northwestern granted certain licenses and rights to Exicure under the Patent Rights.

C. The parties now desire to enter into this Amendment for the purpose of amending certain terms and conditions of the 2014 Agreement.

NOW, THEREFORE, in consideration of the mutual promises contained herein, the parties agree as follows:

1. Definitions. Except as defined in this Amendment, the capitalized terms used herein shall have the same meanings as ascribed to them in the 2014 Agreement.

2. Amendment. Northwestern and Exicure agree to amend the 2014 Agreement as follows:

    1. The phrase "in the Field" is hereby deleted from the first sentence of Section 1.7 of the 2014 Agreement.

3. Effect of Amendment. All of the terms and conditions of the 2014 Agreement shall continue in full force and effect except as modified by the terms of this Amendment. In the event of any inconsistency between the terms and conditions of this Amendment and the terms and conditions of the 2014 Agreement, the terms and conditions of this Amendment shall control and govern.

4. Counterparts. This Amendment may be executed in two or more counterparts, each of which will be deemed an original, but all of which together shall constitute one and the same instrument. Once signed, any reproduction of this Amendment made by reliable means (e.g., photocopy, facsimile) is considered an original.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the parties have caused this Amendment to be executed and delivered by their duly authorized representatives as of the Amendment Effective Date.

NORTHWESTERN UNIVERSITY

/s/ Alicia Löffler, Ph.D.

Alicia Löffler, Ph.D.

Assoc. Professor, Executive Director

EXICURE, INC.

/s/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.

Chief Executive Officer

[Signature page to Amendment No. 2 to 2014 License Agreement]

exicure

CONFIDENTIAL

November 13, 2019

Alicia Löffler, Ph.D.
Associate Vice President for Research, and Executive Director
Innovation and New Ventures Office (INVO)
Northwestern University
1800 Sherman Avenue
Evanston, IL 60202

Re: **Side Agreement to "Northwestern Agreements" in Relation to Allergan Sublicense**

Dear Dr. Löffler:

Reference is hereby made to that certain License Agreement effective as of May 27, 2014, as amended on June 11, 2018, (the "**2014 Agreement**"), and that certain Restated License Agreement restated on August 15, 2015 and effective as of December 12, 2011, as amended on September 27, 2016, November 30, 2017 and January 1, 2019, (the "**2011 Agreement**"), in each case, by and between Northwestern University, an Illinois not-for-profit corporation with a principal place of business at 633 Clark Street, Evanston, Illinois, 60208 ("**Northwestern**"), and Exicure, Inc., a Delaware corporation with a principal place of business at 8045 Lamon Avenue, Skokie, Illinois, 60077 ("**Exicure**"). The "**Northwestern Agreements**" means, collectively, the 2011 Agreement and the 2014 Agreement.

WHEREAS, pursuant to the Northwestern Agreements, Northwestern has granted Exicure an exclusive license to certain Patent Rights, and a non-exclusive license to certain Know-How (each as defined in the Northwestern Agreements) and other rights (in total, the "**Exicure Rights**");

WHEREAS, Exicure is granting an option to sublicense certain of the Exicure Rights to Allergan Pharmaceuticals International Limited, a private company limited by shares having an address at Clonshaugh Business & Technology Park, Dublin 17, D17 E400, Ireland ("**Allergan**") pursuant to the Collaboration, Option and License Agreement, dated on the date hereof, between Exicure and Allergan (the "**Sublicense Agreement**"), upon the execution of which Allergan would become a Sublicensee (as defined under the Northwestern Agreements).

NOW THEREFORE, in order to clarify certain provisions of the Northwestern Agreements, including the consequences to Allergan in the event of a termination by Northwestern of some or all of the Exicure Rights pursuant to Section 10 of the Northwestern Agreements, Exicure, Northwestern and Allergan hereby enter into this side agreement ("**Side Agreement**"). Unless otherwise expressly stated in this Side Agreement, all provisions of the Northwestern Agreements and of the Sublicense Agreement remain unchanged and in full force and effect. Unless defined in this Side Agreement or otherwise indicated, all capitalized terms shall have the meanings assigned to them in the Sublicense Agreement.

Exicure, Northwestern and Allergan, each intending to be legally bound by this Side Agreement, hereby agree to the following:

(a) Northwestern hereby consents and agrees that, notwithstanding Section 2.7 of the Northwestern Agreements, Northwestern hereby consents to the grant of sublicenses by Allergan as follows:

(i) Allergan may grant sublicenses (through multiple tiers) of each license granted to Allergan under the Sublicense Agreement to its Affiliates and Third Parties, including subcontractors that are providing services (including manufacturing services) to Allergan or its Affiliates or sublicensees; *provided, however*, that Allergan shall remain responsible for its obligations under, and compliance with the terms of, the Sublicense Agreement. Notwithstanding the foregoing, in the event Allergan intends to grant a sublicense to an Affiliate or Third Party that constitutes a Restricted Party, Allergan shall provide prior written notice to Northwestern, and Allergan may not grant such sublicense without Northwestern's prior written consent, not to be unreasonably withheld, conditioned or delayed; *provided* that Northwestern's prior written consent shall be deemed to be granted if Northwestern does not provide written notice of any objection to Allergan within ten (10) Business Days of such notice from Allergan. For purposes of this Section (a)(i) a "**Restricted Party**" shall mean any third party with whom, in Allergan's good faith determination, it would be inappropriate for Northwestern to contract or affiliate with taking into consideration (a) Northwestern's status and obligations as an educational institution and (b) the negative impact such relationship will likely have on Northwestern's reputation with the general public. Without limiting the foregoing, "Restricted Party" shall include any person or entity for which the U.S. government maintains restrictions on certain exports, reexports or transfers of items, including any person or entity appearing on the Consolidated Screening List maintained by the International Trade Administration of the United States Department of Commerce. In addition, for each sublicense granted by Allergan to a Third Party other than a subcontractor of Allergan, Allergan (a) shall promptly notify Exicure of the granting of each sublicense, (b) shall provide to Exicure a written copy of each sublicense agreement (which copy may be reasonably redacted as necessary to protect confidential or commercially sensitive information) and (c) shall ensure that the terms of any sublicense agreement (i) are subject to and subordinate to the Sublicense Agreement and (ii) without limiting the foregoing, contain provisions requiring that the Sublicensee (A) comply with the confidentiality and non-use provisions of Article 7 of the Sublicense Agreement with respect to Exicure's Confidential Information and (B) submit applicable sales or other reports to Allergan to the extent necessary or relevant to the reports required to be made or records required to be maintained under the Sublicense Agreement. For the avoidance of doubt, except as otherwise set forth in this Side Agreement, all obligations of "Licensee" and "Sublicensee" (as those terms are used in Section 2.7 of the Northwestern Agreements) are still in effect.

(ii) Allergan may transfer the Sublicense Agreement and Allergan's sublicensees may transfer their sublicense agreements, in each case, including by direct assignment or further sublicensing, or indirectly by operation of law or transfer of voting control of Allergan or such sublicensees, without the prior written approval of Northwestern, except no transfer is permitted to a Restricted Party without Northwestern's prior written consent.

(iii) Northwestern acknowledges and agrees that the Sublicense Agreement is consistent with all terms and conditions of the Northwestern Agreements.

(b) Notwithstanding Section 2.7 of the Northwestern Agreements, in the event of (i) a termination of either or both of the Northwestern Agreements for any reason, or (ii) the rejection of either or both of the Northwestern Agreements in any bankruptcy proceeding pursuant to 11 U.S.C. § 365:

(i) Northwestern, after receiving or providing notice, as applicable, of such termination or rejection, shall promptly notify Allergan in writing of such termination or rejection, as applicable (the "**Termination Notice**"). Unless Allergan is then in material breach of the Sublicense Agreement, Allergan may provide written notice to Northwestern within thirty (30) days of the Termination Notice (the "**Springing Notice**"), and Allergan, automatically and without further required action, shall be granted the same rights (including the grant of licenses) of Exicure under the Northwestern Agreements to the extent of the sublicensed rights granted to Allergan pursuant to the Sublicense Agreement (or that would be granted to Allergan pursuant to the Sublicense Agreement following exercise of the Option (as defined therein)) (the "**Direct License**"), and Northwestern hereby grants such Direct License to Allergan effective upon receipt of such Springing Notice retroactively to the date of such termination or rejection. For clarity, if Northwestern grants a Direct License to Allergan, then all sublicenses granted by Allergan pursuant to Section (a)(i) shall survive such termination or rejection of either or both of the Northwestern Agreements. By sending the foregoing Springing Notice, Allergan will be deemed to have assumed the same rights and responsibilities of Exicure under the Northwestern Agreements, to the extent arising out of the practice of the sublicensed rights granted by Exicure to Allergan under the Sublicense Agreement. Notwithstanding the foregoing, (a) the scope of the rights and obligations of Allergan pursuant to the Direct License shall not in any respect exceed the scope and limitations of the rights and obligations of Allergan under the Sublicense Agreement, (b) Allergan shall not be responsible for any obligations (financial or otherwise) arising out of the activities of any sublicensee of Exicure other than Allergan and its Affiliates and sublicensees and (c) Allergan shall not be responsible for any obligations (financial or otherwise), including, without limitation, one-time or annual license fees, that have already accrued or been satisfied by Exicure prior to the termination or rejection of the Northwestern Agreements. For the sake of clarity, as part of assuming the rights and responsibilities of Exicure, Allergan will pay Northwestern any annual license fee that may thereafter become payable to Northwestern under Section 5.4 of the 2011 Agreement or Section 5.3(b) of the 2014 Agreement, such amount to be pro-rated based on the then-current number of sublicenses granted by Exicure under each Northwestern Agreement that become direct licenses from Northwestern after such termination or rejection, as applicable. For clarity, any such annual license fee paid by Allergan under this Section (b)(i) shall, in accordance with Section 5.4 of the 2011 Agreement or Section 5.3(b) of the 2014 Agreement, as applicable, be creditable against future royalties payable to Northwestern by Allergan pursuant to the Direct License. As between Northwestern and Exicure, Exicure shall have no responsibility with respect to any obligations of Allergan that accrue after the effective date of any such termination or rejection.

(ii) In the event of a Direct License, if the Sublicense Agreement remains in effect, Allergan shall remain fully responsible for making all payments to Exicure as required under the Sublicense Agreement, but shall be entitled to deduct 100% of the payments that are made directly to Northwestern pursuant to the Direct License from the payments that are owed to Exicure under the Sublicense Agreement. Such set-off right shall be without limitation of any other rights or remedies that Allergan may have under the Sublicense Agreement, at law or in equity.

(iii) Each party shall perform, or cause to be performed, all such further acts, and shall execute and deliver all such other agreements and documents, as the other parties may reasonably request in order to carry out the intent and purposes of this Section (b), including the execution and delivery of any instruments or documents requested by Allergan to evidence the grant of a Direct License.

(c) Notwithstanding Section 6.2 of the Northwestern Agreements, Northwestern agrees that Allergan may only be audited directly by or on behalf of Exicure pursuant to the terms of the Sublicense Agreement, and the results of such audit may be shared with Northwestern subject to treatment as Confidential Information of Exicure under the Northwestern Agreements. As between Exicure and Northwestern, Northwestern shall have the right to: (i) request Exicure to exercise its right to audit Allergan under Section 6.14.2 of the Sublicense Agreement, at Exicure's (or, if applicable pursuant to Section 6.14.2 of the Sublicense Agreement, Allergan's) cost, and (ii) approve Exicure's selection of an independent certified public accounting firm of internationally recognized standing for purposes of such audit.

(d) With respect to Article 8 of the Northwestern Agreements, Exicure may, upon written notice to Northwestern, permit Allergan or Allergan's sublicensees to directly exercise any of Exicure's rights thereunder. In addition, notwithstanding anything to the contrary in Article 8 of the Northwestern Agreements, Allergan shall have the first right to (i) defend against an Invalidity/Unenforceability Action with respect to any Orange Book Patent or Product-Specific Patent that is a Patent Right for purposes of the Northwestern Agreements and (ii) prosecute Competitive Infringement of any Orange Book Patent or Product-Specific Patent that is a Patent Right for purposes of the Northwestern Agreements (including defenses or counterclaims in connection with any Third Party Infringement Claim), in each case ((i) and (ii)), at its sole cost and expense, using counsel of its choice. Upon Allergan's request, Northwestern shall join any such action against a Competitive Infringement at Allergan's reasonable cost and expense, *provided* that, if such action is not an enforcement action brought under the Drug Price Competition and Patent Term Restoration Act, 21 U.S.C. ch. 9 § 301; 21 U.S.C. ch. 9, subch. V §§ 355 & 360cc (or its successor or equivalent law) or under the Biologics Price Competition and Innovation Act (or its successor or equivalent law), as applicable, such joinder shall be subject to Northwestern's prior written consent, not to be unreasonably withheld, conditioned or delayed. Northwestern will not exercise its right under Sections 8.2 and 8.4 of the Northwestern Agreements to enforce or defend (as applicable) the applicable Patent Right with respect to a Competitive Infringement if Allergan notifies Exicure and Northwestern of a strategic rationale in good faith for non-enforcement of the applicable Patent Right. Notwithstanding Section 8.3 of the Northwestern Agreements, Allergan shall have the right to settle any claim of Competitive Infringement, *provided* that any settlement that (A) imposes any costs or liability on, or involves any admission (including any admission of infringement or invalidity or unenforceability) by Northwestern, or (B) imposes restrictions or obligations not otherwise permitted by the applicable Northwestern Agreement on Northwestern, or (C) admits the invalidity or unenforceability (in whole or in part) of any Patent Right (as defined in the Northwestern Agreements); shall, in each case, be subject to the express written consent of Northwestern, which consent shall not be unreasonably withheld, conditioned or delayed. Allergan shall keep Exicure and Northwestern reasonably informed of any material steps taken in connection with any action under this Section (d), and shall consider in good faith any comments from Exicure or Northwestern with respect thereto.

(e) In the event that Exicure's licenses under either Northwestern Agreement would be rendered non-exclusive under Section 10.4 of such Northwestern Agreement, other than as a result of an act or omission on the part of Allergan or any of its Affiliates or sublicensees, Northwestern agrees that, subject to Allergan's continued compliance with its obligations under the Sublicense Agreement and this Side Agreement, the licenses granted to Exicure will remain exclusive with respect to the field of the licenses granted to Allergan under the Sublicense Agreement.

(f) Notwithstanding the last sentence of Section 2.7 of the Northwestern Agreements: (i) Northwestern shall only be a third party beneficiary of the Sublicense Agreement with regard to Section 3.10 of the Sublicense Agreement, pertaining to Allergan's compliance with its obligations as a sublicensee

under the Northwestern Agreements; and (ii) with respect to any further sublicenses granted by Allergan, Northwestern shall only be a third party beneficiary of such further sublicense agreements to the same extent as set forth in the preceding sentence with respect to the Sublicense Agreement

(g) Northwestern waives any right to receive notice of or audit Allergan's or its Affiliates' or sublicensees' subcontractors under Section 2.6 of the Northwestern Agreements.

(h) Notwithstanding Article 3 of the Northwestern Agreements, Exicure may disclose to Allergan any documents or information provided by Northwestern pursuant to Article 7 or Article 8 of the Northwestern Agreements, in order to consult with and receive input from Allergan regarding the exercise of Exicure's rights thereunder.

(i) In addition to those restrictions set forth in Section 2.3 of the 2011 Agreement, Northwestern acknowledges and agrees that:

(i) Northwestern does not retain the right: (a) to practice and have practiced the Patent Rights and Know-How (each as defined in the 2011 Agreement) for any use in clinical trials with respect to any Hair Loss Disorder (as defined in the Sublicense Agreement); or (b) to grant any right or license under such Patent Rights or to provide any materials claimed in such Patent Rights in the Field for use in development or commercialization in the Field to any for-profit or commercial third party (excluding hospitals and where otherwise required in order to comply with Bayh Dole); and

(ii) Prior to any publication by Northwestern or any Mirkin/Thaxton Lab Personnel (as defined in the 2011 Agreement) with respect to the results of its research related to Patent Rights, Know How or Licensed Products in relation to any Hair Loss Disorder (as defined in the Sublicense Agreement), Northwestern shall, if such publication is provided to Northwestern's Innovation and New Ventures Office (INVO) by Mirkin/Thaxton Lab Personnel (as defined in the 2011 Agreement) prior to submission of the disclosure, provide a copy of any such proposed publication prior to disclosure to Exicure for review at least thirty (30) days prior to initial submission for publication and shall remove any Confidential Information (as defined in the 2011 Agreement) of Exicure upon the request of Exicure. In addition, if during such review period Exicure determines that a patent application should be filed on any subject matter described in the proposed publication or disclosure, Northwestern shall delay such publication for an additional forty-five (45) day period to allow Northwestern to file patent applications as may be deemed necessary by Northwestern in its sole discretion. For clarity, these patent applications are not included in the Northwestern Agreements or the Sublicense Agreement and Exicure does not have any right, title or interest in or to such applications or the resulting patent rights and will not use the claimed subject matter without a license, which license Northwestern has no obligation to grant.

(j) No party may assign or transfer this Side Agreement without the prior written consent of each other party, except that (i) Allergan may assign this Side Agreement without such consent solely to a permitted assignee of the Sublicense Agreement and (ii) Exicure may assign this Side Agreement without such consent solely to a permitted assignee of each of the Sublicense Agreement, the 2011 Agreement and the 2014 Agreement. Any purported assignment, delegation or transfer in contravention of this Section (i) will be null and void. This Side Agreement will be binding on and inure to the sole benefit of the parties and their permitted successors and assigns.

(k) In the event any provision of this Side Agreement is held to be invalid or unenforceable, the valid or enforceable portion thereof in any other jurisdiction and the remaining provisions of this Side Agreement will remain in full force and effect. The parties desire the terms herein to be valid and enforced to the maximum extent not prohibited by law, regulation or court order in a given jurisdiction and as such, any invalid or unenforceable terms will be promptly reformed by the parties to effectuate the intent of the parties as evidenced on the date hereof.

(l) As between the parties, to the extent of any conflict between this Side Agreement and Section 3.10 (including Schedule 3.10) of the Sublicense Agreement, this Side Agreement shall govern and control. As between Allergan and Exicure, to the extent of any other conflict between this Side Agreement and the Sublicense Agreement, the Sublicense Agreement shall govern and control. This Side Agreement, together with the Sublicense Agreement, the 2011 Agreement and the 2014 Agreement, constitutes the entire, final, complete and exclusive agreement between the parties and supersedes all previous agreements or representations, written or oral. This Side Agreement may not be modified or amended except in a writing signed by a duly authorized representative of each party. Each party acknowledges that it was provided an opportunity to seek advice of counsel and as such this Side Agreement shall not be construed for or against the drafter.

(m) Any waiver (express or implied) by any party of any term of this Side Agreement shall not constitute a waiver of any other or subsequent breach. The delay or failure to assert a right or to insist upon compliance with any term of this Side Agreement shall not constitute a waiver of that right or excuse a similar subsequent failure to perform any such term or condition. A valid waiver must be executed in writing and signed by the party granting the waiver.

(n) This Side Agreement may be executed in counterparts with the same force and effect as if each of the signatories had executed the same instrument.

[Signature page follows]

(o)

In witness whereof, the parties have executed this Side Agreement by their duly authorized representatives on the date first written above.

NORTHWESTERN UNIVERSITY

/s/ Alicia Löffler, Ph.D.

Alicia Löffler, Ph.D.

Executive Director, INVO, and
Associate Vice President for Research

EXICURE, INC.

/s/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.

President and Chief Executive Officer

ALLERGAN PHARMACEUTICALS INTERNATIONAL LIMITED

/s/ Francis Bates

Francis Bates

Director

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

June 11, 2018

David A Giljohann, Ph.D.
Chief Executive Officer
Exicure, Inc.
8045 Lamon Ave.
Skokie, IL 60077

Re: Amendment One to the License Agreement titled NU Exicure GM3 License Agreement dated June 17, 2016 ("Agreement") between Exicure, Inc ("Exicure") and Northwestern University ("Northwestern").

Dear David:

The following letter memorializes the understanding reached between Northwestern and Exicure regarding the First Amendment to the Agreement ("Amendment One NU Exicure GM3"). Unless otherwise defined In this Agreement, capitalized terms shall have the meaning assigned to them in the Agreement.

Subject to the terms and conditions of the Agreement and Exicure's compliance therewith, the parties hereby agree as follows:

1. Exhibits A of the License Agreement is amended and Incorporated herein by reference.
2. All other terms and conditions of the Agreement shall remain in full force and effect as amended hereby.

By signing below, the parties hereby execute this valid and binding agreement effective as of the date listed above.

NORTHWESTERN UNIVERSITY

/s/ Alicia Löffler, Ph.D.

Alicia Löffler, Ph.D.
Associate Vice President for Research
and Executive Director
INVO, Northwestern University

EXICURE, INC.

/s/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.
Chief Executive Officer
Exicure, Inc.

Innovation and
New Ventures Office

Northwestern University
1800 Sherman Ave, Suite 504
Evanston, IL 60201

Phone 847-467-2097
invo.northwestern.edu

Northwestern |INVO
Innovation and New Ventures

Exhibit A:

NU#	Serial Application Number	Application Title	Application Type	Status	Country Code	File Date
*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

Exhibit 10.33

CONFIDENTIAL

EXECUTION VERSION

COLLABORATION, OPTION AND LICENSE AGREEMENT

between

EXICURE, INC.

and

ALLERGAN PHARMACEUTICALS INTERNATIONAL LIMITED

November 13, 2019

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

TABLE OF CONTENTS

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

COLLABORATION, OPTION AND LICENSE AGREEMENT

This COLLABORATION, OPTION AND LICENSE AGREEMENT (this "**Agreement**") is entered into as of November 13, 2019 (the "**Effective Date**"), by and between EXICURE, INC., a Delaware corporation with a place of business at 8045 Lamon Avenue, Suite 410, Skokie, IL 60077 ("**Exicure**"), and ALLERGAN PHARMACEUTICALS INTERNATIONAL LIMITED, a private company limited by shares, with a place of business at Clonshaugh Business & Technology Park, Dublin 17, D17 E400, Ireland ("**Allergan**"). In this Agreement, Allergan and Exicure are collectively referred to as the "**Parties**" and each individually as a "**Party**".

RECITALS

WHEREAS, Exicure has a unique spherical nucleic acid platform that could lead to the creation of new medicines that offer substantial innovation and value for people experiencing hair loss disorders;

WHEREAS, Allergan is engaged in the research, development and commercialization of human therapeutic products, and has substantial expertise in the development and commercialization of drug products;

WHEREAS, Allergan desires to enter into a collaboration with Exicure to research, develop, and manufacture new nucleic acid therapeutics focusing on certain hair loss disorders pursuant to two collaboration programs, each focused on one or more targets; and

WHEREAS, Exicure desires to grant to Allergan certain options to obtain exclusive, worldwide licenses under certain intellectual property rights owned or controlled by Exicure to develop, manufacture and commercialize certain products resulting from each such collaboration program, and Allergan desires to obtain such options;

NOW, THEREFORE, in consideration of the mutual covenants contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereto hereby agree as follows:

ARTICLE 1
DEFINITIONS

As used in this Agreement, the following terms shall have the meanings set forth below:

1.1. "**Abandoned Program**" shall mean (a) any Collaboration Program for which Allergan has not made an Option Exercise prior to the end of the Option Exercise Period as set forth in Section 3.1.5 or (b) any Collaboration Program that is deemed to be an Abandoned Program pursuant to Section 2.8 or Section 3.2.3.

1.2. "**Acquiring Entity**" shall mean a Third Party (the "**Acquiror**") that acquires a Party (and is therefore deemed to be an Affiliate of such Party) through a Change of Control, together

with any Affiliates of such Acquiror existing immediately prior to the consummation of the Change of Control. For purposes of clarity, an "Acquiring Entity" of a Party shall exclude the Party and all of its Affiliates existing immediately prior to the consummation of the Change of Control.

1.3. "**Acquiring Entity Intellectual Property**" shall have the meaning set forth in Section 1.41.

1.4. "**Acquiror**" shall have the meaning set forth in Section 1.2.

1.5. "**Affiliate**" shall mean any individual, corporation, company, partnership, trust, limited liability company, association or other business entity ("**Person**") that directly or indirectly controls, is controlled by or is under common control with the Party in question at any time for so long as such Party controls, is controlled by or is under common control with such first Person. As used in this definition of "Affiliate," the term "control" and, with correlative meanings, the terms "controlled by" and "under common control with" shall mean, as to any Person, (a) direct or indirect ownership of at least fifty percent (50%) (or such lesser percentage that is the maximum allowed to be owned by a foreign corporation in a particular jurisdiction, *provided* that such Party has the ability, directly or indirectly, to direct or cause the direction of management or policies of such Person) of the voting interests or other ownership interests in the Person in question; (b) direct or indirect ownership of at least fifty percent (50%) of the interest in the income of the Person in question; or (c) possession, directly or indirectly, of the power to direct or cause the direction of management or policies of the Person in question (whether through ownership of securities or other ownership interests, by contract or otherwise).

1.6. "**Agreement**" shall have the meaning set forth in the preamble hereto.

1.7. "**Allergan**" shall have the meaning set forth in the preamble hereto.

1.8. "**Allergan Collaboration Know-How**" shall mean all Collaboration Know-How solely owned by Allergan pursuant to the ownership provisions set forth in Section 8.1.1.

1.9. "**Allergan Collaboration Patents**" shall mean all Collaboration Patents solely owned by Allergan pursuant to the ownership provisions set forth in Section 8.1.1.

1.10. "**Allergan Collaboration Technology**" shall mean the Allergan Collaboration Know-How and the Allergan Collaboration Patents.

1.11. "**Allergan-Conducted Activities**" shall have the meaning set forth in Section 2.3.2.

1.12. "**Allergan Indemnitees**" shall have the meaning set forth in Section 11.1.

1.13. "**Alliance Manager**" shall have the meaning set forth in Section 4.7.

1.14. "**Antitrust Clearance Date**" shall mean the earliest date on which Allergan has actual knowledge that all applicable waiting periods under the HSR Act and any antitrust or merger control Law in any Foreign Jurisdictions with respect to the transactions contemplated under this

Agreement upon Allergan's exercise of an Option with respect to a Collaboration Program have expired or have been terminated.

1.15. "**Approval Application**" shall mean an NDA or similar application or submission for a Licensed Product filed with a Regulatory Authority in a country or group of countries to obtain Regulatory Approval for a pharmaceutical product in that country or group of countries, including any amendment thereof.

1.16. "**Bankruptcy Code**" shall have the meaning set forth in Section 9.5.2.

1.17. "**Blocking Platform IP**" shall have the meaning set forth in Section 3.7.2.

1.18. "**Business Day**" shall mean any Monday, Tuesday, Wednesday, Thursday or Friday that is not a public holiday in New York, New York or Chicago, Illinois.

1.19. "**Calendar Quarter**" shall mean a period of three consecutive months corresponding to the calendar quarters commencing on the first day of January, April, July or October, except that the first Calendar Quarter of the Term shall commence on the Effective Date and end on the day immediately prior to the first to occur of January 1, April 1, July 1 or October 1 after the Effective Date and the last Calendar Quarter shall end on the last day of the Term.

1.20. "**Calendar Year**" shall mean a period of 12 consecutive months corresponding to the calendar year commencing on the first day of January, except that the first Calendar Year of the Term shall commence on the Effective Date and end on December 31 of the year in which the Effective Date occurs and the last Calendar Year of the Term shall commence on January 1 of the year in which the Term ends and end on the last day of the Term.

1.21. "**Candidate Criteria**" means, on a Collaboration Program-by-Collaboration Program basis, the criteria that a Compound from the applicable Collaboration Program must satisfy in order to be deemed ready for IND-Enabling Activities, which criteria shall be established by the JDC after the Effective Date based on the categories of criteria set forth in the Development Plan for such Collaboration Program.

1.22. "**Change of Control**", with respect to a Party, shall mean (a) the closing of a sale of all or substantially all of the assets of such Party to which this Agreement relates to a Third Party in one transaction or series of transactions, (b) the closing of a merger or other business combination or transaction that results in the voting securities of such Party outstanding immediately prior thereto, or any securities into which such voting securities have been converted or exchanged, ceasing to represent more than fifty percent (50%) of the combined voting power of the surviving entity or the parent of the surviving entity immediately after such merger or other business combination or transaction, or (c) the closing of a transaction, following which a Third Party acquires direct or indirect ability or power to direct or cause the direction of the management and policies of such Party or of its ultimate parent entity or otherwise direct the affairs of such Party or of its ultimate parent entity, whether through ownership of equity, voting securities, beneficial interest, by contract or otherwise. Notwithstanding the foregoing, a public offering of a Party's capital stock or any

other financing transaction involving a Party and one or more Third Parties whose business is primarily or principally that of financial investing would not constitute a Change of Control.

1.23. "**Clinical Trial**" shall mean any clinical study in humans of a pharmaceutical product.

1.24. "**CMC**" shall mean chemistry, manufacturing and control.

1.25. "**Co-Chair**" shall have the meaning set forth in Section 4.3.

1.26. "**Collaboration Know-How**" shall mean any and all Know-How that is first conceived, discovered, developed or otherwise made by or on behalf of a Party (or its Affiliates or Sublicensees), whether alone or jointly with the other Party (or its Affiliates or Sublicensees), in the course of performing activities under this Agreement, whether or not patented or patentable.

1.27. "**Collaboration Patent**" shall mean any Patent that claims any Collaboration Know-How.

1.28. "**Collaboration Program**" shall have the meaning set forth in Section 2.1.1.

1.29. "**Collaboration Technology**" shall mean the Collaboration Know-How and the Collaboration Patents.

1.30. "**Combination Product**" shall mean (a) any single Licensed Product in finished form containing as active ingredients both (i) a Compound and (ii) one or more other active pharmaceutical ingredients that are not Compounds (each an "**Other API**"); or (b) any sale of a Licensed Product with another product(s) or service(s) for a single invoice price (each such Other API, other product or other service, an "**Other Component**").

1.31. "**Combination Sale**" shall have the meaning set forth in Section 1.125.

1.32. "**Commercialize**" shall mean any and all activities directed to the promotion, marketing, distribution or sale (and offer for sale or import or export for sale) of a product. "**Commercializing**" and "**Commercialization**" shall have corresponding meanings.

1.33. "**Commercially Reasonable Efforts**" shall mean, with respect to a Party, efforts that are not less than those Development or Commercialization efforts such Party makes with respect to other compounds or products in its portfolio at a similar stage of development or in a similar stage of product life, with similar developmental risk profiles and of similar market and commercial potential, based on conditions then-prevailing and taking into account all other relevant factors including issues of safety and efficacy, the nature and extent of market exclusivity (including regulatory exclusivity and the patent and other proprietary position of the product), performance of other products that are of similar market potential and the likely timing of other product's entry into the market, costs, timing, and the likelihood of success of technology transfer, process development and manufacturing validation and scale-up, the likelihood and cost of obtaining Regulatory Approval and of the anticipated or actual approved labeling, financial return, medical and clinical considerations, regulatory environment, the regulatory structure involved, and other relevant scientific, technical and commercial factors.

1.34. "**Committee Deadlock**" shall have the meaning set forth in Section 4.6.2.

1.35. "**Competing Product**" shall mean, with respect to a Party, any product that, if Developed, Manufactured or Commercialized by such Party or its Affiliates, would cause such Party to be in violation of the provisions of Section 3.5.1 or 3.5.2, as applicable.

1.36. "**Competitive Infringement**" shall have the meaning set forth in Section 8.3.2(a).

1.37. "**Compound**" shall mean, with respect to any Collaboration Program for which Allergan has exercised its Option, (a) any and all oligonucleotides that are directed to, bind to or inhibit any applicable Program Target and that are discovered, developed or investigated under such Collaboration Program and (b) any and all compounds consisting of one or more of any such oligonucleotides in an SNA format, including the lead compound(s), and all back-up and follow-on compounds arising out of or from such Collaboration Program, and, in each case ((a) and (b)), any of their various chemical forms, including nucleic acid sequences, modified nucleic acids, nucleic acid derivatives, acids, bases, salts, metabolites, esters, isomers, enantiomers, pro-drug forms, hydrates, solvates, polymorphs and degradants of any of the foregoing, in each case, in any dosage form or formulation.

1.38. "**Compulsory License**" means a compulsory license under the Exicure Technology obtained by a Third Party through the order, decree, or grant of a competent national government, authorizing such Third Party to Commercialize a Licensed Product in the Field in the country of such national government in the Territory.

1.39. "**Confidential Information**" shall mean all secret, confidential or proprietary information, Know-How or data, whether provided in written, oral, graphic, video, computer or other form, that is provided by one Party (the "**Disclosing Party**") to the other Party (the "**Receiving Party**") that is marked or otherwise identified as confidential or that by its nature a reasonable person would understand to be confidential, including information, Know-How or data relating to the Disclosing Party's existing or proposed research, development efforts, Patent applications, business, Compounds or Licensed Products, other compounds or products and any other materials that have not been made available by the Disclosing Party to Third Parties (other than under an obligation of confidentiality). Notwithstanding the foregoing, Confidential Information shall not include any information or materials that:

(i) were already known to the Receiving Party at the time of disclosure by the Disclosing Party to the extent such Receiving Party has contemporaneous documentation or other competent evidence to that effect;

(ii) were generally available to the public or otherwise part of the public domain at the time of its disclosure to the Receiving Party;

(iii) became generally available to the public or otherwise part of the public domain after its disclosure, other than through any act or omission of a Party in breach of such Party's confidentiality obligations under this Agreement;

(iv) were subsequently disclosed to the Receiving Party by a Third Party who had no obligation to the Disclosing Party not to disclose such information to others; or

(v) were independently discovered or developed by or on behalf of the Receiving Party without the use of, reliance on or reference to the Confidential Information of the other Party and the Receiving Party has contemporaneous documentation or other competent evidence to that effect.

Notwithstanding anything contained herein to the contrary, (A) the terms of this Agreement shall be deemed to be the Confidential Information of both Parties (and both Parties shall be deemed to be the Receiving Party with respect thereto) and (B) Collaboration Know-How shall be deemed to be the Confidential Information of both Parties (and both Parties shall be deemed to be the Receiving Party with respect thereto); *provided*, *however*, that following Allergan's exercise of an Option with respect to a Collaboration Program, all Collaboration Know-How arising out of or from such Collaboration Program to the extent it specifically relates to the Compounds or Licensed Products arising out of or from such Collaboration Program, shall be deemed to be the Confidential Information of Allergan (and Allergan shall be deemed to be the Disclosing Party and Exicure shall be deemed to be the Receiving Party with respect thereto).

For the avoidance of doubt, and notwithstanding anything contained herein to the contrary, any "Confidential Information" (as defined in the Existing Confidentiality Agreement) disclosed by or on behalf of a Party to the other Party or its Affiliates or representatives prior to the Effective Date pursuant to the Mutual Confidential Disclosure Agreement by and between Exicure and Allergan, Inc. dated as of ***** (the "**Existing Confidentiality Agreement**") shall be Confidential Information of such disclosing Party under this Agreement.

1.40. "**Continuing Party**" shall have the meaning set forth in Section 8.2.2(d).

1.41. "**Control**" and its correlative terms, "**Controlled**" or "**Controls**", shall mean, with respect to any Party and any intellectual property right or other intangible property, that such Party or its Affiliates owns or has a license or sublicense to such item or right, and has the ability to assign, grant access to, license or sublicense, as applicable, such right to the extent provided for in this Agreement without violating the terms of any agreement or other arrangement with any Third Party. Notwithstanding the foregoing, following a Change of Control of a Party, such Party shall not be deemed to Control any intellectual property right or other intangible property that is owned or controlled by an Acquiring Entity, except to the extent that any such intellectual property right or other intangible property was developed in the course of such Party's or such Acquiring Entity's performance of activities under this Agreement or through the exploitation of such Party's Patents, Know-How or Confidential Information, was actually used in the course of such Party's or such Acquiring Entity's performance of activities under this Agreement, or was already licensed to the other Party under this Agreement prior to the applicable Change of Control (such intellectual property or other intangible property that is deemed to not be Controlled by a Party pursuant to this sentence, "**Acquiring Entity Intellectual Property**").

1.42. "**Controlling Party**" shall have the meaning set forth in Section 8.4.4.

1.43. "**Cover**," "**Covering**" or "**Covers**" shall mean, as to a compound or product and a Patent, that, in the absence of a license granted under, or ownership of, such Patent, the making, using, selling, offering for sale or importation of such compound or product would infringe such Patent or, as to a pending claim included in such Patent, the making, using, selling, offering for sale or importation of such compound or product would infringe such Patent if such pending claim were to issue in an issued Patent without modification.

1.44. "**Declining Party**" shall have the meaning set forth in Section 8.2.2(d).

1.45. "**Defaulting Party**" shall have the meaning set forth in Section 9.3.1.

1.46. "**Defending Party**" shall have the meaning set forth in Section 8.5.2.

1.47. "**Development**" shall mean any and all activities, including research, discovery, compound identification and generation, non-clinical and pre-clinical testing and trials and Clinical Trials, post-approval studies, supporting Manufacturing, production process development and formulation and related regulatory activities, in each case directed to obtaining or maintaining Regulatory Approval for a product for an Indication. "**Develop**" and "**Developing**" shall have corresponding meanings.

1.48. "**Development and Regulatory Milestone Events**" shall have the meaning set forth in Section 6.4.1.

1.49. "**Development and Regulatory Milestone Payments**" shall have the meaning set forth in Section 6.4.1.

1.50. "**Development Plan**" shall have the meaning set forth in Section 2.1.2.

1.51. "**Disclosing Party**" shall have the meaning set forth in Section 1.38.

1.52. "**Distributor**" shall mean any Third Party that purchases Licensed Product in final form from Allergan or its Affiliates or Sublicensees for resale, in circumstances where such Third Party is appointed by Allergan or its Affiliate or Sublicensee as a distributor to distribute, market and resell such Licensed Product in one or more countries and such Third Party takes title to such Licensed Product but does not make any royalty, profit, revenue share or other similar payment to Allergan or any of its Affiliates or Sublicensees with respect to its resale of such Licensed Product, regardless of whether such Third Party is granted ancillary rights to further Develop, package or obtain Regulatory Approvals of such Licensed Product in order to distribute, market or sell such Licensed Product. For the avoidance of doubt, any wholesaler or reseller of a Licensed Product is a "Distributor" to the extent such Person meets the requirements of this definition.

1.53. "**DMPK**" shall mean drug metabolism and pharmacokinetics.

1.54. "**DOJ**" shall have the meaning set forth in Section 1.91.

1.55. "**Effective Date**" shall have the meaning set forth in the preamble hereto.

1.56. "**EMA**" shall mean the European Medicines Agency, and any successor or replacement agency.

1.57. "**Excluded Scope**" shall have the meaning set forth in Section 3.7.1.

1.58. "**Exicure**" shall have the meaning set forth in the preamble hereto.

1.59. "**Exicure Collaboration Know-How**" shall mean all Collaboration Know-How solely owned by Exicure pursuant to the ownership provisions set forth in Section 8.1.1.

1.60. "**Exicure Collaboration Patents**" shall mean all Collaboration Patents solely owned by Exicure pursuant to the ownership provisions set forth in Section 8.1.1.

1.61. "**Exicure Indemnitees**" shall have the meaning set forth in Section 11.2.

1.62. "**Exicure Know-How**" shall mean (a) all Know-How owned or Controlled by Exicure as of the Effective Date or during the Term that is necessary or useful for the Exploitation of Licensed Products in the Field in the Territory, and (b) all Exicure Collaboration Know-How. For purposes of clarity, Exicure Know-How shall exclude any Acquiring Entity Intellectual Property.

1.63. "**Exicure Patents**" shall mean (a) any Patents that are owned or Controlled by Exicure as of the Effective Date or during the Term that Cover a Compound or Licensed Product, or are otherwise necessary or useful to Exploit any Licensed Product in the Field in the Territory, and (b) the Exicure Collaboration Patents. The Exicure Patents as of the Effective Date are listed on Exhibit C, which Exhibit may be updated from time to time to include any additional Exicure Patents that may arise or come into the Control of Exicure during the Term, *provided* that a failure to so include a Patent on Exhibit C that otherwise meets the definition of an Exicure Patent shall not preclude such Patent from being deemed an Exicure Patent hereunder. For purposes of clarity, Exicure Patents shall exclude any Acquiring Entity Intellectual Property.

1.64. "**Exicure Platform**" shall mean the use of SNAs for intracellular gene regulation as disclosed in the Exicure Patents existing as of the Effective Date, together with any improvements, enhancements or modifications thereto to the extent owned by Exicure or its Affiliates. For the avoidance of doubt, the Exicure Platform shall not include the specific oligonucleotide sequences of any Compound.

1.65. "**Exicure Technology**" shall mean the Exicure Know-How and the Exicure Patents.

1.66. "**Exicure Third Party Agreement**" shall mean any agreement between Exicure or any of its Affiliates and any Third Party (a) pursuant to which Exicure Controls any of the Exicure Technology as of the Effective Date, including the Northwestern Agreements, or (b) that is otherwise deemed to be an Exicure Third Party Agreement pursuant to Section 3.7.1.

1.67. "**Exploit**" shall mean to make, have made, import, use, sell or offer for sale, including to Develop, Manufacture, Commercialize, register, hold or keep (whether for disposal or otherwise), have used, export, transport, distribute, promote, market or have sold or otherwise dispose of.

1.68. "**Extended Option Exercise Period**" shall mean, on a Collaboration Program-by-Collaboration Program basis, the period starting on the Effective Date and ending ***** days after the date of Exicure's delivery to Allergan of a complete IND-Enabling Activities Data Package.

1.69. "**Extension Exercise**" shall have the meaning set forth in Section 3.1.2.

1.70. "**Extension Exercise Notice**" shall have the meaning set forth in Section 3.1.2.

1.71. "**FD&C Act**" shall mean the Federal Food, Drug and Cosmetic Act, as the same may be amended or supplemented from time to time.

1.72. "**FDA**" shall mean the US Food and Drug Administration, and any successor or replacement agency.

1.73. "**Field**" shall mean any and all uses.

1.74. "**First Commercial Sale**" shall mean (a) with respect to a Licensed Product, the first sale of such Licensed Product by Allergan or its Affiliates or Sublicensees in a particular country after Regulatory Approval of such Licensed Product has been obtained in such country or (b) with respect to a Terminated Product, the first sale of such Terminated Product by Exicure or its Affiliates or licensees in a particular country after Regulatory Approval of such Terminated Product has been obtained in such country.

1.75. "**First Right Party**" shall have the meaning set forth in Section 8.2.1(d).

1.76. "**Force Majeure Event**" shall have the meaning set forth in Section 12.4.

1.77. "**Foreign Filing**" shall have the meaning set forth in Section 3.2.1.

1.78. "**Foreign Jurisdictions**" shall have the meaning set forth in Section 3.1.3.

1.79. "**FTC**" shall have the meaning set forth in Section 1.91.

1.80. "**FTE**" shall mean the equivalent of the work of one employee full time for one Calendar Year (consisting of at least a total of ***** hours per Calendar Year) of work directly related to the applicable activity under this Agreement. Any person who works more than ***** hours per Calendar Year and any person who devotes less than ***** hours per Calendar Year shall be treated as an FTE on a *pro rata* basis based upon the actual number of hours worked divided by *****.

1.81. "**FTE Rate**" shall mean a rate of ***** per FTE per year, which rate shall, on the anniversary of the Effective Date each year during the Term, increase by the percentage increase in the All Urban Consumer Price Index for the immediately preceding calendar year.

1.82. "**GAAP**" shall mean United States generally accepted accounting principles, consistently applied.

1.83. "**General Orange Book Patents**" shall have the meaning set forth in Section 8.6.

1.84. "**Generic Product**" shall mean, with respect to a Licensed Product in a particular country, a Third Party pharmaceutical product that (a) contains the same active pharmaceutical ingredient(s) as such Licensed Product and is approved by the applicable Regulatory Authority in such country for an Indication for which such Licensed Product obtained Regulatory Approval from the applicable Regulatory Authority in such country; or (b) is approved by the applicable Regulatory Authority in such country as substitutable for and therapeutically equivalent to such Licensed Product for an Indication for which such Licensed Product obtained Regulatory Approval from the applicable Regulatory Authority in such country, in either case ((a) or (b)), in a manner that relied on, referenced or incorporated data held by such Regulatory Authority that was initially submitted by Allergan or its Affiliates or Sublicensees in connection with the Approval Application for such Licensed Product in such country.

1.85. "**Generic Product Presence**" shall have the meaning set forth in Section 6.7.2.

1.86. "**Good Laboratory Practice**" or "**GLP**" shall mean the then-current Good Laboratory Practice Standards promulgated or endorsed by the FDA or in the case of any other country in the Territory, comparable regulatory standards promulgated or endorsed by the Regulatory Authorities in that country.

1.87. "**Good Manufacturing Practice**" or "**GMP**" shall mean the then-current Good Manufacturing Practices as specified in the United States Code of Federal Regulations, ICH Guideline Q7A, or equivalent Laws of an applicable Governmental Authority of any other relevant country at the time of manufacture.

1.88. "**Governmental Authority**" shall mean any court, tribunal, arbitrator, agency, department, board, division, administration, legislative body, commission, official or other instrumentality of (a) any government of any country, (b) a federal, state, province, county, city or other political subdivision thereof or (c) any international, multinational or supranational body.

1.89. "**Hair Loss Disorder**" shall mean any Indication for the prevention or treatment of hair loss, including Androgenetic Alopecia (*i.e.*, male-pattern hair loss/balding and female-pattern hair loss), *****.

1.90. "**HSR Act**" shall mean the Hart-Scott-Rodino Antitrust Improvements Act of 1976, as amended, and the rules and regulations promulgated thereunder.

1.91. "**HSR Filing**" shall mean a filing by Exicure and Allergan or their ultimate parent entities as that term is defined in the HSR Act with the United States Federal Trade Commission (the "**FTC**") and the United States Department of Justice (the "**DOJ**") of a Notification and Report Form for Certain Mergers and Acquisitions (as that term is defined in the HSR Act) with respect to the transactions contemplated under this Agreement upon Allergan's exercise of an Option with respect to a Collaboration Program, together with all required documentary attachments thereto.

1.92. "**ICH**" shall mean the International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use.

1.93. *****

1.94. "**IND**" shall mean any Investigational New Drug application, as defined in Title 21 of the Code of Federal Regulations, on file with the FDA before commencement of Clinical Trials, or any comparable filing with any relevant Regulatory Authority in any country or jurisdiction in the Territory including a Clinical Trial authorization application.

1.95. "**IND-Enabling Activities**" shall have the meaning set forth in Section 2.1.2.

1.96. "**IND-Enabling Activities Data Package**" shall mean a complete data package containing all information and data (a) required by the JDC to be included in such IND-Enabling Activities data package and (b) generated by or on behalf of Exicure under the applicable Collaboration Program through completion of IND-Enabling Activities as set forth in the applicable Development Plan.

1.97. "**Indemnification Claim Notice**" shall have the meaning set forth in Section 11.3.

1.98. "**Indemnified Party**" shall have the meaning set forth in Section 11.3.

1.99. "**Indemnifying Party**" shall have the meaning set forth in Section 11.3.

1.100. "**Indemnitees**" shall have the meaning set forth in Section 11.3.

1.101. "**Independent Price(s)**" shall have the meaning set forth in Section 1.125.

1.102. "**Indication**" shall mean the intended use of a product for the treatment or prevention of a distinct recognized human disease or condition, or of a manifestation of a recognized human disease or condition, or for the relief of symptoms associated with a recognized human disease or condition, and which, if approved in the U.S., would be reflected in the "Indications and Usage" section of labeling pursuant to 21 C.F.R. §201.57(c)(2) or, to the extent applicable, any comparable labeling section outside the U.S.

1.103. "**Initial Development Activities**" shall have the meaning set forth in Section 2.1.2.

1.104. "**Initial Development Report**" shall mean, on a Collaboration Program-by-Collaboration Program basis, a report that (a) describes in reasonable detail the results of the Initial Development Activities conducted by or on behalf of Exicure under the applicable Collaboration Program, as required by the JDC to be included in such report, and (b) identifies at least one Compound that, in the JDC's determination, satisfies the Candidate Criteria for such Collaboration Program.

1.105. "**Initial Option Exercise Period**" shall mean, on a Collaboration Program-by-Collaboration Program basis, the period starting on the Effective Date and ending ***** days after the later of the date that (a) Exicure delivers to Allergan a complete Initial Development Report for

the applicable Collaboration Program or (b) the JDC approves an amendment to the IND-Enabling Activities set forth in the applicable Development Plan, if any, pursuant to Section 2.1.3.

1.106. "**Initiation**" shall mean, with respect to a Clinical Trial, the first dosing of the first subject in such Clinical Trial.

1.107. "**Insolvency Event**" shall have the meaning set forth in Section 9.5.1.

1.108. "**Invalidity/Unenforceability Action**" shall have the meaning set forth in Section 8.4.1.

1.109. "**JDC**" shall have the meaning set forth in Section 4.1.

1.110. "**Joint Collaboration Know-How**" shall have the meaning set forth in Section 8.1.2.

1.111. "**Joint Collaboration Patents**" shall have the meaning set forth in Section 8.1.2.

1.112. "**Joint Collaboration Technology**" shall have the meaning set forth in Section 8.1.2.

1.113. "**JWG**" shall have the meaning set forth in Section 4.8.

1.114. "**Know-How**" shall mean all technical, scientific and other know-how and information, trade secrets, knowledge, discoveries, results, technology, technical developments, inventions, methods, processes, practices, formulae, instructions, skills, techniques, procedures, ideas, concepts, designs, drawings, specifications, data, results and other material (together with all improvements to any of the foregoing).

1.115. "**Knowledge**" shall mean, with respect to each Party, the actual knowledge of any of the individuals listed on Exhibit D, in each case after reasonable inquiry of such named individuals' files and records and of outside counsel (including patent counsel, as applicable) and, as applicable, those employees of such Party or its Affiliates who are such named individuals' direct reports or are otherwise responsible for the relevant activity or subject matter.

1.116. "**Law**" shall mean all laws, statutes, ordinances, rules, rulings, treaties, procedures, notices, regulations, writs, judgments, decrees, injunctions (whether preliminary or final), orders and other pronouncements having the effect of law of any Governmental Authority in effect from time to time.

1.117. "**License Effective Date**" shall mean, with respect to a Collaboration Program, the date of Allergan's Option Exercise for such Collaboration Program; *provided*, *however*, that, if Allergan determines that an HSR Filing is required to be made under the HSR Act or that a filing is required or advisable under the antitrust or merger control Laws of any Foreign Jurisdictions as a result of Allergan's exercise of an Option and notifies Exicure of such determination prior to the expiration of the applicable Option Exercise Period, the License Effective Date shall not occur until the Antitrust Clearance Date with respect to Allergan's exercise of the Option with respect to such Collaboration Program.

1.118. "**Licensed Product**" shall mean, with respect to any Collaboration Program for which Allergan has exercised its Option, any product that contains a Compound as an active ingredient, whether alone or in combination with other active ingredients.

1.119. "**Losses**" shall have the meaning set forth in Section 11.1.

1.120. "**Major European Countries**" shall mean the *****.

1.121. "**Manufacture**" shall mean, in respect of a product, the production, manufacture, formulation, processing, filling, finishing, packaging, labeling, shipping and holding of such product or any intermediate thereof, including pre-clinical, clinical and commercial manufacture and analytic development, product characterization, stability testing, quality assurance and quality control.

1.122. "**Materials**" shall mean any tangible chemical or biological material, including any small molecules, DNA, RNA, clones, cells, and any expression product, progeny, derivative or other improvement thereto, along with any tangible chemical or biological material.

1.123. "**Mono Product(s)**" shall have the meaning set forth in Section 1.125.

1.124. "**NDA**" shall mean a new drug application submitted to the FDA pursuant to Section 505(b) of the FD&C Act (21 U.S.C. § 355(b)), and all amendments and supplements thereto, or any comparable filing with any relevant Regulatory Authority in any country or jurisdiction in the Territory.

1.125. "**Net Sales**" shall mean, with respect to a Licensed Product in a country in the Territory, the gross amount invoiced for sale or other disposition of such Licensed Product in such country by Allergan, its Affiliates or Sublicensees to Third Parties (including Distributors, resellers, wholesalers and end users), less the following deductions accounted for in accordance with GAAP:

(a) sales returns and allowances actually paid, granted or accrued on the Licensed Product, including trade quantity, prompt pay and cash discounts and any other adjustments granted on account of price adjustments or billing errors;

(b) credits or allowances given or made for rejection, recall, return or wastage replacement of, and for uncollectible amounts on, Licensed Products or for rebates or retroactive price reductions;

(c) price reductions, rebates and chargeback payments granted to managed health care organizations, pharmacy benefit managers (or equivalents thereof), national, state/provincial, local, and other governments, their agencies and purchasers and reimbursers, or to trade customers (including Medicare, Medicaid, managed care and similar types of rebates and chargebacks);

(d) costs of freight, insurance, and other transportation charges, as well as any administration fees or other fees for services provided by wholesalers, distributors, warehousing chains and other Third Parties related to the distribution of such Licensed Product;

(e) taxes, duties or other governmental charges (including any tax such as a value added or similar tax, but excluding any taxes based on income) relating to the sale of such Licensed Product, as adjusted for reimbursement, rebates and refunds of or on such taxes, duties or governmental charges from any Third Party, including pharmaceutical excise taxes; and

(f) the portion of administrative fees paid during the relevant time period to group purchasing organizations or pharmaceutical benefit managers relating to such Licensed Product;

in each case to the extent such deductions: (i) are applicable and in accordance with standard allocation procedures and consistently applied, (ii) have not already been deducted or excluded, (iii) are incurred in the ordinary course of business in type and amount consistent with good industry practice, (iv) are actually taken, and (v) except with respect to the uncollectible amounts and pharmaceutical excise taxes described in clauses (b) and (e) above, are determined in accordance with, and as recorded in revenues under GAAP. With respect to any uncollectible amounts described in clause (b), if, at any time after such deduction is taken, the Person who took the deduction collects any of such amount, even if such amount is collected after the end of the Royalty Term applicable to the Licensed Product for which the deduction was taken, such collected amount shall be included as Net Sales in the Calendar Quarter in which they are collected and Allergan shall pay Exicure royalties thereon accordingly.

With respect to any sale of any Licensed Product in any country for less than fair market value or for any substantive consideration other than monetary consideration on arm's length terms (which has the effect of reducing the invoiced amount below what it would have been in the absence of such non-monetary consideration), for purposes of calculating the Net Sales under this Agreement, such Licensed Product shall be deemed to be sold exclusively for cash at the average Net Sales price charged to Third Parties for cash sales in such country during the applicable reporting period (or if there were only *de minimis* cash sales in such country, at the fair market value as determined in good faith based on pricing in comparable markets). Net Sales shall not be imputed to transfers of Licensed Product without consideration or for nominal consideration (in each case) for use in any Clinical Trial, or for any bona fide charitable, compassionate use or indigent patient program purpose or as a sample. For the avoidance of doubt, in the case of any transfer of any Licensed Product between or among Allergan and its Affiliates or Sublicensees for resale, Net Sales shall be determined based on the sale made by such Affiliate or Sublicensee to a Third Party.

*****

1.126. "**Non-Defaulting Party**" shall have the meaning set forth in Section 9.3.1.

1.127. *****

1.128. "**Non-Prosecuting Party**" shall have the meaning set forth in Section 8.2.3.

1.129. "**Northwestern**" shall mean Northwestern University.

1.130. "**Northwestern 2011 Agreement**" shall mean the Restated License Agreement restated on August 15, 2015 and effective as of December 12, 2011, as amended on September 27, 2016, November 30, 2017 and January 1, 2019, between Northwestern and Exicure, as such agreement may be further amended or amended and restated in accordance with the terms of this Agreement.

1.131. "**Northwestern 2014 Agreement**" shall mean the License Agreement effective as of May 27, 2014, as amended on June 11, 2018, between Northwestern and Exicure, as such agreement may be further amended or amended and restated in accordance with the terms of this Agreement.

1.132. "**Northwestern Agreements**" shall mean the Northwestern 2011 Agreement and Northwestern 2014 Agreement.

1.133. "**Northwestern Side Agreement**" shall mean the Side Agreement to "Northwestern Agreements" in Relation to Allergan Sublicense, dated as of the date hereof, between Northwestern, Exicure and Allergan, as such agreement may be further amended or amended and restated.

1.134. "**Option**" shall have the meaning set forth in Section 3.1.1.

1.135. "**Option Exercise**" shall have the meaning set forth in Section 3.1.3.

1.136. "**Option Exercise Notice**" shall have the meaning set forth in Section 3.1.3.

1.137. "**Option Exercise Payment**" shall have the meaning set forth in Section 6.3.

1.138. "**Option Exercise Period**" shall mean, on a Collaboration Program-by-Collaboration Program basis, (a) the Initial Option Exercise Period for the applicable Collaboration Program or (b) solely in the case that Allergan makes an Extension Exercise for such Collaboration Program, the Extended Option Exercise Period for such Collaboration Program.

1.139. "**Option Extension Payment**" shall have the meaning set forth in Section 6.2.

1.140. "**Orange Book**" shall mean the book of Approved Drug Products with Therapeutic Equivalence Evaluations, as published by FDA.

1.141. "**Orange Book Patents**" shall mean any Exicure Patents or Joint Collaboration Patents, in each case, that are or can be, in accordance with applicable Laws, listed in the Orange Book with respect to a Licensed Product. For the avoidance of doubt, Orange Book Patents may include Product-Specific Patents.

1.142. *****

1.143. "**Other API**" shall have the meaning set forth in Section 1.30.

1.144. "**Other Component**" shall have the meaning set forth in Section 1.30.

1.145. "**Party**" and "**Parties**" shall have the meaning set forth in the preamble hereto.

1.146. "**Patents**" shall mean (a) all patents or patent applications, including any continuations, continuations-in-part, divisions, provisional, converted provisional, continued prosecution or substitute applications, (b) any patent issued with respect to any of the foregoing patent applications, including utility models, petty patents, innovation patents and design patents and certificates of invention, (c) any reissue, reexamination, renewal, restoration or extension (including any supplementary protection certificate and the like) of any of the foregoing patents or patent applications, (d) any confirmation patent or registration patent or patent of addition based on any such patent, (e) any similar rights, including so-called pipeline protection or any importation, revalidation, confirmation or introduction patent or registration patent or patent of additions to any of such foregoing patent applications and patents, and (f) all foreign counterparts of any of the foregoing, or as applicable portions thereof or individual claims therein.

1.147. "**Person**" shall have the meaning set forth in Section 1.5.

1.148. "**Personal Information**" shall have the meaning set forth in Section 10.3.1.

1.149. "**Phase I Clinical Trial**" shall mean, as to a specific product, a Clinical Trial of such product designed to obtain data on the safety and tolerability of such product, including pharmacological or pharmacokinetic information, as described in 21 C.F.R. 312.21(a) as amended from time to time, or the corresponding regulation in jurisdictions other than the United States.

1.150. "**Phase II Clinical Trial**" shall mean, as to a specific product, a Clinical Trial of such product designed to make a preliminary determination as to whether a product is safe for its intended use and achieves its efficacy primary endpoint, in a manner that is generally consistent with 21 C.F.R. § 312.21(b), as amended (or its successor regulation), to permit the design of further Clinical Trials, or the corresponding regulation in jurisdictions other than the United States.

1.151. "**Phase III Clinical Trial**" shall mean, as to a specific product, a Clinical Trial designed to obtain evidence of statistical significance of the efficacy of such product in a target patient population, and to obtain expanded evidence of safety for such product that is needed to evaluate the overall benefit-risk relationship of such product and provide an adequate basis for filing an NDA, as described in 21 C.F.R. 312.21(c) as amended from time to time, or the corresponding regulation in jurisdictions other than the United States.

1.152. "**PMDA**" shall mean the Japanese Pharmaceuticals and Medical Devices Agency, and any successor or replacement agency.

1.153. "**PPACA**" shall mean the Patient Protection and Affordable Care Act, as modified by the Health Care and Education Reconciliation Act.

1.154. "**Product-Specific Patents**" shall mean all Exicure Patents and Joint Collaboration Patents, in each case, claiming or disclosing (a) the specific composition of matter of a Compound or Licensed Product, including any formulation thereof, or (b) methods of using the specific composition of matter of a Compound or Licensed Product.

1.155. "**Product Trademarks**" shall mean the Trademark(s) used or to be used by Allergan or its Affiliates or its or their Sublicensees for the Commercialization of Licensed Products in the Field in the Territory and any registrations thereof or any pending applications relating thereto in the Field in the Territory, including any unregistered Trademark rights related to the Licensed Products as may exist through use before, on or after the Effective Date (excluding, in any event, any trademarks, service marks, names or logos that include any corporate name or logo of the Parties or their Affiliates or Sublicensees).

1.156. "**Program Target**" shall mean, on a Collaboration Program-by-Collaboration Program basis, any target set forth in Exhibit A for the applicable Collaboration Program or any Substitute Target for such Collaboration Program, but excluding any Terminated Target.

1.157. "**Prosecuting Party**" shall have the meaning set forth in Section 8.2.3.

1.158. "**Receiving Party**" shall have the meaning set forth in Section 1.38.

1.159. "**Regulatory Approval**" shall mean, with respect to a product in a particular country in the Territory, the receipt of all clearances, approvals, certifications, licenses, registrations or authorizations of any Regulatory Authority necessary to commercially distribute, sell or market such product in such country, including, where applicable, pre- and post-approval marketing authorizations (including any prerequisite Manufacturing approval or authorization related thereto), and labeling approval, and where applicable, pricing or reimbursement approval in such country.

1.160. "**Regulatory Authority**" shall mean any national, supranational, regional, state or local regulatory agency, administration, department, bureau, commission, council or other governmental entity including the FDA and the EMA and any other agencies in any country involved in the granting of Regulatory Approvals.

1.161. "**Regulatory Documentation**" shall mean all (a) applications (including all INDs and Approval Applications), registrations, licenses, authorizations and Regulatory Approvals; (b) correspondence and reports submitted to or received from Regulatory Authorities (including minutes and official contact reports relating to any communications with any Regulatory Authority) and all supporting documents with respect thereto, including all adverse event files and complaint files; and (c) clinical data, chemistry, manufacturing and controls data and other data contained or relied upon in any of the foregoing.

1.162. "**Regulatory Exclusivity**" shall mean, with respect to a Licensed Product or a Terminated Product in a country, any data exclusivity rights or other exclusive right, other than a Patent, granted, conferred or afforded by any Regulatory Authority in such country or otherwise under applicable Law with respect to such Licensed Product or such Terminated Product in such country, that either confers exclusive marketing rights with respect to such Licensed Product or such Terminated Product or prevents another party from using or otherwise relying on the data supporting the Regulatory Approval of such Licensed Product or such Terminated Product without the prior written authorization of the holder of the Approval Application, such as new chemical entity exclusivity, exclusivity associated with new Clinical Trials necessary to approval of a change (*e.g.*, new Indication or use), orphan drug exclusivity, non-patent-related pediatric exclusivity, or

any other applicable marketing or data exclusivity, including any such periods under national implementations in the EU of Article 10 of Directive 2001/83/EC, Article 14(11) of Parliament and Council Regulation (EC) No 726/2004, Parliament and Council Regulation (EC) No 141/2000 on orphan medicines, Parliament and Council Regulation (EC) No 1901/2006 on medicinal products for pediatric use and all international equivalents.

1.163. "**Research Term**" shall have the meaning set forth in Section 2.7.

1.164. "**Restricted Party**" shall have the meaning set forth in Section 3.5.3(a).

1.165. *****

1.166. *****

1.167. *****

1.168. "**Royalty Payment**" shall have the meaning set forth in Section 6.6.1.

1.169. "**Royalty Term**" shall have the meaning set forth in Section 6.6.2.

1.170. "**Sales Milestone Events**" shall have the meaning set forth in Section 6.5.1.

1.171. "**Sales Milestone Payments**" shall have the meaning set forth in Section 6.5.1.

1.172. "**Second Right Party**" shall have the meaning set forth in Section 8.2.1(d).

1.173. "**Senior Officer**" shall mean the Chief Executive Officer of Exicure and the Executive Vice President of Research and Development of Allergan, or the functional successor in their respective organizations, or their respective designees at Senior Vice President level or above.

1.174. **"SNA"** shall mean a spherical nucleic acid construct whereby one or more oligonucleotides are arranged in a spherical configuration.

1.175. "**Sublicense Agreement**" shall mean any agreement under which Allergan has granted a sublicense to a Third Party under any Exicure Technology licensed to Allergan pursuant to this Agreement, but excluding any subcontract agreement under which a Third Party agrees to perform activities with respect to the Compounds or Licensed Products on Allergan's behalf.

1.176. "**Sublicensee**" shall mean a Third Party to whom Allergan has granted a sublicense under any Exicure Technology licensed to Allergan pursuant to this Agreement, excluding Distributors.

1.177. "**Substitute Target**" shall have the meaning set forth in Section 2.2.

1.178. "**Term**" shall have the meaning set forth in Section 9.1.

1.179. "**Terminated Product**" shall have the meaning set forth in Section 9.7.3.

1.180. "**Terminated Target**" shall have the meaning set forth in Section 2.2.

1.181. "**Termination Date**" shall mean the effective date of termination of this Agreement in its entirety or with respect to one or more Collaboration Programs or Licensed Products, as applicable.

1.182. "**Territory**" shall mean worldwide.

1.183. "**Third Party**" shall mean any Person that is not a Party or an Affiliate of a Party.

1.184. "**Third Party Claims**" shall have the meaning set forth in Section 11.1.

1.185. "**Third Party Infringement Claim**" shall have the meaning set forth in Section 8.5.1.

1.186. "**Third Party IP**" shall mean, with respect to any Licensed Product, any Patent or Know-How controlled by a Third Party, which Patent or Know-How is necessary or useful to Exploit such Licensed Product in the Field in the Territory in accordance with this Agreement but excluding any Patent or Know-How that is necessary solely for the Exploitation of any Other API.

1.187. "**Trademark**" shall mean any word, name, symbol, color, shape, designation or any combination thereof, including any trademark, service mark, trade name, brand name, sub-brand name, trade dress, product configuration, program name, delivery form name, certification mark, collective mark, logo, tagline, slogan, design or business symbol, that functions as an identifier of source or origin, whether or not registered and all statutory and common law rights therein and all registrations and applications therefor, together with all goodwill associated with, or symbolized by, any of the foregoing.

1.188. "**US**" and "**United States**" shall mean the United States of America, including all of its territories and possessions.

1.189. "**USD**" or "**$**" shall mean United States Dollars.

1.190. "**Valid Claim**" shall mean: (a) a claim of an issued and unexpired Patent that has not been abandoned, cancelled or held permanently revoked, unenforceable or invalid by a decision of a court or other governmental agency of competent jurisdiction unappealed within the time allowed for appeal, or that has not been admitted to be invalid or unenforceable through reissue or disclaimer or otherwise; or (b) a claim of a pending patent application, which patent application was filed and is being prosecuted in good faith and has not been cancelled, withdrawn from consideration, abandoned or finally disallowed without the possibility of appeal or refiling of the application and that has not been pending for more than ***** from the earliest date from which the patent application claims priority. If the patent application has been re-filed or is a divisional application, the ***** period mentioned above shall be calculated from the first application filed in the series of applications. Notwithstanding the foregoing, if, such a pending patent application issues after the expiration of the ***** period mentioned above, each claim of the applicable issued

patent shall, subject to clause (a) above, be deemed to be a Valid Claim with effect from the date of issue.

1.191. "**Value Added Tax**" or "**VAT**" shall mean any value added tax, ad valorem, goods and services or similar tax chargeable on the supply or deemed supply of goods or services, sales and use taxes, transaction taxes, consumption taxes and other similar taxes required by applicable Law including any interest, penalties or other additions to tax thereon, required under applicable Law.

1.192. "**Withholding Taxes**" shall have the meaning set forth in Section 6.9.

1.193. Interpretation. Unless the context of this Agreement otherwise requires: (a) words of one gender include the other gender; (b) words using the singular or plural number also include the plural or singular number, respectively; (c) the terms "hereof," "herein," "hereby," and other similar words refer to this entire Agreement; (d) the words "include", "includes", and "including" when used in this Agreement shall be deemed to be followed by the words "without limitation", unless otherwise specified; (e) the terms "Article" and "Section" refer to the specified Article and Section of this Agreement (unless clear from the context that it refers to an Article or Section of some other document); (f) references to any "person" include individuals, sole proprietorships, partnerships, limited partnerships, limited liability partnerships, corporations, limited liability companies, business trusts, joint stock companies, trusts, incorporated associations, joint ventures or similar entities or organizations, and the successors and permitted assigns of that person; (g) "or" has the inclusive meaning represented by the phrase "and/or"; (h) the words "will" and "shall" shall have the same meaning; (i) the letter "M" used in connection with the USD figures in this Agreement denotes "million" and the letter "B" used in connection with the USD figures in this Agreement denotes "billion"; and (j) references to a Law include any amendment or modification to such Law and any rules or regulations issued thereunder, whether such amendment or modification is made, or issuance of such rules or regulations occurs, before or, only with respect to events or developments occurring or actions taken or conditions existing after the date of such amendment, modification or issuance, after the date of this Agreement, but only to the extent such amendment or modification, to the extent it occurs after the date hereof, does not have a retroactive effect. Whenever this Agreement refers to a number of days, unless otherwise specified, such number shall refer to calendar days.

ARTICLE 2

RESEARCH AND DEVELOPMENT COLLABORATION

2.1. Collaboration Programs.Subject to the terms and conditions of this Agreement, during the applicable Research Term, Exicure shall conduct two collaboration programs, each focused on one or more Hair Loss Disorders, for the discovery, research and development of one or more spherical nucleic acid therapeutic products that are directed to, bind to or inhibit one or more specific Program Targets (each, a "**Collaboration Program**"). The initial Program Targets for each Collaboration Program are identified in Exhibit A and may be updated as provided in Section 2.2.

2.1.1. As of the Effective Date, the Parties have agreed upon a development plan for each Collaboration Program that describes the development activities and timelines required to advance such Collaboration Program through first IND filing (each, a "**Development Plan**"), which are attached hereto as Exhibit B. Each Development Plan will at all times include, at a minimum, (a) preclinical activities for the applicable Collaboration Program, including CMC activities relating to drug substance and drug product, target screening, and lead optimization through identification of a Compound that satisfies the Candidate Criteria (the "**Initial Development Activities**"), and (b) all activities following the Initial Development Activities that are necessary to enable the first IND filing for such Collaboration Program, including GLP toxicology studies, GMP active pharmaceutical ingredient manufacture, release and Phase I Clinical Trial supply, DMPK studies and assay development (the "**IND-Enabling Activities**"). The terms of, and activities set forth in, each Development Plan shall at all times be designed to be in compliance with all applicable Laws and to be conducted in accordance with professional and ethical standards customary in the pharmaceutical industry, and, where applicable, each Party's respective health care compliance policies and applicable standard operating procedures, to the extent that, in the case of Allergan, any such policies or procedures are provided to Exicure in writing at least ***** days in advance of its performance of any activities set forth in a Development Plan that are subject to them.

2.1.2. The JDC shall be responsible for reviewing each Development Plan on a periodic basis and approving any amendments to such Development Plan. Without limiting the foregoing, on a Collaboration Program-by-Collaboration Program basis, concurrently with or within ***** Business Days following the delivery of the Initial Development Report for the applicable Collaboration Program, each Party may deliver to the JDC such proposed amendments to the IND-Enabling Activities set forth in the Development Plan for such Collaboration Program as such Party deems appropriate based on the results of the Initial Development Activities, including in such proposed amendment identification of the Compound(s) with respect to which such IND-Enabling Activities would be performed if Allergan makes an Extension Exercise. The JDC shall be responsible for reviewing and approving any such amendment, and will endeavor to do so within ***** days of the delivery of the later of such proposed amendments.

2.1.3. With respect to each Collaboration Program for which Allergan has made an Extension Exercise, the Parties will collaborate to develop the study design for the first Clinical Trial of a Licensed Product under such Collaboration Program, and to prepare the corresponding Clinical Trial protocol and investigator's brochure, *provided* that, in the event of any disagreement

between the Parties with respect to any of the foregoing, Allergan shall have the final decision-making authority. Prior to Allergan's Option Exercise with respect to each such Collaboration Program, Exicure will be responsible for conducting any pre-IND regulatory meetings and related regulatory communications and submissions (excluding any IND) with respect to such Collaboration Program, *provided* that, wherever possible, and to the extent permitted under applicable Law, Exicure shall provide Allergan with the opportunity (i) to have a representative present at any such regulatory meetings and (ii) to review in advance and comment on any such communications or submissions proposed to be made by Exicure to any Regulatory Authority. Exicure shall not unreasonably reject any comments provided by Allergan under this Section 2.1.4. Exicure shall promptly provide to Allergan a copy of any correspondence received from any Regulatory Authority with respect to a Collaboration Program. The Parties will collaborate to prepare the initial IND for such Collaboration Program for review and approval by the JDC in accordance with Section 4.2.10.

2.2. Program Target Substitution. At any time until the second anniversary of the Effective Date, no more than one time per Collaboration Program upon written notice to Exicure, Allergan may, at its sole option, substitute one existing Program Target (each, a "**Terminated Target**") in each Collaboration Program with one newly identified target (a "**Substitute Target**"), following good faith discussions at the JDC. Notwithstanding the foregoing, in the event that the Program Target to be substituted is a Program Target under both Collaboration Programs, then Allergan may elect to replace such Program Target with a Substitute Target in either or both Collaboration Programs, *provided* that if Allergan replaces such Program Target with the same Substitute Target in both Collaboration Programs, such substitution shall be deemed a single substitution for only one of the Collaboration Programs (*i.e.*, Allergan may still substitute another Program Target in one of the Collaboration Programs). Subject to the provisions of this Section 2.2, effective as of Allergan's delivery of such written notice, the Terminated Target will no longer constitute a Program Target hereunder, and the applicable Substitute Target will constitute a Program Target. The Parties, through the JDC, shall work in good faith to agree upon an amendment to the applicable Development Plan as appropriate in light of the termination of the Terminated Target and the addition of the Substitute Target to the applicable Collaboration Program. Notwithstanding the foregoing, if, at the time of Allergan's notice under this Section 2.2, Exicure has already granted an exclusive license to a Third Party with respect to any proposed Substitute Target that would prevent Exicure from granting to Allergan the license under Section 3.3 with respect to such proposed Substitute Target, (a) Exicure shall provide Allergan with written notice thereof within ***** days of Allergan's notice of such proposed Substitute Target, (b) such proposed Substitute Target shall not become a Substitute Target under this Agreement and (c) Allergan may again exercise its rights with respect to the applicable Collaboration Program under this Section 2.2 for one Substitute Target at any time until the second anniversary of the Effective Date.

2.3. Conduct of Development Plans.

2.3.1. During the applicable Research Term, Exicure shall use Commercially Reasonable Efforts to perform all activities set forth in the Development Plan for each Collaboration Program through completion thereof, *provided* that Exicure shall have no obligation to conduct (or report on) (i) the IND-Enabling Activities under such Development Plan unless Allergan has made an Extension Exercise for such Collaboration Program or (ii) the Allergan-Conducted Activities;

and *provided*, *further*, that any inability to perform, or delay in the performance of, any of Exicure's activities under the Development Plan to the extent attributable to a delay by Allergan in conducting any Allergan-Conducted Activities or delivering any results or data related to Allergan-Conducted Activities, where such performance or such delivery of results or data are necessary to enable Exicure to perform such activities, shall not be considered a failure of Exicure to use Commercially Reasonable Efforts to perform its activities under the Development Plan. Without limiting the foregoing, Exicure shall devote FTEs sufficient to perform the activities set forth in each Development Plan, which FTEs shall be appropriately qualified research and development personnel possessing at least the level of skill and experience that Exicure's personnel engaged in discovery, research and other Development activities for Exicure's other programs possess. Exicure will conduct its activities under each Development Plan in accordance with good scientific standards and practices and in compliance in all material respects with all applicable Laws, including those regarding environmental, safety and industrial hygiene, quality assurance and quality control (including data integrity), and, solely to the extent stated in the applicable Development Plan, the applicable requirements of GLP and GMP. Exicure shall maintain (either directly or through its subcontractors) laboratories, offices and all other facilities reasonably necessary to carry out the activities to be performed by it pursuant to each Development Plan. In conformity with standard pharmaceutical and biotechnology industry practices and the terms and conditions of this Agreement, Exicure shall prepare and maintain, or shall cause to be prepared and maintained, complete and accurate laboratory notebooks and other written records, accounts, notes, reports and data with respect to activities conducted pursuant to each Development Plan and, upon Allergan's written request, will send legible copies of the aforesaid to Allergan in such form(s) as Allergan may reasonably request.

2.3.2. Notwithstanding anything to the contrary, Allergan may elect, in its sole discretion and at its sole cost and expense, to conduct any formulation assessment activities or *in vivo* efficacy models set forth in a Development Plan (any such activities, to the extent Allergan has made such an election, the "**Allergan-Conducted Activities**"). In such event, (a) Allergan shall provide to Exicure prompt written notice of such election specifying the Allergan-Conducted Activities, (b) Exicure shall, at Exicure's reasonable cost and expense (with Allergan reimbursing any reasonable incremental costs and expenses in excess of Exicure's estimated costs to complete such Development Plan activity that Allergan has elected to conduct), deliver to Allergan all Materials in Exicure's possession or control in connection with the Collaboration Program that are reasonably necessary for Allergan to conduct such Allergan-Conducted Activities and (c) Exicure's diligence obligations under Section 2.3.1 shall not apply with respect to such Allergan-Conducted Activities. In furtherance of the foregoing, effective as of Exicure's receipt of Allergan's notice specifying the Allergan-Conducted Activities under this Section 2.3.2, Exicure, on behalf of itself and its Affiliates, hereby grants to Allergan, and Allergan hereby accepts, a non-exclusive, royalty-free, non-sublicensable (except to any subcontractors acting on Allergan's behalf), nontransferable (except in accordance with Section 12.1), worldwide license under the Exicure Technology and Exicure's interest in the Joint Collaboration Technology, solely to conduct the Allergan-Conducted Activities.

2.4. Development Costs. Exicure shall be solely responsible for all costs and expenses of conducting each Collaboration Program in accordance with the applicable Development Plan, except as expressly set forth in Section 2.3.2.

2.5. Subcontracts. Exicure may perform its activities under the Development Plans pursuant to this Agreement through one or more Third Party subcontractors, *provided* that Exicure obtains Allergan's written consent prior to engaging any such subcontractor to conduct such activities, and *provided*, *further,* that Exicure engages each such subcontractor through a written agreement consistent with the terms and conditions of this Agreement. Notwithstanding anything to the contrary in this Agreement, Exicure may only engage a Third Party subcontractor to perform its activities under the Development Plans if: (a) no rights of Allergan under this Agreement would be diminished or otherwise adversely affected as a result of such subcontracting, (b) the subcontractor undertakes the obligations of confidentiality and non-use regarding Confidential Information that are substantially the same as those undertaken by the Parties pursuant to Article 7 hereof, and (c) the subcontractor agrees that any intellectual property developed in the course of the work hereunder shall be assigned to Exicure or Exicure's designee, so as to permit licensing of such intellectual property to Allergan as required by the terms and conditions of this Agreement. Any subcontracting shall not relieve Exicure of its obligations or liability under this Agreement, and, in the event of any subcontracting by Exicure, Exicure will remain responsible for the performance of its obligations hereunder notwithstanding any such subcontracts.

2.6. Reports.

2.6.1. Exicure shall promptly provide the JDC with written reports of all Know-How made or generated by Exicure in the course of performing activities under the Development Plans. Without limiting the foregoing, Exicure shall prepare and provide to the JDC (a) a written report within ***** days after the end of every Calendar Quarter during which Exicure is conducting activities under the Development Plan that (i) details the activities performed, including all results achieved, (ii) sets forth the expected activities for the next Calendar Quarter and the prioritization thereof, and (iii) identifies any issues or circumstances of which it is aware that may prevent or adversely affect in a material manner its future performance of activities assigned to it under such Development Plan and (b) such other reports or updates as may be required under such Development Plan or otherwise reasonably requested by Allergan.

2.6.2. Without limiting the foregoing, promptly following the completion of all Initial Development Activities, Exicure shall prepare and deliver to Allergan an Initial Development Report for purposes of Allergan's evaluation of the Initial Development Activities and the Option or extension thereof. Exicure shall make its relevant personnel reasonably available to discuss the contents of such Initial Development Report with Allergan upon Allergan's request.

2.6.3. If Allergan makes an Extension Exercise for a Collaboration Program, promptly following the completion of the IND-Enabling Activities under such Collaboration Program, Exicure shall prepare and deliver to Allergan an IND-Enabling Activities Data Package for purposes of Allergan's evaluation of the IND-Enabling Activities and the Option. Exicure shall make its relevant personnel reasonably available to discuss the contents of such IND-Enabling Activities Data Package with Allergan upon Allergan's request.

2.6.4. The Development Plans and all reports under this Section 2.6, including the Initial Development Report and the IND-Enabling Activities Data Package, to the extent such Development Plan or report specifically relates to the Compounds or Licensed Products, shall, on a Collaboration Program-by-Collaboration Program basis following Allergan's exercise of its Option with respect to the applicable Collaboration Program, be deemed the Confidential Information of Allergan and (in each case) shall be subject to the confidentiality provisions contained in this Agreement.

2.7. Research Term. On a Collaboration Program-by-Collaboration Program basis, the term for the conduct of activities under the Development Plan shall be the period commencing on the Effective Date and terminating upon the earliest of (a) the License Effective Date with respect to the Collaboration Program, (b) the date such Collaboration Program becomes an Abandoned Program and (c) the fifth anniversary of the Effective Date, *provided* that, if, as of the fifth anniversary of the Effective Date, (i) the Option Exercise Period is still in effect for the Collaboration Program and (ii) Exicure has not delivered a complete Initial Development Report or, if Allergan makes an Extension Exercise for a Collaboration Program, a complete IND-Enabling Activities Data Package for such Collaboration Program, as determined by the JDC, then the Research Term for such Collaboration Program shall automatically be extended by one-year increments until such obligation is satisfied, but in no event past the seventh anniversary of the Effective Date (the "**Research Term**").

2.8. Program Abandonment. On a Collaboration Program-by-Collaboration Program basis, Allergan may choose to abandon a Collaboration Program and forego its Option with respect to such Collaboration Program at any time prior to the expiration of the applicable Option Exercise Period by providing written notice to Exicure of such abandonment, in which case such Collaboration Program will be deemed to be an Abandoned Program. For the avoidance of doubt, and notwithstanding anything to the contrary, Exicure shall have no further obligations under this Agreement with respect to any Abandoned Program and Allergan's Option with respect to the applicable Collaboration Program will expire, in each case, with effect from the date the applicable Collaboration Program becomes an Abandoned Program.

ARTICLE 3
OPTIONS; LICENSE GRANTS

3.1. Options; Option Extensions.

3.1.1. On a Collaboration Program-by-Collaboration Program basis, Exicure hereby grants to Allergan and its Affiliates an exclusive right and option to obtain the license set forth in Section 3.3 (the "**Option**"). Subject to Section 2.8, the Option will be available to Allergan and its Affiliates at any time starting from the Effective Date until the expiration of the applicable Option Exercise Period.

3.1.2. On a Collaboration Program-by-Collaboration Program basis, at any time during the Initial Option Exercise Period, Allergan may elect to either (a) exercise the Option as set forth in Section 3.1.3 or (b) extend the Option Exercise Period by (i) providing written notice to Exicure thereof (the "**Extension Exercise Notice**"), and (ii) paying to Exicure the Option

Extension Payment set forth in Section 6.2 (collectively, the "**Extension Exercise**"). If Allergan makes an Extension Exercise for a Collaboration Program, (x) Exicure shall perform the IND-Enabling Activities set forth in the Development Plan updated pursuant to Section 2.1.3 for such Collaboration Program and, promptly following completion of such activities, shall deliver to Allergan a complete IND-Enabling Activities Data Package, and (y) the Extended Option Exercise Period shall take effect.

3.1.3. On a Collaboration Program-by-Collaboration Program basis, if, during the applicable Option Exercise Period, Allergan or its designated Affiliate (a) notifies Exicure in writing that it wishes to exercise the Option (the "**Option Exercise Notice**"), and (b) within ***** Business Days after delivery of the Option Exercise Notice, pays to Exicure the applicable Option Exercise Payment set forth in Section 6.3 (collectively, the "**Option Exercise**"), Exicure will, and hereby does, grant to Allergan or its designated Affiliate the license set forth in Section 3.3 with respect to Licensed Products and Compound under such Collaboration Program; *provided* that, if Allergan determines that an HSR Filing is required to be made under the HSR Act or that a filing is required or advisable under the antitrust or merger control Laws of any foreign jurisdictions ("**Foreign Jurisdictions**") as a result of Allergan's exercise of an Option and notifies Exicure of such determination prior to the expiration of the applicable Option Exercise Period, the Parties will promptly file an HSR Filing and prepare and file with the appropriate Governmental Authority of any Foreign Jurisdictions a comparable notification form required by the antitrust or merger control Laws of such jurisdictions in accordance with Section 3.2.1, and Allergan's election to exercise the applicable Option will not be effective (and Allergan will not be obligated to make any payment under Section 6.3) until the Antitrust Clearance Date.

3.1.4. Notwithstanding anything to the contrary in this Agreement, if an Initial Development Report delivered by Exicure pursuant to Section 2.6.2 or an IND-Enabling Activities Data Package delivered by Exicure pursuant to Section 2.6.3 is incomplete (in that it doesn't include the information required by determination of the JDC to be included in such Initial Development Report or IND-Enabling Activities Data Package), Allergan may notify Exicure of the incomplete status of such Initial Development Report or IND-Enabling Activities Data Package in writing, identifying any items that, in Allergan's reasonable determination made in good faith, were required under the applicable Development Plan to have been included in such Initial Development Report or IND-Enabling Activities Data Package but were not included therein. Allergan shall provide any such notice within ***** days after receipt of such Initial Development Report or ***** days after receipt of such IND-Enabling Activities Data Package, as applicable, and such Initial Development Report or IND-Enabling Activities Data Package, as applicable, shall be deemed approved if Exicure does not receive such a notice within such *****- or *****day period, as applicable. Following receipt of such notice, Exicure will promptly deliver to Allergan the additional information requested by Allergan required to complete such Initial Development Report or IND-Enabling Activities Data Package. For clarity, delivery of such an incomplete Initial Development Report or IND-Enabling Activities Data Package shall not trigger the *****-day period after which the Option Exercise Period would end as described in Section 1.68 or Section 1.105, as applicable, but such *****-day period shall thereafter be triggered on the date of Allergan's receipt of the additional information requested by Allergan required to complete such Initial Development Report or IND-Enabling Activities Data Package. In addition, Allergan may request in writing at any time

during the Option Exercise Period any additional information in the possession or control of Exicure that Allergan reasonably determines is necessary or useful to assist Allergan in deciding whether to exercise or extend an Option, and Exicure shall promptly deliver such information to Allergan following receipt of such written request.

3.1.5. If by the end of the Initial Option Exercise Period for a Collaboration Program (or if Allergan makes an Extension Exercise for such Collaboration Program, the Extended Option Exercise Period for such Collaboration Program), Allergan has not made the Option Exercise for the applicable Collaboration Program, then such Collaboration Program shall be deemed to be an Abandoned Program.

3.2. Antitrust Compliance.

3.2.1. If Allergan notifies Exicure pursuant to Section 3.1.3 that an HSR Filing or other filing with any Governmental Authority in any Foreign Jurisdictions is required or advisable for Allergan to exercise an Option, each of Allergan and Exicure will, (a) within ***** days after such notice from Allergan (or such later time as may be agreed to in writing by the Parties), file with the FTC and the DOJ, any HSR Filing required with respect to the transactions contemplated hereby, and (b) as promptly as practicable and advisable after such notice from Allergan, prepare and file with the appropriate Governmental Authority of any Foreign Jurisdictions a comparable notification form ("**Foreign Filing**") required by the antitrust or merger control Laws of such Foreign Jurisdictions. The Parties will cooperate with one another to the extent necessary in the preparation of any such HSR Filing or Foreign Filing. Each Party will be responsible for its own costs and expenses (other than filing fees, which Allergan will pay) associated with any HSR Filing or Foreign Filing.

3.2.2. In furtherance of obtaining clearance for an HSR Filing or Foreign Filing filed pursuant to this Section 3.2, Exicure and Allergan will use their respective commercially reasonable efforts to resolve as promptly as practicable any objections that may be asserted with respect to this Agreement or the transactions contemplated by this Agreement under any antitrust, competition, merger control or trade regulatory Law. In connection with such clearance from the FTC, the DOJ or any other Governmental Authority, neither Party, nor its Affiliates will be required to (a) sell, divest (including through license or a reversion of licensed or assigned rights), hold separate, transfer or dispose of any assets, operations, rights, product lines, businesses or interest therein of such Party or any of its Affiliates (or consent to any of the foregoing actions); (b) otherwise take any action that limits such Party's freedom of action with respect to any assets, operations, rights, product lines, businesses or interest therein of such Party or any of its Affiliates; or (c) litigate or otherwise formally oppose any determination (whether judicial or administrative in nature) by a Governmental Authority seeking to impose any of the restrictions referenced in clause (a) or (b) above.

3.2.3. If the Antitrust Clearance Date has not occurred within ***** days after Allergan notifies Exicure pursuant to Section 3.1.3 that an HSR Filing or Foreign Filing is required to exercise an Option under this Agreement, Allergan may withdraw its HSR Filing or Foreign Filing upon written notice to Exicure. In such case, the applicable Option will be deemed not to

have been exercised under Section 3.1.3 and, for the avoidance of doubt, the applicable Collaboration Program will be deemed to be an Abandoned Program.

3.3. License Grant. On a Collaboration Program-by-Collaboration Program basis, effective as of the License Effective Date, Exicure, on behalf of itself and its Affiliates, shall grant and does hereby grant to Allergan, and Allergan hereby accepts, an exclusive (including with regard to Exicure and its Affiliates), royalty-bearing, sublicensable (subject to Section 3.4), nontransferable (except as set forth in Section 12.1), worldwide license under the Exicure Technology and Exicure's interest in the Joint Collaboration Technology, to Exploit the Compounds and the corresponding Licensed Products in the Field in the Territory. Notwithstanding anything to the contrary, the foregoing license does not apply to any Other APIs.

3.4. Sublicenses. Allergan shall have the right, in its sole discretion, to grant sublicenses, in whole or in part, under the license granted in Section 3.3 to its Affiliates or Third Parties; *provided, however*, that for each sublicense granted to a Third Party other than a subcontractor of Allergan, Allergan (a) shall promptly notify Exicure of the granting of each sublicense, (b) shall provide to Exicure a written copy of each Sublicense Agreement (which copy may be reasonably redacted as necessary to protect confidential or commercially sensitive information) and (c) shall ensure that the terms of any Sublicense Agreement (i) are subject to and subordinate to this Agreement and (ii) without limiting the foregoing, contain provisions requiring that the Sublicensee (A) comply with the confidentiality and non-use provisions of Article 7 with respect to Exicure's Confidential Information and (B) submit applicable sales or other reports to Allergan to the extent necessary or relevant to the reports required to be made or records required to be maintained under this Agreement. Notwithstanding any sublicense, Allergan shall remain responsible for its obligations under, and compliance with the terms of, this Agreement.

3.5. Exclusivity.

3.5.1. Exicure Exclusivity.

(a) Except with respect to activities under this Agreement (including as provided under the Development Plan), during the period starting on the Effective Date and ending on the later of (i) the expiration of the Research Term of both Collaboration Programs or (ii) the date upon which, with respect to each Collaboration Program, either (x) the License Effective Date has occurred or (y) the Option Exercise Period for such Collaboration Program has terminated without Option Exercise, Exicure shall not, and shall cause its Affiliates not to, either itself, or together with or through enabling (including through a grant of rights to) any Third Party, Develop, Manufacture or Commercialize any *****.

(b) Except with respect to activities under this Agreement (including as provided under the Development Plan), on a Collaboration Program-by-Collaboration Program basis (excluding any Abandoned Program), during the period starting on the Effective Date and ending on the later of (i) the expiration of the Research Term for such Collaboration Program or (ii) the

date upon which, with respect to such Collaboration Program, either (x) the License Effective Date has occurred or (y) the Option Exercise Period for such Collaboration Program has terminated without Option Exercise, Exicure shall not, and shall cause its Affiliates not to, either itself, or together with or through enabling (including through a grant of rights to) any Third Party, Develop, Manufacture or Commercialize any *****.

(c) In the event of an Option Exercise by Allergan for a Collaboration Program, during the period starting on the License Effective Date and ending on the expiration or earlier termination of this Agreement with respect to such Collaboration Program or the Licensed Product(s) arising therefrom, Exicure shall not, and shall cause its Affiliates not to, either itself, or together with or through enabling (including through a grant of rights to) any Third Party, Develop, Manufacture or Commercialize any *****.

3.5.2. Allergan Exclusivity. On a Collaboration Program-by-Collaboration Program basis, except with respect to activities under this Agreement, during the period starting on the Effective Date and ending on the earliest of *****, Allergan shall not, and shall cause its Affiliates not to, either itself or together with or through enabling (including through a grant of rights to) any Third Party, Develop, Manufacture or Commercialize any *****.

3.5.3. Exceptions.

(a) Notwithstanding anything to the contrary in this Agreement, the identification of a Competing Product by the relevant restricted Party (the "**Restricted Party**") or its Affiliates in the course of discovery or research activities that are not directed to the identification of such a Competing Product shall not be a violation of Section 3.5.1(a), 3.5.1(b), 3.5.1(c) or 3.5.2, as applicable; *provided* that no further Development (including any further research other than confirmatory experiments) is conducted with respect to such Competing Product following such identification during the periods set forth in Section 3.5.1(a), 3.5.1(b), 3.5.1(c) or 3.5.2, as applicable.

(b) Notwithstanding anything to the contrary in this Agreement, the restrictions placed on a Restricted Party and its Affiliates in Sections 3.5.1 and 3.5.2, respectively, will not apply to the Development, Manufacture or Commercialization of a Competing Product by any Acquiring Entity, *provided* that such Development, Manufacture or Commercialization occurs without (i) any access to any Confidential Information of the other Party, Exicure Know-How or Collaboration Know-How (in each case, to the extent not in the public domain), or (ii) rights to any Exicure Patents or Collaboration Patents for such purpose (but, in each case ((i) and (ii)), with respect to any Acquiring Entity of Exicure, excluding any Exicure Know-How or Exicure Patents to the extent relating to the Exicure Platform and not specifically relating to a Compound or Licensed Product); and *provided*, *further*, that a "firewall" of reasonable safeguards is put in place by the Restricted Party

between individuals with access to any such Confidential Information, Exicure Know-How or Joint Collaboration Know-How, on the one hand, and the personnel responsible for the Development, Manufacture or Commercialization of such Competing Product, on the other hand.

(c) Notwithstanding anything to the contrary in this Agreement, the restrictions placed on a Restricted Party and its Affiliates in Sections 3.5.1 and 3.5.2, respectively, will not apply to a Restricted Party or any of its Affiliates with respect to an acquisition by such Restricted Party or its Affiliates, through an equity or asset purchase, merger, consolidation, license or other transaction (other than a Change of Control), in each case, whether in a single transaction or a series of related transactions, of a Competing Product or a Third Party that is Developing, Manufacturing or Commercializing a Competing Product (other than in a transaction or series of transactions where such Competing Product is the only product acquired or such Competing Product otherwise constitutes a substantial portion of the value of such transaction or series of transactions), *provided* that the Development, Manufacture or Commercialization of such Competing Product occurs without any use of, reliance on or reference to the Confidential Information of the other Party, Exicure Know-How or Collaboration Know-How (to the extent not in the public domain), or rights to any Exicure Patents or Collaboration Patents for development purposes; and *provided*, *further*, that a "firewall" of reasonable safeguards is put in place by the Restricted Party between individuals with access to any such Confidential Information, Exicure Know-How or Joint Collaboration Know-How, on the one hand, and the personnel responsible for the Development, Manufacture or Commercialization of such Competing Product, on the other hand.

(d) Notwithstanding anything to the contrary in this Section 3.5.3, if a Restricted Party or any of its Affiliates acquires, through an equity or asset purchase, merger, consolidation, license or other transaction (other than a Change of Control), in a transaction or series of transactions, a Competing Product or a Third Party that is Developing, Manufacturing or Commercializing a Competing Product, where such Competing Product is the only product acquired or such product otherwise constitutes a substantial portion of the value of such transaction or series of transactions, then, within six months after the closing of such acquisition, such Restricted Party or its Affiliate, as the case may be, shall divest all rights (other than the right to merely receive payments based on the Development, Manufacture or Commercialization of such Competing Product) or cease to Develop, Manufacture or Commercialize, as applicable, such Competing Product for the duration of the relevant restriction on such Restricted Party as set forth in Section 3.5.1 or 3.5.2, as applicable. Such Restricted Party shall not be in violation of Section 3.5.1 or Section 3.5.2, as applicable, *provided* that such Restricted Party or its Affiliate complies with its divestment or cessation

obligations as set forth in the preceding sentence; and *provided*, *further*, that, until the time of such divestment or cessation, such Development, Manufacture or Commercialization occurs without any use of, reliance on or reference to any Confidential Information of the other Party, Exicure Know-How or Collaboration Know-How, or rights to any Exicure Patents or Collaboration Patents for development purposes; and a "firewall" of reasonable safeguards is put in place by the Restricted Party between individuals with access to the other Party's Confidential Information, Exicure Know-How or Joint Collaboration Know-How, on the one hand, and the personnel responsible for the Development, Manufacture or Commercialization of such Competing Product, on the other hand.

3.5.4. Each Party acknowledges and agrees that (a) this Section 3.5 has been negotiated by the Parties, (b) the geographical and time limitations on activities set forth in this Section 3.5 are reasonable, valid, and necessary in light of the Parties' circumstances and necessary for the adequate protection of the business of the Compound and the Licensed Products, and (c) the other Party would not have entered into this Agreement without the protection afforded it by this Section 3.5. If, notwithstanding the foregoing, a court of competent jurisdiction determines that the restrictions set forth in this Section 3.5 are too broad or otherwise unreasonable under applicable Law, including with respect to duration, geographic scope, or space, the court is hereby requested and authorized by the Parties to revise this Section 3.5 to include the maximum restrictions allowable under applicable Law.

3.6. *****

3.7. Additional In-Licensed Intellectual Property.

3.7.1. During the Term, if Exicure or any of its Affiliates (a) enters into any ***** or (b) enters into any *****, then, in each case ((a) and (b)), Exicure will use commercially reasonable efforts to ensure that it or its Affiliate obtains Control of such Third Party IP under such agreement. If Exicure or its Affiliate obtains Control of such Third Party IP, Exicure will provide written notice to Allergan of such Third Party IP, together with a true, complete and correct copy of the applicable Third Party agreement, within ***** Business Days after execution thereof; *provided* that Exicure may redact financial and confidential portions of such agreement and any other terms of such agreement that could not reasonably be expected to affect any of Allergan's rights or obligations under this Agreement; and, upon Allergan's written notice to Exicure, such agreement will automatically be deemed an Exicure Third Party Agreement under this Agreement and such Third Party IP shall automatically be included in the Exicure Technology. Exicure will promptly notify Allergan of any Third Party IP to which it is granted rights by a Third Party for which it is unable to obtain Control for the purposes of this Agreement. If Exicure is unable to obtain Control of any such Third Party IP, then Exicure shall use commercially reasonable efforts to obtain either (1) a non-exclusive license to such Third Party IP with respect to the Compounds and Licensed Products in the Field in the Territory; or (2) a license that does not include in its scope the Exploitation of Compounds and Licensed Products in the Field in the Territory (the "**Excluded Scope**") such that Allergan or its Affiliates may obtain a license to the Excluded Scope directly. Notwithstanding the

foregoing, for *****, then (x) Exicure or its Affiliates shall promptly provide written notice to Allergan, and (y) Exicure or its Affiliates shall use commercially reasonable efforts to obtain Control of such Third Party IP, or, if it is unable to do so, to amend such agreement so that (I) with respect to the Excluded Scope, it only receives a non-exclusive license under such Third Party IP, or (II) it receives a license under such Third Party IP that does not include the Excluded Scope such that, in either case ((I) or (II)), Allergan or its Affiliates may obtain a license to the Excluded Scope directly. If Exicure or its Affiliate obtains Control of such Third Party IP, Exicure will provide written notice to Allergan of such Third Party IP, together with a true, complete and correct copy of the applicable Third Party agreement, within ***** Business Days after the later of (A) the date that Exicure determines (including through notice by Allergan) that the Patents or Know-How under such Third Party agreement include Third Party IP and (B) the date that Exicure or its Affiliate obtains Control of such Third Party IP; *provided* that Exicure may redact financial and confidential portions of such agreement and any other terms of such agreement that could not reasonably be expected to affect any of Allergan's rights or obligations under this Agreement; and, upon Allergan's written notice to Exicure, such agreement will automatically be deemed an Exicure Third Party Agreement under this Agreement and such Third Party IP shall automatically be included in the Exicure Technology effective retroactively to the date that Exicure or its Affiliate obtained Control of such Third Party IP. Notwithstanding the foregoing, with respect to any Third Party agreement of any Acquiring Entity that would otherwise be subject to this Section 3.7.1, if, on an agreement-by-agreement basis, the Third Party Patents or Know-How to which such Acquiring Entity receives a license, option or other similar rights under such agreement are deemed not to be Controlled by Exicure pursuant to Section 1.41, then the provisions of this Section 3.7.1 shall not apply with respect to such agreement. References to a "license, option or similar rights" in this Section 3.7.1 shall not include, for the avoidance of doubt, the grant of a right of reference.

3.7.2. Without limiting the provisions of Section 3.7.1, and subject to Section 3.7.3, Exicure will be responsible for obtaining and maintaining rights (whether through acquisition or license) to use any and all Patents and Know-How of any Third Party that would, absent such right, be infringed, misappropriated, or otherwise violated by the practice of the Exicure Platform in accordance with this Agreement ("**Blocking Platform IP**"). Upon Allergan's written notice identifying any such Blocking Platform IP, or promptly upon Exicure otherwise becoming aware of any such Blocking Platform IP, Exicure will, subject to Section 3.7.3, use diligent efforts to promptly obtain rights to such Blocking Platform IP. Exicure will ensure that any such rights acquired under a license are Controlled by Exicure, and such Blocking Platform IP shall automatically be included in the Exicure Technology to the extent it otherwise meets the definition thereof (including any of the sub-definitions thereof). Exicure will be solely responsible for all payment obligations (including any royalty or other obligations that relate to the Exicure Technology) under any agreement entered into during the Term between Exicure and any Third Party with respect to any Blocking Platform IP.

3.7.3. If a Party disputes whether certain Patents or Know-How would, absent obtaining rights to use such Patents or Know-How, be infringed, misappropriated, or otherwise violated by the practice of the Exicure Platform, then either Party may refer such matter for resolution to an independent Third Party expert agreed upon by the Parties. Such independent Third Party expert will be an attorney who has practiced United States patent law for at least 10 years (or who

has such other similar credentials as agreed by the Parties) and, unless otherwise agreed in writing by the Parties, must not be a current or former employee, contractor, agent, or consultant of either Party or its Affiliates. The Party bringing a dispute pursuant to this Section 3.7.3 will promptly engage such expert and the Parties will share the out-of-pocket costs incurred in connection with the engagement of such expert equally. Within 30 days after the engagement of such expert by the disputing Party, such expert will deliver its written decision to the Parties (including a detailed report as to such expert's rationale for such decision), and such decision will be binding on the Parties.

3.7.4. Notwithstanding any provision to the contrary set forth in this Agreement, at any time during the Term (including during the pendency of any dispute under Section 3.7.3), if Exicure does not obtain rights to any Blocking Platform IP within ***** days of becoming aware of such Blocking Platform IP, Allergan will have the right to obtain rights to such Blocking Platform IP from the applicable Third Party, and, if the Parties agree or the applicable Third Party expert determines pursuant to Section 3.7.3 that the applicable Patents or Know-How constitute Blocking Platform IP, then Allergan will be entitled to offset *****% of the amounts payable by Allergan to such Third Party in respect of such Blocking Platform IP against amounts payable to Exicure under this Agreement in accordance with Section 6.8. Notwithstanding anything to the contrary herein, the Parties acknowledge and agree that the Patents and Know-How licensed under the Northwestern Agreements would, absent the rights granted pursuant to the applicable Northwestern Agreement, constitute Blocking Platform IP and, if Allergan enters into a direct license with Northwestern following the termination of either Northwestern Agreement, Allergan shall be entitled to a *****% offset of the amounts payable under such direct license as set forth in this Section 3.7.4 and Section 6.8.

3.8. No Implied Rights. Neither Party grants any right or license to the other Party under any Know-How, Patent or other intellectual property rights of such Party except as expressly granted in this Agreement. All rights not expressly granted by a Party under this Agreement are reserved to such Party. For the sake of clarity, in no event shall anything in this Agreement, including Section 3.3, be construed to include any grant of any right, license or other authorization by an Acquiring Entity to any Party to this Agreement to use any Acquiring Entity Intellectual Property or, except as expressly set forth in Section 3.5, to limit any grant of any right, license or other authorization by an Acquiring Entity to any Third Party to use any Acquiring Entity Intellectual Property to research, develop, commercialize or co-promote compounds or products.

3.9. Disclosure of Know-How.

3.9.1. Promptly following Allergan's exercise of an Option, and thereafter at least once per Calendar Quarter or otherwise upon Allergan's request, Exicure shall, and shall cause its Affiliates to, without additional compensation, disclose and make available to Allergan, in electronic form or hard-copy, as Allergan may reasonably request, copies of the physical embodiments of the Exicure Know-How and Joint Collaboration Know-How, including all clinical and non-clinical data, summaries of data, research, analyses and other information, in each case, relating to the applicable Compounds or Licensed Products, and any other information claimed or covered by any Exicure Patent or Joint Collaboration Patent or otherwise relating to any of the applicable Compound

or Licensed Product or the Exploitation thereof, in each case that are in Exicure's possession or control as of the date of Allergan's request.

3.9.2. Exicure, at its own cost and expense, shall provide Allergan with all reasonable assistance required in order to transfer to Allergan the applicable Exicure Know-How, Joint Collaboration Know-How, and other information required to be produced pursuant to Section 3.9.1 above, in each case, in a timely manner, *provided* that Allergan will reimburse Exicure for all reasonable out-of-pocket expenses incurred by Exicure and its Affiliates in providing such assistance. Without limiting the foregoing, Exicure shall make available to Allergan, including at Allergan's facilities, those of Exicure's representatives as Allergan may reasonably request for purposes of transferring the Exicure Know-How, Joint Collaboration Know-How, or other information to Allergan or for purposes of Allergan acquiring expertise on the practical application of such information or assisting on issues arising during such Exploitation and, upon Allergan's reasonable request, shall reasonably assist Allergan with respect to its Exploitation of the Licensed Products under this Agreement.

3.10. Northwestern Agreements. The Parties acknowledge and agree that the rights and obligations under this Agreement are subject to certain terms of the Northwestern Agreements, as modified by the Northwestern Side Agreement, as set forth on Schedule 3.10. Allergan agrees to be bound by the terms and conditions of the provisions set forth on Schedule 3.10, as applicable, with respect to sublicenses under such Northwestern Agreements granted by Exicure to Allergan under Section 3.3, and Northwestern is hereby named an intended third party beneficiary solely with regard to the obligations of Allergan under this Section 3.10, without imposition of obligation or liability on the part of Northwestern to Allergan.

ARTICLE 4
GOVERNANCE

4.1. Establishment of Joint Development Committee. Within ***** days of the Effective Date, the Parties shall establish a Joint Development Committee (the "**JDC**") consisting of an appropriate number of representatives as may be agreed upon by the Parties, with an equal number of representatives designated by each Party. The initial members of the JDC will be nominated by the Parties promptly following the Effective Date. Such representatives shall be individuals suitable in seniority and experience and having sufficient authority to make decisions of the JDC with respect to matters within the scope of the JDC's responsibilities. The JDC shall operate in accordance with the provisions of this Article 4, and shall have no authority to alter, amend or waive the terms and conditions of this Agreement, including any payment conditions or terms, periods for performance, or obligations of the Parties. A Party may change one or more of its representatives serving on the JDC at any time upon written notice to the other Party, *provided* that such replacement is of comparable authority and scope of functional responsibility within that Party's organization as the person he or she is replacing. At its meetings, the JDC shall discuss the matters described below and such other matters as are reasonably requested by either Party. The JDC shall remain in effect, on a Collaboration Program-by-Collaboration Program basis, until the earliest of (a) such Collaboration Program becoming an Abandoned Program, (b) the expiration of the applicable Option Exercise Period with respect to such Collaboration Program, if Allergan has not exercised the

applicable Option, or (c) the exercise of the applicable Option with respect to such Collaboration Program. Following the termination of the JDC, if Allergan has exercised the Option with respect to a Collaboration Program, Allergan shall have sole decision-making authority, in its sole discretion, over all matters concerning such Collaboration Program or the Licensed Products arising out of or from such Collaboration Program, and any information regarding such Collaboration Program will be exchanged directly between the Parties.

4.2. Responsibilities of JDC. The JDC shall perform the following functions:

4.2.1. establish the Candidate Criteria with respect to each Collaboration Program, and review and update such Candidate Criteria as necessary from time to time;

4.2.2. periodically review each Development Plan, and discuss and approve any amendments to such Development Plan (including any such amendment proposed by either Party under Section 2.1.3 to the IND-Enabling Activities set forth in such Development Plan based on the results of the Initial Development Activities, including identification of the Compound(s) with respect to which such IND-Enabling Activities would be performed if Allergan makes an Extension Exercise);

4.2.3. determine the information, data and results required to be included in the Initial Development Report and the IND-Enabling Data Package, respectively, for each Collaboration Program;

4.2.4. facilitate the exchange of information regarding activities conducted under the Development Plans and the results of such activities, including reviewing and discussing reports provided by Exicure under Section 2.6, and providing guidance with respect to such activities;

4.2.5. determine whether any Compound for which Exicure has conducted Initial Development Activities satisfies the Candidate Criteria for the applicable Collaboration Program;

4.2.6. determine, by reference to the applicable requirements determined by the JDC pursuant to Section 4.2.3, whether each Initial Development Report or IND-Enabling Activities Data Package is complete;

4.2.7. consult regarding the possible substitution of a Substitute Target for a Program Target upon Allergan's request pursuant to Section 2.2;

4.2.8. facilitate the exchange of information and Materials for purposes of the conduct of any Allergan-Conducted Activities pursuant to Section 2.3;

4.2.9. review, discuss and attempt to resolve any technical or scientific issues arising in the conduct of the activities under the Development Plans;

4.2.10. in the case of an Extension Exercise with respect to a Collaboration Program, review, comment on and approve the initial IND for a Compound under such Collaboration Program for submission by Allergan if Allergan exercises the Option; and

4.2.11. perform such other functions as are specifically designated for the JDC in this Agreement or that the Parties mutually agree in writing to refer to the JDC.

4.3. Co-Chairs. Each Party shall designate one of its representatives on the JDC to co-chair the meetings for the JDC (each, a "**Co-Chair**"). The Co-Chairs shall, through and with the assistance of the Alliance Managers, coordinate and prepare the agenda for, and ensure the orderly conduct of, the meetings of the JDC. The Co-Chairs shall, through and with the assistance of the Alliance Managers, solicit agenda items from the JDC members and provide an agenda, along with appropriate information for such agenda, reasonably in advance of any meeting. Such agenda shall include all items requested by either Co-Chair for inclusion therein. In the event the Co-Chairs or another JDC member from either Party is unable to attend or participate in a meeting of the JDC, the Party whose Co-Chair or member is unable to attend may designate a substitute co-chair or other representative for the meeting.

4.4. Meetings. The JDC shall meet on a quarterly basis or as otherwise mutually agreed by the Parties. JDC meetings may be conducted by telephone, videoconference or in person. Any in-person JDC meetings shall be held on an alternating basis between Exicure's and Allergan's facilities, unless otherwise agreed by the Parties. Each Party shall be responsible for the cost of such Party's own personnel and for its own expenses in attending such meetings and carrying out the other activities contemplated under this Article 4. As appropriate, the JDC may invite a reasonable number of non-voting employees, consultants and scientific advisors to attend its meetings as non-voting observers, *provided* that such invitees are bound by confidentiality obligations at least as stringent as the provisions set forth herein. Each Party may also call for special meetings of the JDC to discuss particular matters requested by such Party. The Alliance Managers shall provide the members of the JDC with no less than ***** Business Days' notice of each regularly scheduled meeting and, to the extent reasonably practicable under the circumstances, no less than ***** Business Days' notice of any special meetings called by either Party.

4.5. Minutes. The Co-Chairs of the JDC (or their respective designees) shall keep the minutes of the JDC meetings on a rotating basis and shall send such minutes to all members of the JDC by e-mail for review and approval within ***** days after each such meeting. The JDC shall formally accept the minutes of the previous meeting at or before the next meeting of the JDC. Minutes will be deemed approved unless any member of the JDC objects to the accuracy of such minutes by providing written notice to the other members of the JDC prior to the next meeting of the JDC. Minutes shall list action items and shall designate any issues that need to be resolved by the JDC or applicable resolution process. In the event of any objection to the minutes that is not resolved by mutual agreement of the Parties, such minutes will be amended to reflect such unresolved dispute.

4.6. JDC Decisions.

4.6.1. All decisions of the JDC shall be made by unanimous vote, with each Party having one vote. In order to make any decision, the JDC must have present (in person or via telephone or videoconference) and voting at least one representative of each Party.

4.6.2. Subject to the terms of this Agreement, if the JDC cannot resolve a matter described in Section 4.2 within ***** days, or such shorter time as may be determined by the Parties, after it begins discussing any such matter (a "**Committee Deadlock**"), then the JDC shall escalate such Committee Deadlock to the Senior Officers for resolution by consensus. If, following consideration by the Senior Officers for a period of up to ***** days from the date of escalation of such Committee Deadlock there is still no consensus, then:

*****

4.7. Alliance Managers. Each Party shall designate an individual to serve as the main point of contact for such Party to exchange information, facilitate communication and coordinate the Parties' activities under this Agreement (each, an "**Alliance Manager**"). The Alliance Managers shall attend meetings (or designate an appropriate representative to attend meetings on the Alliance Manager's behalf) between the Parties, including JDC meetings. Each Party may change its designated Alliance Manager from time to time upon written notice to the other Party.

4.8. Working Groups. Within ***** days of the Effective Date, the Parties will establish a joint working group ("**JWG**") to oversee and facilitate the execution of the activities under each Development Plan. The JWG will consist of representatives from each Party with expertise in preclinical pharmacology, safety/toxicology, CMC/manufacturing and other functions as deemed relevant by the Parties. The JWG will meet periodically to review and discuss the progress of the activities under each Development Plan and any issues that have arisen in the course of such activities. The JWG will report to the JDC regarding the outcome of any such discussions. For clarity, the JWG may advise the JDC regarding decisions within the JDC's purview, but will have no independent decision-making authority.

ARTICLE 5
DEVELOPMENT, COMMERCIALIZATION AND MANUFACTURE

5.1. Development of Licensed Products.

5.1.1. Development Diligence Obligations. Following Option Exercise for a Collaboration Program, Allergan shall use Commercially Reasonable Efforts, itself or through its Affiliates or Sublicensees, to Develop and seek and obtain Regulatory Approval for *****.

5.1.2. Development Responsibilities. Following Option Exercise for a Collaboration Program, subject to Section 5.1.1, Allergan shall have the sole right and responsibility, in its sole discretion and at its sole cost and expense, to Develop the Compounds and Licensed Products arising out of or from such Collaboration Program, including all non-clinical, clinical and regulatory activities with respect thereto.

5.1.3. Reports. Within ***** days following Option Exercise for a Collaboration Program, Allergan shall provide Exicure with a high-level development plan, in writing, summarizing its intended Development of the Licensed Products arising out of or from such Collaboration Program. Thereafter, on an annual basis until the First Commercial Sale of the first Licensed Product arising out such Collaboration Program, Allergan shall provide Exicure with a

high-level written development report regarding the status and progress of the Licensed Products arising out of or from such Collaboration Program. In addition, at least ***** months prior to the anticipated First Commercial Sale of the first Licensed Product arising out such Collaboration Program in any country in the Territory, and on an annual basis after such First Commercial Sale, within ***** days after such First Commercial Sale and each anniversary thereof, Allergan shall provide Exicure with a high-level commercialization plan setting forth the anticipated dates of First Commercial Sale and annual forecast of Net Sales of the Licensed Products in each of the United States, the Major European Countries and Japan. Allergan shall make its relevant personnel reasonably available to discuss the contents of any such report with Exicure upon Exicure's request.

5.1.4. Regulatory Affairs.

(a) Following Option Exercise for a Collaboration Program, Allergan shall own, and be solely responsible, at its sole expense, for preparing, seeking, submitting and maintaining, all Regulatory Documentation for each Licensed Product arising out of or from such Collaboration Program, and shall, in its sole discretion, determine where such regulatory filings shall be submitted and the content thereof. All Regulatory Documentation relating to the Licensed Products shall be owned by and shall be the sole property and held in the name of Allergan or its designated Affiliate, Sublicensee or designee. Allergan shall have the sole right to conduct and control all interactions and communications with any Governmental Authority relating to any Licensed Product, or the Exploitation thereof.

(b) If, during the Research Term or at any time that Exicure is performing activities related to a Collaboration Program following Option Exercise with respect thereto, any Governmental Authority conducts, or gives notice to Exicure of its intent to conduct, an inspection or audit at any investigational site or any Exicure office or facility or to take any other regulatory action, or otherwise makes an inquiry, in each case with respect to or involving or that would otherwise reasonably be expected to adversely affect any Licensed Product or the conduct of a Development Plan, Exicure shall, unless prohibited from doing so by applicable Law, notify Allergan within three Business Days after Exicure first learns of such governmental inspection or audit, and, where reasonably practicable, consult with Allergan in advance of implementing, and permit Allergan to comment on, any proposed plan of action for responding to or complying with any associated demand or request of such Governmental Authority. Wherever possible, and to the extent permitted under applicable Law, Exicure shall provide Allergan with the opportunity (i) to have a representative present at any such governmental inspection or audit to the extent relating to a Licensed Product and (ii) to review in advance and comment on any communications or submissions proposed to be made by Exicure to any Regulatory Authority in relation to any such inquiry, inspection or audit. Exicure shall not unreasonably reject any comments provided by Allergan under this Section 5.1.4. Following any

such inquiry, inspection or audit, Exicure shall provide to Allergan a copy of any report with respect thereto issued by the applicable Governmental Authority.

5.1.5. Exicure Assistance. Exicure shall reasonably cooperate to assist Allergan, at Allergan's request, in connection with any Development activities with respect to the Licensed Products, including under the preceding Sections 5.1.2 and 5.1.4. Such Development support, which may include support in connection with IND preparation and submission by Allergan and responding to FDA requests related to any submitted IND, shall continue after the Research Term, provided that Allergan will reimburse Exicure for its internal costs at the FTE Rate and for its reasonable out-of-pocket costs, in each case, incurred in connection with providing such assistance as evidenced through written documentation.

5.1.6. Right of Reference. Exicure hereby grants to Allergan and its Affiliates and Sublicensees a "Right of Reference", as that term is defined in 21 C.F.R. § 314.3(b) (or any successor rule or analogous Law recognized outside of the United States), to all Regulatory Documentation Controlled by Exicure or its Affiliates and all information and data therein, solely to apply for, obtain and maintain Regulatory Approval for the Compounds and the corresponding Licensed Products in the Field in the Territory in accordance with this Agreement. If requested by Allergan, Exicure will, and will cause its Affiliates to, provide a signed statement to this effect in accordance with applicable Laws.

5.2. Commercialization of Licensed Products.

5.2.1. Commercialization Diligence Obligations. With respect to each Collaboration Program for which Allergan has exercised its Option, Allergan shall use Commercially Reasonable Efforts to *****.

5.2.2. Commercialization Responsibilities. Following Option Exercise for a Collaboration Program, subject to Section 5.2.1, Allergan shall have the sole right and responsibility, in its sole discretion and at its sole cost and expense, to Commercialize the Compounds and Licensed Products arising out of or from such Collaboration Program.

5.3. Manufacturing of Licensed Products.

5.3.1. Manufacturing Responsibilities. Following Option Exercise for a Collaboration Program, subject to Sections 5.1.1 and 5.2.1, Allergan shall have the sole right and responsibility, in its sole discretion and at its sole cost and expense, to Manufacture and have Manufactured the Compounds and Licensed Products arising out of or from such Collaboration Program.

5.3.2. Third Party Subcontractors. Following Option Exercise for a Collaboration Program, at Allergan's reasonable request, Exicure will use commercially reasonable efforts to facilitate the establishment of a business relationship between Allergan and any Third Party subcontractor that Exicure has engaged in the Manufacture of any Compounds, including by

facilitating introductions with such subcontractors, and assigning to Allergan any agreements with any such Third Party subcontractor that are exclusively related to such Compounds.

ARTICLE 6
FINANCIAL PROVISIONS

6.1. Upfront Payment. Within 10 Business Days of the Effective Date, Allergan shall pay to Exicure a non-refundable, one-time lump sum payment in the amount of Twenty-Five Million USD ($25M).

6.2. Option Extension Payment. Subject to the provisions of Section 3.1, on a Collaboration Program-by-Collaboration Program basis, if Allergan desires to extend the Option for a Collaboration Program through the Extended Option Exercise Period, Allergan shall pay to Exicure a one-time Option extension payment in the amount of Ten Million USD ($10M) (the "**Option Extension Payment**"). Any such Option Extension Payment shall be payable within five Business Days of Allergan's delivery of the applicable Extension Exercise Notice.

6.3. Option Exercise Payment. Subject to the provisions of Section 3.1, on a Collaboration Program-by-Collaboration Program basis, if Allergan desires to exercise the Option for a Collaboration Program, Allergan shall pay to Exicure a one-time Option exercise payment as follows depending on the timing of the applicable Option Exercise (the "**Option Exercise Payment**"):

Timing of Option Exercise	Option Exercise Payment
During Initial Option Exercise Period	$10M
After expiration of Initial Option Exercise Period and during Extended Option Exercise Period	$15M

Any such Option Exercise Payment shall be payable within five Business Days of Allergan's delivery of the applicable Option Exercise Notice.

6.4. Development and Regulatory Milestone Payments.

6.4.1. Subject to the terms of this Agreement, following Option Exercise for a Collaboration Program, Allergan shall make the following payments to Exicure (the "**Development and Regulatory Milestone Payments**") after the achievement by Allergan or any of its Affiliates or Sublicensees of the applicable event set forth below with respect to a Licensed Product (the "**Development and Regulatory Milestone Events**"):

	Development and Regulatory Milestone Event	Development and Regulatory Milestone Payment
1.	*****	*****
2.	*****	*****
3.	*****	*****
4.	*****	*****
5.	*****	*****
6.	*****	*****
7.	*****	*****
8.	*****	*****

* *****.

6.4.2. Each of the Development and Regulatory Milestone Payments is payable only once with respect to the Licensed Products arising out of or from a given Collaboration Program upon the first achievement of such Development and Regulatory Milestone Event by a Licensed Product arising out of or from such Collaboration Program, regardless of the number of Licensed Products arising out of or from such Collaboration Program that achieve the applicable Development and Regulatory Milestone Event; *provided*, *however*, that *****.

6.4.3. Each of Development and Regulatory Milestone Events 1 and 2 as set forth in Section 6.4.1 is intended to be successive. If a Licensed Product is not required to undergo such Development and Regulatory Milestone Event, such skipped Development and Regulatory Milestone Event will be deemed to have been achieved upon the achievement by such Licensed Product of the next successive Development and Regulatory Milestone Event. The Development and Regulatory Milestone Payment corresponding to any such skipped Development and Regulatory Milestone Event that is owed in accordance with the provisions of the foregoing sentence with respect to a given Licensed Product will be due concurrently with the Development and Regulatory Milestone Payment for the next successive Development and Regulatory Milestone Event by such Licensed Product, it being agreed that if a Licensed Product is not required to undergo Development and Regulatory Milestone Event 2, the corresponding Development and Regulatory Milestone Payment will be made upon the first to occur of Development and Regulatory Milestone Events 3, 4 or 5.

6.4.4. Allergan shall deliver to Exicure written notice of the achievement of any Development and Regulatory Milestone Event for which a Development and Regulatory Milestone Payment is payable hereunder, together with the corresponding Development and Regulatory Milestone Payment, within ***** days after achievement of the applicable Development and Regulatory Milestone Event.

6.5. Sales Milestones.

6.5.1. Subject to the terms of this Agreement, following Option Exercise for a Collaboration Program, Allergan shall make the following payments to Exicure (the "**Sales Milestone Payments**") after the achievement of the applicable event set forth below with respect

to aggregate Net Sales of all Licensed Products arising out of or from such Collaboration Program (the "**Sales Milestone Events**"):

Sales Milestone Event	Sales Milestone Payment
First Calendar Year in which aggregate global Net Sales of all Licensed Products arising out of or from the applicable Collaboration Program are greater than or equal to *****	*****
First Calendar Year in which aggregate global Net Sales of all Licensed Products arising out of or from the applicable Collaboration Program are greater than or equal to *****	*****
First Calendar Year in which aggregate global Net Sales of all Licensed Products arising out of or from the applicable Collaboration Program are greater than or equal to *****	*****

6.5.2. Each of the Sales Milestone Payments is payable on a Collaboration Program-by-Collaboration Program basis only once with respect to the Licensed Products arising out of or from a Collaboration Program upon the first achievement of each Sales Milestone Event. If multiple Sales Milestone Events for a Collaboration Program are first achieved within the same Calendar Year, only the largest Sales Milestone Payment for a Sales Milestone Event so achieved shall be payable for such Calendar Year, and the Sales Milestone Payments for any other Sales Milestone Event so achieved shall remain payable in the next subsequent Calendar Year when such Sales Milestone Event is again achieved.

6.5.3. Allergan shall deliver to Exicure written notice of the achievement of any Sales Milestone Event for which a Sales Milestone Payment is payable hereunder, together with the corresponding Sales Milestone Payment, within ***** days after achievement of the applicable Sales Milestone Event.

6.6. Royalty Payments.

6.6.1. Subject to the terms of this Agreement (including Section 6.6.2), on a Licensed Product-by-Licensed Product basis, Allergan or its Affiliates shall pay Exicure a royalty on annual Net Sales of each Licensed Product in the Territory as set forth in this Section 6.6 ("**Royalty Payment**"):

Net Sales Tranche	Royalty Rate
For that portion of aggregate global Net Sales of the applicable Licensed Product in any given Calendar Year of less than or equal to *****	*****
For that portion of aggregate global Net Sales of the applicable Licensed Product in any given Calendar Year of greater than ***** but less than or equal to *****	*****
For that portion of aggregate global Net Sales of the applicable Licensed Product in any given Calendar Year of greater than ***** but less than or equal to *****	*****
For that portion of aggregate global Net Sales of the applicable Licensed Product in any given Calendar Year of greater than ***** but less than or equal to *****	*****
For that portion of aggregate global Net Sales of the applicable Licensed Product in any given Calendar Year of greater than *****	*****

6.6.2. The Royalty Payment shall be payable to Exicure on a Licensed Product-by-Licensed Product and country-by-country basis starting upon First Commercial Sale of a Licensed Product in a country until the latest to occur of (a) the expiration of the last-to-expire Valid Claim of an Exicure Patent or Joint Collaboration Patent, in each case, that Covers the manufacture, use or sale of such Licensed Product in such country, (b) ***** years after First Commercial Sale of such Licensed Product in such country, or (c) the expiration of Regulatory Exclusivity for such Licensed Product in such country (the "**Royalty Term**").

6.7. Reductions.

6.7.1. No Valid Claim Reduction. On a Licensed Product-by-Licensed Product and country-by-country basis, if, in any Calendar Quarter during the Royalty Term, there is no Valid Claim of an Exicure Patent or Joint Collaboration Patent, in each case, that Covers the manufacture, use or sale of a Licensed Product in a country, then the Net Sales of such Licensed Product in such country for such Calendar Quarter and each Calendar Quarter in the remainder of the Royalty Term will be reduced by ***** percent ***** for purposes of calculating the royalties payable to Exicure under Section 6.6.

6.7.2. Generic Competition. On a Licensed Product-by-Licensed Product and country-by-country basis, if (a) a Licensed Product is sold in a country in the Territory and at any time one or more products that are Generic Products with respect to such Licensed Product are sold or marketed by a Third Party (other than a Generic Product sold by Allergan or any of its Affiliates or by any Sublicensee under a license granted by Allergan) in such country and (b) the total units of such Generic Product(s) sold in such country in any Calendar Quarter, as a percentage of the

total aggregate units of Licensed Products and such Generic Product(s) sold in such country in such Calendar Quarter, is at least ***** percent ***** ("**Generic Product Presence**"), then the Net Sales of such Licensed Product in such country during such Calendar Quarter and all subsequent Calendar Quarters during the Royalty Term will be reduced by ***** percent ***** for purposes of calculating the royalties payable to Exicure under Section 6.6. Units of Generic Products sold in a particular country for determining Generic Product Presence will be measured based on data provided by IMS International (or another Third Party data aggregating source reasonably selected by Allergan). If the data regarding units of Generic Products sold in a country is not available from any Third Party data aggregating source or able to be estimated by any methodology reasonably acceptable to both Parties, and the Net Sales of such Licensed Product in such country in any Calendar Quarter following the launch of a Generic Product in such country are less than ***** percent ***** of the Net Sales of such Licensed Product in the Calendar Quarter immediately prior to the launch of a Generic Product in such country, then Generic Product Presence shall be deemed to have occurred in such country, and the reduction set forth in this Section 6.7.2 shall apply for such Calendar Quarter.

6.7.3. Royalty Floor for No Valid Claim and Generic Competition Reductions. The royalty reductions set forth in Section 6.7.1 and Section 6.7.2 shall be applied on a cumulative basis; *provided*, *however*, that in no event may any Royalty Payment payable to Exicure hereunder be reduced as a result of the application of the royalty reductions set forth in Section 6.7.1 and Section 6.7.2 by more than ***** percent ***** of the amount that would otherwise be owed to Exicure under Section 6.6.

6.8. Anti-Stack. Allergan shall have the right to reduce any payments otherwise payable to Exicure under this Article 6 (but excluding for the avoidance of doubt any payments already made under this Article 6), following the application of all applicable reductions under Section 6.7.1 and Section 6.7.2, if applicable, by ***** percent ***** of any amounts, including upfront payments, milestones or royalties, that are paid by Allergan to any Third Party in consideration for a license or other rights under any Third Party IP in order to Exploit any Licensed Product (excluding any Other API); *provided*, *however*, that in no event may any payment otherwise payable to Exicure under this Article 6 be reduced as a result of the application of this reduction by more than ***** percent *****. In the event that Allergan is not able to deduct the full amount of the permitted deduction from the amount due to Exicure as a result of the proviso set forth in the preceding sentence, Allergan shall be entitled to deduct any undeducted excess amount from subsequent amounts owed to Exicure (subject in each case to the proviso set forth in the preceding sentence). Notwithstanding anything to the contrary in this Section 6.8, if Allergan obtains any rights to Blocking Platform IP in accordance with Section 3.7.4, then Allergan shall have the right to reduce any payments otherwise payable to Exicure under this Article 6, following the application of all applicable reductions under Section 6.7.1 and Section 6.7.2, if applicable, by ***** percent ***** of any amounts, including upfront payments, milestones or royalties, that are paid by Allergan to any Third Party in consideration for a license or other rights under such Blocking Platform IP, and, for clarity, such deduction shall not be subject to any payment floor (and shall be applied cumulatively with any deductions under the first sentence of this Section 6.8). In the event that Allergan is not able to deduct the full amount of the permitted deduction for payments to Third

Parties from the amount due to Exicure, Allergan shall be entitled to deduct any undeducted excess amount from subsequent amounts owed to Exicure.

6.9. Taxes. Each Party shall be responsible for its own taxes, duties, levies, imposts, assessments, deductions, fees, withholdings or similar charges imposed on or measured by net income or overall gross income (including branch profits), gross receipts, capital, ability or right to do business, property, and franchise or similar taxes pursuant to applicable Law. If Allergan is required to deduct or withhold from any payment due hereunder any taxes, duties, levies, imposts, assessments, deductions, fees, and other similar charges by applicable Law or any Governmental Authority ("**Withholding Taxes**"), then Allergan shall pay such Withholding Taxes to the local applicable Governmental Authority and make the payment to Exicure of the net amount due after deduction or withholding of such taxes. Such Withholding Taxes shall be treated for all purposes of this Agreement as having been paid to Exicure hereunder. Allergan shall submit reasonable proof of payment of the Withholding Taxes within a reasonable period of time after such Withholding Taxes are remitted to the Governmental Authority. The Parties shall reasonably cooperate to eliminate or minimize any such Withholding Taxes. Exicure shall indemnify and hold harmless Allergan for any such Withholding Taxes, including any interest and penalties thereon. Exicure represents and agrees that it is the beneficial owner of the payments and is a resident of the United States by virtue of the applicable Law of the United States, and does not have a fixed base, office or permanent establishment in Ireland through which it carries on a trade or business, and will notify Allergan of any change in such status. *****

6.10. Value Added Tax. Notwithstanding anything contained in Section 6.9, this Section 6.10 shall apply with respect to VAT. All payments under this Agreement are exclusive of VAT. If any VAT is required in respect of any payments under applicable Law, the payor shall pay VAT at the applicable rate in respect of any such payments following the receipt of a valid VAT invoice in the appropriate form issued by the payee in respect of those payments, such VAT to be payable on the later of the due date of the payments to which such VAT relates and 60 days after the receipt by the payor of the applicable valid invoice relating to that VAT payment. The Parties will reasonably cooperate to issue valid VAT invoices for all amounts due under this Agreement consistent with VAT requirements. The payor shall not be responsible for any penalties and interest resulting from the failure by the payee to collect (if not included on a valid VAT invoice) or remit any such VAT. The Parties shall reasonably cooperate to report, eliminate or minimize the amount of any such VAT imposed on the transactions contemplated in this Agreement.

6.11. Allergan Statements and Payment. Allergan shall, after the date of First Commercial Sale in any country in the Territory, deliver to Exicure, within ***** days after the end of each Calendar Quarter, a report setting forth for such Calendar Quarter the following information: (a) Net Sales of Licensed Products on a Licensed Product-by-Licensed Product, (b) the Royalty Payments due to Exicure on account of Net Sales of Licensed Products, (c) the exchange rates used in calculating any of the foregoing, and (d) any deductions provided for under this Agreement. If no Royalty Payments were payable for any such Calendar Quarter, Allergan's report shall so state. Allergan shall pay such Royalty Payments simultaneously with the delivery of each such report.

6.12. Currency Exchange. For any currency conversion required in determining the amount of payments due hereunder, such conversion shall be made as follows: (a) when calculating Net Sales, the amount of such sales in foreign currencies shall be converted into USD using the average of the daily last price rate of exchange for such currencies for the relevant month utilized by Allergan for public financial accounting purposes in accordance with GAAP and (b) when calculating all other sums due under this Agreement, the amount in foreign currencies shall be converted into USD using the average of daily last price rate of exchange for such currencies for the relevant month utilized by Allergan for public financial accounting purposes in accordance with GAAP.

6.13. Payment Method. All payments due to a Party hereunder shall be made via wire transfer of immediately available USD funds to an account designated in writing by that Party to the other Party.

6.14. Records Retention; Financial Audit; Consolidation Reporting.

6.14.1. Record Retention. Allergan shall maintain complete and accurate books, records and accounts for the calculation of Net Sales and Royalty Payments due, in sufficient detail to confirm the accuracy of any Royalty Payments required under this Agreement, which books, records and accounts shall be retained for at least three years after the end of the period to which such books and records pertain.

6.14.2. Financial Audit. Exicure shall have the right to have an independent certified public accounting firm of internationally recognized standing reasonably acceptable to Allergan have access during normal business hours, upon reasonable prior written notice, to such of the records of Allergan and its Affiliates as may be required to verify the accuracy of the calculation of Net Sales and Royalty Payments due for any year ending not more than three years prior to the date of such request. Such verifications may not (a) be conducted for any Calendar Quarter more than three years after the end of such Calendar Quarter, (b) be conducted more than once in any 12 month period or (c) be repeated for any period unless, subject to the foregoing clauses (a) and (b), a subsequent verification uncovers a material error that is reasonable for Exicure to assume existed in previously audited records. The independent certified public accounting firm shall disclose to Exicure only the amounts which the independent certified public accounting firm believes to be due and payable hereunder (whether related to an underpayment or an overpayment), shall provide a copy of same to Allergan, and shall disclose no other information revealed in such audit. Any and all records of Allergan and its Affiliates examined by such independent certified public accounting firm shall be deemed Allergan's Confidential Information, which may not be disclosed by said independent certified public accounting firm to any Third Party or (except for the information expressly sought to be confirmed by Exicure as set forth in this Section 6.14.2) to Exicure. Exicure shall bear all costs of such audit, unless the audit reveals a discrepancy in Allergan's favor of more than ***** percent *****, in which case Allergan shall bear the cost of the audit. The result of the audit shall, in the absence of manifest error, be final and binding on the Parties.

6.14.3. Payment of Additional Amounts. If, based on the results of any audit conducted under Section 6.14.2, payments are owed to a Party under this Agreement, then the other Party shall make such payments within ***** Business Days after the accounting firm's written

report is delivered to the Parties, with interest calculated thereon in accordance with Section 6.15. If the report is contested by either, the Parties shall follow the dispute resolution procedures described in Section 12.3. The responsible Party shall pay any amount ultimately found due within ***** Business Days after resolution of the dispute.

6.15. Interest on Late Payments. Any failure by either Party to make a payment of any undisputed amount when due shall obligate that Party to pay interest to the other Party on the amount unpaid at ***** (or, if lower, the maximum rate permitted by applicable Law) calculated on a daily basis and payable for the period from the date payment is due until the date payment is actually made, without prejudice to the recipient's right to receive payment on the due date.

6.16. Right to Offset. Each Party shall have the right to offset any amount owed by the other Party to such first Party under or in connection with this Agreement, including pursuant to Article 11 or in connection with any breach, against any payments owed by such first Party to such other Party under this Agreement, in each case based on a final determination by an independent certified public accounting firm pursuant to Section 6.14.2, any agreement of the Parties as to amounts owed or pursuant to an arbitration proceeding pursuant to Section 12.3, as applicable. Such offsets shall be in addition to any other rights or remedies available under this Agreement and applicable Law.

6.17. Third Party Agreements. Exicure shall be solely responsible for (a) all payments under any Exicure Third Party Agreements, and (b) all payments to inventors (other than inventors that are representatives of Allergan) of any Exicure Technology or Joint Collaboration Technology, including payments under inventorship compensation laws.

6.18. Reverse Royalty. On a Terminated Product-by-Terminated Product basis for any Terminated Product that is Covered by, uses or incorporates any of the Allergan Collaboration Technology or Joint Collaboration Technology, starting upon First Commercial Sale of such Terminated Product, Exicure shall pay Allergan a ***** percent ***** royalty on annual Net Sales (defined *mutatis mutandis* with Section 1.125) of Exicure, its Affiliates and its sublicensees of such Terminated Product in the Territory, which royalty shall be payable on a Terminated Product-by-Terminated Product and country-by-country basis until the latest to occur of (a) the last to expire Valid Claim of an Allergan Collaboration Patent or Joint Collaboration Patent that Covers the manufacture, use or sale of such Terminated Product in such country, (b) ***** years after First Commercial Sale of such Terminated Product in such country, and (c) the expiration of Regulatory Exclusivity for such Terminated Product in such country. The provisions of Section 6.7 through Section 6.15 shall apply, *mutatis mutandis*, with respect to Exicure's payments to Allergan with respect to the Terminated Products under this Section 6.18.

ARTICLE 7
CONFIDENTIALITY

7.1. Protection of Confidential Information. The Receiving Party shall not, and shall cause its Affiliates and its and their officers, directors, employees and agents not to, disclose or disseminate Confidential Information of the Disclosing Party to any Third Party unless expressly permitted hereunder, and shall not use such Confidential Information for any purpose other than in

performing the Receiving Party's obligations or exercising the Receiving Party's rights under this Agreement. In addition, the Receiving Party shall take, and shall cause its Affiliates to take, reasonable steps to protect the Confidential Information of the Disclosing Party from unauthorized use or disclosure, which steps shall be no less than those the Receiving Party takes to protect its own confidential or proprietary material of a similar nature. Each Party shall be responsible for any breach of its confidentiality obligations by its respective employees and agents. The foregoing obligations shall apply equally to all copies, extracts and summaries of the Disclosing Party's Confidential Information.

7.2. Certain Permitted Disclosures.

7.2.1. Disclosure Required by Law. Notwithstanding the foregoing, the Receiving Party may disclose Confidential Information of the Disclosing Party to the extent such disclosure is required by applicable Law, *provided* that, to the extent it may legally do so, the Receiving Party shall: (a) give reasonable advance notice to the Disclosing Party of such disclosure to permit the Disclosing Party to use its reasonable efforts to secure confidential treatment of such Confidential Information prior to disclosure to the extent such treatment is applicable (whether through protective orders or otherwise), (b) cooperate with the Disclosing Party in the exercise of its right to protect the confidentiality of the Confidential Information and (c) disclose only that Confidential Information that is required to be disclosed.

7.2.2. Disclosure for Agreement Purposes. The Receiving Party may disclose Confidential Information of the Disclosing Party to a Third Party to the extent such disclosure is reasonably necessary to exercise the rights granted to or retained by it under this Agreement or to perform its obligations under this Agreement, including in (a) preparing, filing, maintaining or prosecuting Patents, (b) prosecuting or defending litigation, or (c) submitting information to Governmental Authorities for the purpose of seeking Regulatory Approvals with respect to a Licensed Product, as applicable.

7.2.3. Disclosure to Certain Third Parties. The Receiving Party may disclose such of the Disclosing Party's Confidential Information to (a) its Affiliates, employees, directors, consultants and subcontractors who have a need to know such Confidential Information and (b) in the case of Allergan, its existing or potential Distributors, Sublicensees, collaboration partners and acquirers and (c) in the case of Exicure, Northwestern, in each case ((a) and (b) and (c)), who are bound by obligations of confidentiality and non-use at least as stringent as those by which the Receiving Party is bound hereunder. Notwithstanding the foregoing or anything to the contrary in this Agreement, Exicure may not disclose any Confidential Information of either Party to Northwestern unless such disclosure is made in accordance with Article 13 of the Northwestern Agreements, so as to ensure confidential treatment of such information by Northwestern.

7.3. Return of Confidential Information. Upon termination of this Agreement, the Receiving Party shall promptly return or destroy all of the Disclosing Party's Confidential Information, including all information relating to Licensed Products received hereunder and copies thereof in any medium, unless, and solely for so long as, the Receiving Party has continuing rights to use the foregoing pursuant to Article 9. Notwithstanding the foregoing, the Receiving Party may retain one copy for its legal files. Nothing herein shall require the erasure or destruction of back-

up media made in the ordinary course of business, *provided* that it is not accessible in the ordinary course of business.

7.4. Unauthorized Use. If the Receiving Party becomes aware of any unauthorized use or disclosure of the Disclosing Party's Confidential Information, it shall promptly notify the Disclosing Party of such unauthorized use or disclosure.

7.5. Public Disclosure.

7.5.1. Neither Party shall mention or otherwise use the name, logo or Trademark of the other Party or any of its Affiliates or any of its or their sublicensees or any abbreviation or adaptation thereof in any advertising, marketing, promotional or sales literature or other form of publicity or in any document employed to obtain funds or financing without the prior written approval of the Party whose name is to be used, except as follows:

(a) Allergan, its Affiliates and Sublicensees may state that they are licensed under the Exicure Technology, and Exicure and its Affiliates may state that they have licensed the Exicure Technology to Allergan, its Affiliates and Sublicensees. For this purpose, each Party may use the name and logo of the other Party, and may make a high level non-confidential statement about the existence, scope and key terms of this contractual relationship that is consistent with and limited to the information that is included within any mutually agreed press releases (including that set forth on Schedule 7.5.1(c)) or any other communication content that the Parties mutually agree is acceptable for general public use or any other prior public disclosure made in accordance with this Article 7.

(b) Either Party or its Affiliates may make such a disclosure and may disclose the contents of this Agreement and the Northwestern Side Agreement (i) subject to Section 7.2.1 and Section 7.5.2, as applicable, to the extent required by the rules of any nationally recognized securities exchange, quotation system or over-the-counter market on which such Party has its securities listed or traded or (ii) to any acquirers, potential acquirers, investors, prospective investors, lenders and other potential financing sources who are obligated to (A) keep such information confidential and (B) use such information solely to evaluate the applicable transaction.

(c) The Parties have agreed upon the content of a press release, which may be issued by Exicure substantially in the form and substance attached hereto as Schedule 7.5.1(c), upon a date to be mutually agreed by the Parties (or such earlier date as Exicure makes any disclosure or filing with respect to this Agreement under Section 7.5.1(b) or Section 7.5.2).

7.5.2. If either Party is required to file this Agreement with the U.S. Securities and Exchange Commission (or any successor or replacement agency), the Parties shall in good faith seek to mutually agree upon an acceptable redacted version of this Agreement for such filing, and

the filing Party shall use commercially reasonable efforts to secure confidential treatment of this Agreement consistent with such mutually agreed redacted version.

7.6. Publications. During the Term until exercise of the Option for a Collaboration Program by Allergan, neither Party shall make any publication, presentation or other announcement regarding such Collaboration Program, including the applicable Development Plan, Compounds and Licensed Products, unless such publication, presentation or announcement has been previously approved by the other Party (such consent not to be unreasonably withheld, conditioned or delayed) or unless required by applicable Law. Where any such publication, presentation or announcement is required by applicable Law the Party subject to such requirement shall use its commercially reasonable efforts to give prior written notice of any such proposed publication, presentation or announcement to the other Party. Such other Party shall respond promptly through its designated representative and in any event no later than ***** Business Days after receipt of such proposed publication, presentation or other announcement or such shorter period as may be required by the publication, presentation or announcement. The Party desiring to make such publication, presentation or announcement agrees to allow a reasonable period (not to exceed ***** days) to permit filings for patent protection and to otherwise address issues of Confidential Information or related competitive harm to the reasonable satisfaction of the other Party. Following the exercise of the Option for a Collaboration Program by Allergan, all publications, presentations and announcements regarding the applicable Compounds or Licensed Products arising out of or from such Collaboration Program shall be controlled by Allergan in its sole discretion.

ARTICLE 8
INTELLECTUAL PROPERTY

8.1. Collaboration Technology.

8.1.1. Ownership of Solely Invented Collaboration Technology. Subject to the licenses and other rights granted herein, as between the Parties, each Party shall be the sole owner and retain all right, title and interest in and to any and all Collaboration Know-How that is first conceived, discovered, developed or otherwise made solely by or on behalf of such Party (or its Affiliates or Sublicensees), and any and all Patents that claim such Collaboration Know-How.

8.1.2. Ownership of Jointly Invented Collaboration Technology. Subject to the licenses and other rights granted herein, as between the Parties, the Parties shall each own an equal, undivided interest in any and all: (a) Collaboration Know-How that is first conceived, discovered, developed or otherwise made jointly by or on behalf of Exicure or its Affiliates, on the one hand, and Allergan or its Affiliates or Sublicensees, on the other hand (the "**Joint Collaboration Know-How**"); and (b) Patents that claim such Collaboration Know-How described in clause (a) (such Patents, the "**Joint Collaboration Patents**", and, together with Joint Collaboration Know-How, the "**Joint Collaboration Technology**"). Each Party shall promptly disclose to the other Party in writing the development, making, conception or reduction to practice of any Collaboration Know-How or Collaboration Patents. Subject to the license granted under Section 3.3 and the other provisions of this Agreement, including the applicable exclusivity obligations under Section 3.5, each Party shall have the right to Exploit the Joint Collaboration Technology without a duty of seeking consent of or notice or accounting to the other Party.

8.1.3. United States Law. The determination of whether Know-How is conceived, discovered, developed or otherwise made by a Party for the purpose of allocating proprietary rights (including Patent, copyright or other intellectual property rights) therein, shall, for purposes of this Agreement, be made in accordance with applicable Law in the United States, irrespective of where or when such conception, discovery, development or making occurs. Each Party shall, and does hereby, assign, and shall cause its Affiliates to, and use good faith efforts to cause its and their subcontractors and Sublicensees to, so assign, to the other Party, without additional compensation, such right, title and interest in and to any Collaboration Know-How or Collaboration Patents as is necessary to fully effect, as applicable, the allocation of ownership set forth in Section 8.1.1 or Section 8.1.2.

8.1.4. Assignment Obligation. Each Party shall cause all Persons who perform Development activities, Manufacturing activities or regulatory activities for such Party under this Agreement or who conceive, discover, develop or otherwise make any Collaboration Know-How to be under an obligation to assign their rights in any Collaboration Know-How resulting therefrom to such Party, except (a) where applicable Law requires otherwise or (b) in the case of governmental, not-for-profit and public institutions that have standard policies against such an assignment (in which case ((a) or (b)), a suitable license, or right to obtain such a license, shall be obtained).

8.2. Prosecution and Maintenance of Patents.

8.2.1. Solely Owned Patents.

(a) Except as expressly set forth in Section 8.2.1(b), Exicure shall have the first right (but not the obligation), in its sole discretion and at its sole cost, to prepare, file, prosecute and maintain all Exicure Patents.

(b) From and after Option Exercise for a Collaboration Program, Allergan shall have the first right (but not the obligation), in its sole discretion and at its sole cost, to prepare, file, prosecute and maintain any Exicure Patents that constitute Product-Specific Patents arising out of or from such Collaboration Program.

(c) Allergan shall have the sole right (but not the obligation), in its sole discretion and at its sole cost, to prepare, file, prosecute and maintain all Allergan Collaboration Patents.

(d) If either Party (the "**First Right Party**") elects not to file a patent application included in the Orange Book Patents or Product-Specific Patents that it is has the right to file under Section 8.2.1(a) or Section 8.2.1(b), in any country, or elects to cease the prosecution or maintenance of any such Patent in any country, then such Party shall provide the other Party (the "**Second Right Party**") with written notice immediately, but not less than 30 days before any action is required, upon the decision to not file or continue the prosecution of such patent application or maintenance of such Patent. In the event that the First Right Party has provided notice to the Second Right

Party as described in the preceding sentence, the Second Right Party shall be permitted, at its sole cost, to file or continue prosecution or maintenance of such Patent in such country using patent counsel selected by the Second Right Party and reasonably acceptable to the First Right Party; *provided* that if Exicure makes a decision to not file or continue the prosecution of an Orange Book Patent that is not a Product-Specific Patent based upon a good faith, strategic rationale, and Exicure provides a description of such strategic rationale in its written notice to Allergan, then Allergan will not have the second right to file such patent application under this Section 8.2.1(d).

8.2.2. Jointly Owned Patents.

(a) If any Joint Collaboration Know-How arises under this Agreement, the Parties shall promptly meet to discuss and determine the patent strategy with respect thereto.

(b) Allergan shall have the first right, but not the obligation, to prepare, file, prosecute and maintain any Joint Collaboration Patent throughout the world using patent counsel selected by Allergan and reasonably acceptable to Exicure. Exicure shall reimburse Allergan for ***** percent ***** of the reasonable out-of-pocket costs incurred by Allergan in preparing, filing, prosecuting and maintaining such Joint Collaboration Patents, which reimbursement will be made pursuant to invoices submitted by Allergan to Exicure no more often than once per Calendar Quarter.

(c) If Allergan elects not to file a patent application included in such Joint Collaboration Patents in any country or elects to cease the prosecution or maintenance of any such Joint Collaboration Patent in any country, then Allergan shall provide Exicure with written notice immediately, but not less than 30 days before any action is required, upon the decision to not file or continue the prosecution of such patent application or maintenance of such patent. In the event Allergan has provided notice to Exicure as described in the preceding sentence, Exicure shall be permitted to file or continue prosecution or maintenance of such Joint Collaboration Patent in such country using patent counsel selected by Exicure and reasonably acceptable to Allergan. Allergan shall reimburse Exicure for ***** percent ***** of the reasonable out-of-pocket costs incurred by Exicure in preparing, filing, prosecuting and maintaining such Joint Collaboration Patent, which reimbursement will be made pursuant to invoices submitted by Exicure to Allergan no more often than once per Calendar Quarter.

(d) If either Party (the "**Declining Party**") at any time declines to share in the costs of filing, prosecuting and maintaining any Joint Collaboration Patent, on a country-by-country basis, the Declining Party shall provide the other Party (the "**Continuing Party**") with 30 days' prior written notice to such effect, in which event, (i) the Declining Party shall have no responsibility

for any expenses incurred in connection with such Joint Collaboration Patent after the end of such 30 day period, (ii) if the Continuing Party elects to continue prosecution or maintenance, the Declining Party, upon the Continuing Party's request, shall execute such documents and perform such acts, at the Continuing Party's expense, as may be reasonably necessary to permit the Continuing Party to file, prosecute and maintain such Joint Collaboration Patent, (iii) the Declining Party shall have no further information, review or comment rights with respect to the prosecution, maintenance or enforcement of such Joint Collaboration Patent and (iv) if Allergan is the Declining Party, such Joint Collaboration Patent will no longer be included in the exclusive license granted under Section 3.3. For the avoidance of doubt, the Declining Party will retain its right to Exploit such Joint Collaboration Patent without a duty of seeking consent of or notice or accounting to the Continuing Party in accordance with Section 8.1.2.

8.2.3. Cooperation Regarding Prosecution of Patents. Each Party shall cooperate with the other Party to the extent reasonably necessary for such Party to prosecute the Product-Specific Patents, Joint Collaboration Patents, Exicure Collaboration Patents (to the extent that such Exicure Collaboration Patents are necessary or useful to Exploit a Compound or a Licensed Product) or Orange Book Patents in the Territory, including the execution and delivery of documents to such prosecuting Party (the "**Prosecuting Party**") at such other Party's (the "**Non-Prosecuting Party**") cost and expense, and providing access to relevant documents (including laboratory notebooks) and other evidence and making its employees available at reasonable business hours. The Prosecuting Party with respect to any of the foregoing Patents in the Territory shall give the Non-Prosecuting Party an opportunity to review any application with respect to such Patent before filing, shall consult with the Non-Prosecuting Party with respect thereto, and shall consider any reasonable comments of the Non-Prosecuting Party with respect thereto. The Prosecuting Party shall supply the Non-Prosecuting Party with a copy of the application as filed, together with notice of its filing date and serial number. The Prosecuting Party shall keep the Non-Prosecuting Party reasonably informed of the status of the actual and prospective patent filings (including the grant of any such Patent), and shall provide advance copies of any official correspondence related to the filing, prosecution and maintenance of such patent filings.

8.3. Enforcement of Patents.

8.3.1. Notice. Each Party shall provide to the other Party prompt written notice of any actual or threatened infringement of any Orange Book Patent, Product-Specific Patent, Joint Collaboration Patent or Allergan Collaboration Patent in the Territory of which such Party becomes aware.

8.3.2. Enforcement of Patents Covering Licensed Products.

(a) Allergan shall have the first right to enforce any Orange Book Patents, Product-Specific Patents and other Joint Collaboration Patents against any Third Party infringer of such Patents that is actually or potentially Exploiting a product that is or would be competitive with a Licensed Product (a

"**Competitive Infringement**"), including, subject to the provisions of Article 11 (including each Party's right and obligation to defend against any Third Party Claim for which such Party has indemnification obligations thereunder), as a defense or counterclaim in connection with any Third Party Infringement Claim against Allergan or any of its Affiliates or its or their Sublicensees, at its sole cost and expense, using counsel of its choice. If Allergan fails to take commercially reasonable steps to prosecute or settle any such Competitive Infringement within 90 days of receiving a notice with respect to such infringement pursuant to Section 8.3.1 or within 10 Business Days before the time limit, if any, under applicable Law for taking any action with respect to the timeframe of any other relevant regulatory or statutory framework that may govern, or earlier notifies Exicure in writing of its intent not to bring such action or proceeding (whichever is earlier), Exicure may enforce, at its sole cost and expense, using counsel of its choice, such Orange Book Patent, Product-Specific Patent or Joint Collaboration Patent against such Competitive Infringement, unless Allergan notifies Exicure of a strategic rationale in good faith for non-enforcement of such Orange Book Patent, Product-Specific Patent or Joint Collaboration Patent. Any strategic rationale will be considered as made in good faith by Allergan if such strategic rationale is for any reason other than to avoid or reduce any payments payable to Exicure as set forth in Article 6. The non-enforcing Party under this Section 8.3.2(a) may participate in such enforcement at its sole cost and expense and using counsel of its choice, *provided* that the other Party shall, subject to Section 8.3.4, retain the right to control such Competitive Infringement action.

(b) For all other enforcement of any Product-Specific Patents and other Joint Collaboration Patents against any actual or potential infringers, the Parties shall consult with each other in good faith regarding such possible enforcement and determine by mutual agreement an appropriate course of action.

8.3.3. Enforcement of Other Patents. Except as otherwise expressly set forth in Section 8.3.2, Exicure shall have the sole right (but not the obligation), in its sole discretion, to enforce the Exicure Patents, except that, with respect to the enforcement of Orange Book Patents that are not Product-Specific Patents or Joint Collaboration Patents, Exicure shall consider in good faith the interests of Allergan in so doing. Allergan shall have the sole right (but not the obligation), in its sole discretion, to enforce the Allergan Collaboration Patents.

8.3.4. Cooperation Regarding Enforcement of Patents. The Parties shall cooperate fully in any enforcement action pursuant to Section 8.3.2, including by making the inventors, applicable records, and documents (including laboratory notebooks) with respect to the relevant Patents available to the enforcing Party and its advisors at the enforcing Party's request. The non-enforcing Party shall, and shall cause its Affiliates to, assist and cooperate with the enforcing Party, as the enforcing Party may reasonably request from time to time, in connection with its activities

set forth in Section 8.3.2, including joining in, or being named as a necessary party to, such action, providing access to relevant documents and other evidence, making its employees available at reasonable business hours, and executing any settlement agreement that meets the requirements of this Section 8.3.4 as requested by the enforcing Party, *provided* that the enforcing Party shall reimburse the non-enforcing Party for its reasonable and verifiable out-of-pocket costs and expenses incurred in connection therewith. Unless otherwise set forth herein, the enforcing Party shall have the right to settle such claim, *provided* that neither Party shall have the right to settle any litigation or claim under Section 8.3.2 in a manner that (a) imposes any costs or liability on the other Party or its Affiliates or its or their sublicensees, (b) involves any admission by the other Party or its Affiliates or its or their sublicensees, (c) admits the invalidity or unenforceability (in whole or in part) of intellectual property owned or Controlled by the other Party or its Affiliates or its or their licensees, or (d) imposes restrictions or obligations on the other Party or its Affiliates or licensees not otherwise permitted under this Agreement, in each case ((a) through (d)), without the express written consent of such other Party, which consent shall not be unreasonably withheld, conditioned or delayed. In connection with any activities with respect to an action prosecuted by the applicable enforcing Party pursuant to Section 8.3.2 involving Patents owned or Controlled by the other Party, without limiting any of the enforcing Party's other obligations in this Section 8.3.4, the enforcing Party shall (i) prior to taking any steps to enforce such Patents under Section 8.3.2, inform and consult with the non-enforcing Party as to the proposed strategy for the enforcement of such Patents, (ii) keep the non-enforcing Party reasonably informed of any material steps proposed to be taken and taken, and provide copies of all material documents filed or received, in connection with such action, and (iii) consider in good faith any comments from the non-enforcing Party with respect thereto. In addition, with respect to any Competitive Infringement, unless there are no Product-Specific Patents or Joint Collaboration Patents that may be enforced against such Competitive Infringement, Allergan's strategy for enforcing the Orange Book Patents that are not Product-Specific Patents or Joint Collaboration Patents against such Competitive Infringement shall be subject to Exicure's prior approval, *provided* that Exicure may only withhold its approval if the proposed strategy could reasonably be expected to materially adversely affect Exicure or its Affiliates or any of its or their licensees; and *provided*, *further*, that Exicure's approval shall be deemed to be granted if Exicure does not provide written notice of an objection to Allergan within ten (10) Business Days of Exicure's receipt of a written notice from Allergan that Allergan intends to enforce such Patents and describing in reasonable detail the Competitive Infringement and Allergan's proposed strategy with respect thereto.

8.3.5. Recoveries.

(a) Except as otherwise agreed by the Parties in writing, any recovery realized as a result of enforcing a Patent under Section 8.3.2(a) (whether by way of settlement or otherwise) shall be first allocated to reimburse the Parties for their costs and expenses in making such recovery (which amounts shall be allocated *pro rata* if insufficient to cover the totality of such expenses). Any remainder after such reimbursement is made shall be *****

(b) Any recovery realized as a result of enforcing a Patent under Section 8.3.2(b) (whether by way of settlement or otherwise) shall be first allocated

to reimburse the Parties for their costs and expenses in making such recovery (which amounts shall be allocated *pro rata* if insufficient to cover the totality of such expenses). Any remainder after such reimbursement is made shall be *****.

8.3.6. Delegation of Enforcement Rights. Allergan shall have the right, in its sole discretion, to delegate its rights under this Section 8.3 in whole or in part to any of its Affiliates or Sublicensees, *provided* that any such Affiliate or Sublicensee shall comply with the terms of this Section 8.3.

8.4. Invalidity or Unenforceability Actions.

8.4.1. Notice. Each Party shall promptly notify the other Party in writing of any alleged or threatened assertion of invalidity or unenforceability, including any *inter partes* review, post-grant review, reexamination, opposition or any other similar action before a patent office, of any of the Exicure Patents, Joint Collaboration Patents or Allergan Collaboration Patents by a Third Party of which such Party becomes aware (an "**Invalidity/Unenforceability Action**").

8.4.2. Control of Invalidity or Unenforceability Actions Involving Orange Book Patents, Product-Specific Patents or Joint Collaboration Patents.

(a) Allergan shall have the first right to defend: (1) any Product-Specific Patents against any Invalidity/Unenforceability Action with respect to such Product-Specific Patent; and (2) any Orange Book Patent that is not a Product-Specific Patent solely (x) against any assertion of invalidity or unenforceability that is raised in any forum by a Third Party defendant in a Competitive Infringement action initiated by Allergan pursuant to Section 8.3.2(a) (including as a defense or counterclaim in connection with such Competitive Infringement action), or (y) for so long as a Licensed Product is the only product with respect to which such Orange Book Patent is listed in the Orange Book, against any Invalidity/Unenforceability Action with respect to such Orange Book Patent; in each case, using counsel of its choice and at its sole cost and expense. If Allergan does not take commercially reasonable steps to defend against an Invalidity/Unenforceability Action under this Section 8.4.2(a) by the earlier of (a) 90 days after notice of such Invalidity/Unenforceability Action, and (b) 10 Business Days before the time limit, if any, under applicable Law for taking any action with respect to the defense of such Invalidity/Unenforceability Action, then (i) Allergan shall so notify Exicure and (ii) Exicure shall have the right (but not the obligation) to defend against such Invalidity/Unenforceability Action at its sole cost and expense, using counsel of its choice. The Party not controlling the defense of any Invalidity/Unenforceability Action under this Section 8.4.2(a) may participate in such defense at its sole cost and expense and using counsel of its choice, *provided* that the other Party shall, subject to Section 8.4.4, retain the right to control the defense of such Invalidity/Unenforceability Action.

(b) For any Invalidity/Unenforceability Action with respect to any other Joint Collaboration Patents, the Parties shall consult with each other in good faith regarding the defense against such Invalidity/Unenforceability Action and determine by mutual agreement an appropriate course of action.

8.4.3. Control of Invalidity or Unenforceability Actions Involving Other Patents.

(a) Allergan shall have the sole right (but not the obligation), in its sole discretion, to defend any Invalidity/Unenforceability Action with respect to the Allergan Collaboration Patents.

(b) Except as otherwise expressly set forth in Section 8.4.2, Exicure shall have the sole right (but not the obligation), in its sole discretion, to defend any Invalidity/Unenforceability Action with respect to the Exicure Patents, except that with respect to the defense of any Invalidity/Unenforceability Action with respect to Orange Book Patents that are not Product-Specific Patents or Joint Collaboration Patents, Exicure shall consider in good faith the interests of Allergan in so doing.

8.4.4. Cooperation. The Parties shall cooperate fully in defense of any Invalidity/Unenforceability Action pursuant to Section 8.4.2, including by making applicable records and documents (including laboratory notebooks) with respect to the relevant Invalidity/Unenforceability Action available to the Party controlling such defense (the "**Controlling Party**") on the Controlling Party's request. The non-Controlling Party shall, and shall cause its Affiliates to, assist and cooperate with the Controlling Party, as the Controlling Party may reasonably request from time to time, in connection with its activities set forth in this Section 8.4.2, including, where necessary, joining in, or being named as a necessary party to, such action, providing access to relevant documents and other evidence, and making its employees available at reasonable business hours, and executing any settlement agreement that meets the requirements of this Section 8.4.4 as requested by the Controlling Party, *provided* that the Controlling Party shall reimburse the non-Controlling Party for its reasonable and verifiable out-of-pocket costs and expenses incurred in connection therewith. Unless otherwise set forth herein, the Controlling Party shall have the right to settle an Invalidity/Unenforceability Action, *provided* that neither Party shall have the right to settle any Invalidity/Unenforceability Action under Section 8.4.2 in a manner that (a) imposes any costs or liability on the other Party or its Affiliates or its or their sublicensees, (b) involves any admission by the other Party or its Affiliates or its or their sublicensees, (c) admits the invalidity or unenforceability (in whole or in part) of intellectual property owned or Controlled by the other Party or its Affiliates or its or their licensees, or (d) imposes restrictions or obligations on the other Party or its Affiliates or licensees not otherwise permitted under this Agreement, in each case ((a) through (d)), without the express written consent of such other Party (which consent shall not be unreasonably withheld, conditioned or delayed). In connection with any activities with respect to defense of an Invalidity/Unenforceability Action under Section 8.4.2, the Controlling Party shall (i) prior to taking any steps to defend such Invalidity/Unenforceability Action under Section 8.4.2, inform and consult with the non-Controlling Party as to the proposed strategy for the defense of such Invalidity/Unenforceability Action, (ii) keep the non-Controlling Party reasonably informed of any material steps proposed to

be taken or taken, and provide copies of all material documents filed or received, in connection with such action, and (iii) consider in good faith any comments from the non-Controlling Party with respect thereto. In addition, with respect to any defense of an Invalidity/Unenforceability Action with respect to any Orange Book Patent that is not a Product-Specific Patent or a Joint Collaboration Patent, unless there are no Product-Specific Patents or Joint Collaboration Patents that Cover a Licensed Product Covered by such Orange Book Patents, Allergan's strategy for defending against such Invalidity/Unenforceability Action with respect to such Orange Book Patent shall be subject to Exicure's prior approval, *provided* that Exicure may only withhold its approval if the proposed strategy could reasonably be expected to materially adversely affect Exicure or its Affiliates or its or their licensees; and *provided*, *further*, that Exicure's approval shall be deemed to be granted if Exicure does not provide written notice of an objection to Allergan within ten (10) Business Days of Exicure's receipt of a written notice from Allergan that it intends to defend such Patents and describing in reasonable detail the Invalidity/Unenforceability Action and Allergan's proposed strategy with respect thereto.

8.5. Infringement Claims by Third Parties.

8.5.1. Notice. If the Exploitation of a Licensed Product in the Field in the Territory pursuant to this Agreement results in, or is reasonably expected to result in, any claim, suit or proceeding by a Third Party alleging infringement by Exicure, Allergan or any of its Affiliates or its or their Sublicensees, distributors or customers (a "**Third Party Infringement Claim**"), including any defense or counterclaim in connection with an infringement action initiated pursuant to Section 8.3, the Party first becoming aware of such alleged infringement shall promptly notify the other Party thereof in writing.

8.5.2. Defense of Third Party Infringement Claims. Subject to the provisions of Article 11, including each Party's right and obligation to defend against any Third Party Claim for which such Party has indemnification obligations thereunder, Allergan shall have the first right (but not the obligation) to defend against any Third Party Infringement Claim against Allergan or any of its Affiliates or its or their Sublicensees at its sole cost and expense, using counsel of its choice. The Party having the first right to defend against a Third Party Infringement Claim shall be the "**Defending Party**". If Allergan does not take commercially reasonable steps to defend against a Third Party Infringement Claim by the earlier of (a) 90 days after notice of such Third Party Infringement Claim, and (b) 10 Business Days before the time limit, if any, under applicable Law for taking any action with respect to the defense of such Third Party Infringement Claim, then (i) Allergan shall so notify Exicure and (ii) Exicure shall have the right (but not the obligation) to defend against such Third Party Infringement Claim at its sole cost and expense, using counsel of its choice, and shall thereafter be deemed the Defending Party with respect to such Third Party Infringement Claim. The non-Defending Party may participate in the defense of any Third Party Infringement Claim, at its sole cost and expense and using counsel of its choice, *provided* that the Defending Party shall retain the right to control the defense of such Third Party Infringement Claim.

8.5.3. Cooperation. The Parties shall cooperate fully in defense of any Third Party Infringement Claim pursuant to this Section 8.5, including by making applicable records and documents (including laboratory notebooks) with respect to the relevant Third Party Infringement

Claim available to the Defending Party on the Defending Party's request. The non-Defending Party shall, and shall cause its Affiliates to, assist and cooperate with the Defending Party, as the Defending Party may reasonably request from time to time, in connection with its activities set forth in this Section 8.5, including, where necessary, joining in, or being named as a necessary party to, such action, providing access to relevant documents and other evidence, and making its employees available at reasonable business hours, and executing any settlement agreement that meets the requirements of this Section 8.5.3 as requested by the Defending Party, *provided* that the Defending Party shall reimburse the non-Defending Party for its reasonable and verifiable out-of-pocket costs and expenses incurred in connection therewith. Unless otherwise set forth herein, the Defending Party shall have the right to settle a Third Party Infringement Claim, *provided* that neither Party shall have the right to settle any Third Party Infringement Claim under this Section 8.5 in a manner that imposes any costs or liability on, or involves any admission (other than an admission limited to the subject matter of the settlement agreement) by, the other Party or its Affiliates or its or their sublicensees, without the express written consent of such other Party (which consent shall not be unreasonably withheld, conditioned or delayed). For clarity, any admission as to the invalidity or unenforceability of intellectual property owned or Controlled by the other Party or its Affiliates shall not be considered to be an admission limited to the subject matter of the settlement agreement for purposes of the preceding sentence. In connection with any activities with respect to defense of a Third Party Infringement Claim, the Defending Party shall (a) consult with the non-Defending Party as to the strategy for the defense of such Third Party Infringement Claim, (b) consider in good faith any comments from the non-Defending Party with respect thereto, and (c) keep the non-Defending Party reasonably informed of any material steps taken, and provide copies of all material documents filed, in connection with such action.

8.5.4. Damages. Any damages or other awards, including royalties, incurred in connection with any Third Party Infringement Claim defended by a Party under this Section 8.5 such Party shall be solely responsible for paying such awards, subject to and without prejudice to Allergan's rights and obligations under Section 6.8 and Article 11, as applicable.

8.6. Patent Term Extension and Supplementary Protection Certificate. Allergan shall have the sole right to make decisions regarding, and Allergan shall have the sole right to apply for, patent term extensions, in the Territory, including the United States with respect to extensions pursuant to 35 U.S.C. § 156 et. seq. and in other jurisdictions pursuant to supplementary protection certificates, and in all jurisdictions with respect to any other extensions that are now or become available in the future, wherever applicable, for Product-Specific Patents, Joint Collaboration Patents and Allergan Collaboration Patents with respect to the Licensed Products, in each case including whether or not to so apply. In addition, Allergan shall have the right to make decisions regarding, and Allergan shall have the right to apply for, patent term extensions, in the Territory, including the United States with respect to extensions pursuant to 35 U.S.C. § 156 et. seq. and in other jurisdictions pursuant to supplementary protection certificates, and in all jurisdictions with respect to any other extensions that are now or become available in the future, wherever applicable, for Orange Book Patents that are not Product-Specific Patents, Joint Collaboration Patents or Allergan Collaboration Patents (the "**General Orange Book Patents**") with respect to the Licensed Products, in each case including whether or not to so apply, except to the extent that, on a General Orange Book Patent-by-General Orange Book Patent basis, at the time Allergan desires to elect to

apply a patent term extension to any such General Orange Book Patent with respect to a Licensed Product, (a) an application for patent term extension has already been made by Exicure or any of its Affiliates or its or their licensees with respect to a product in the applicable jurisdiction, (b) such product has already received Regulatory Approval in such jurisdiction (and such Regulatory Approval occurred prior to the Regulatory Approval of the applicable Licensed Product for which Allergan desires to elect to apply a patent term extension to such General Orange Book Patent), and (c) Exicure or any of its Affiliates or its or their licensees has elected to apply its patent term extension with respect to such product to such General Orange Book Patent. If Allergan desires to apply for a patent term extension for any Exicure Patents for which Allergan has a right to apply for patent term extension under this Section 8.6, then Allergan shall notify Exicure and shall consider in good faith Exicure's reasonable comments with respect thereto, *provided* that Allergan shall have the final decision with respect to any such listing. Exicure shall provide prompt and reasonable assistance, as requested by Allergan, including by taking such action as is required of the Regulatory Approval holder or Patent owner under any applicable Law to obtain such extension or supplementary protection certificate.

8.7. Patent Listing. Allergan shall have the full and exclusive right, in its sole discretion, to determine and control the listing of any Exicure Patents, Joint Collaboration Patents and Allergan Collaboration Patents in the then-current edition of the Orange Book, or in equivalent patent listings in any other country within the Territory, in connection with the Regulatory Approval of any Licensed Product. If Allergan desires to include in any such listing any Exicure Patents, then Allergan shall notify Exicure and shall consider in good faith Exicure's reasonable comments with respect thereto, *provided* that Allergan shall have the final decision with respect to any such listing.

8.8. Trademarks for Licensed Product.

8.8.1. Ownership. Allergan shall be solely responsible for developing, selecting, searching, registering and maintaining, and shall be the exclusive owner of, all Product Trademarks, trade dress, logos, slogans, designs, copyrights and domain names used on or in connection with Licensed Products, together with all goodwill associated with, or symbolized by, any of the foregoing.

8.8.2. Notice. Each Party shall provide to the other Party prompt written notice of any actual or threatened infringement of the Product Trademarks in the Territory and of any actual or threatened claim that the use of the Product Trademarks in the Territory violates the rights of any Third Party, in each case, of which such Party becomes aware.

8.8.3. Prosecution of Product Trademarks. Allergan shall have the sole right to register, prosecute and maintain the Product Trademarks using counsel of its own choice. All costs and expenses of registering, prosecuting and maintaining the Product Trademarks shall be borne solely by Allergan.

8.8.4. Enforcement of Product Trademarks. Allergan shall have the sole right to take such action as Allergan deems necessary against a Third Party based on any alleged, threatened or actual infringement, dilution, misappropriation or other violation of or unfair trade practices or any other like offense relating to, the Product Trademarks by a Third Party in the Territory at its

sole cost and expense and using counsel of its own choice. Allergan shall retain any damages or other amounts collected in connection therewith.

8.8.5. Third Party Claims. Allergan shall have the sole right to defend against and settle any alleged, threatened or actual claim by a Third Party that the use or registration of the Product Trademarks in the Territory infringes, dilutes, misappropriates or otherwise violates any Trademark or other right of that Third Party or constitutes unfair trade practices or any other like offense or any other claims as may be brought by a Third Party against a Party in connection with the use of the Product Trademarks with respect to a Licensed Product in the Territory at its sole cost and expense and using counsel of its own choice. Allergan shall retain any damages or other amounts collected in connection therewith.

8.8.6. Cooperation. Exicure shall, and shall cause its Affiliates to, assist and cooperate with Allergan, as Allergan may reasonably request from time to time, in connection with its activities set forth in this Section 8.8, including where necessary, joining in, or being named as a necessary party to, such action, providing access to relevant documents and other evidence and making its employees available at reasonable business hours, *provided* that Allergan shall reimburse Exicure for its reasonable and verifiable out-of-pocket costs and expenses incurred in connection therewith.

ARTICLE 9
TERM AND TERMINATION

9.1. Term. Unless terminated earlier pursuant to this Article 9, the term of this Agreement shall commence on the Effective Date and shall continue in full force and effect until (a) if both Option Exercise Periods expire without Allergan exercising either Option, the expiration of the later to expire Option Exercise Period, and (b) if either or both Options are exercised on a Licensed Product-by-Licensed Product and country-by-country basis, the expiration of the Royalty Term for such Licensed Product in such country (the "**Term**"). On a Licensed Product-by-Licensed Product and country-by-country basis, if an Option Exercise was made with respect to the applicable Collaboration Program, then upon the expiration of the Royalty Term for a Licensed Product in a country, the license granted to Allergan pursuant to Section 3.3 shall become worldwide, fully paid-up, irrevocable and perpetual with respect to such Licensed Product in such country.

9.2. Termination at Will by Allergan. Allergan shall have the right to terminate this Agreement for any reason or no reason, either in its entirety or on a Collaboration Program-by-Collaboration Program basis, at any time on ***** prior written notice to Exicure.

9.3. Material Breach.

9.3.1. In the event of a material breach of this Agreement by a Party (the "**Defaulting Party**"), the other Party (the "**Non-Defaulting Party**") shall have the right to terminate this Agreement on a Collaboration Program-by-Collaboration Program basis (if an Option Exercise has not been made with respect to the applicable Collaboration Program) or a Licensed Product-by-Licensed Product basis (if an Option Exercise has been made with respect to the applicable Collaboration Program), solely with respect to the Collaboration Program or Licensed Product to

which such material breach relates, as applicable, or with respect to this Agreement in its entirety if the material breach relates to the entire Agreement, by providing written notice to the Defaulting Party specifying the nature of such breach in reasonable detail, with such termination becoming effective upon the Non-Defaulting Party notifying the Defaulting Party of such termination not less than ***** from receipt of such notice of material breach by the Defaulting Party, unless the Defaulting Party has cured such breach within such ***** period.

9.3.2. Notwithstanding the foregoing: (a) any such ***** cure period shall be extended for an additional ***** or such longer period as is reasonably required to cure such breach if (in each case) such breach is not a failure to pay amounts due under this Agreement and the Defaulting Party is employing ongoing, Commercially Reasonable Efforts to cure such alleged material breach (which longer period shall not, in any event, be more than ***** and (b) if either Party initiates a dispute resolution procedure under Section 9.4 on or before the end of such initial ***** cure period with respect to a Party's right to terminate this Agreement pursuant to this Section 9.3 and is diligently pursuing such procedure, the cure period set forth in this Section 9.3 shall be tolled, and any termination notice from the Non-Defaulting Party shall become effective upon the Non-Defaulting Party notifying the Defaulting Party of such termination only if such alleged material breach remains uncured for ***** after the final resolution of the dispute through such dispute resolution procedure (or such longer period as is determined by the arbitrator of the dispute to be reasonably required to cure such breach if the Defaulting Party is employing ongoing, Commercially Reasonable Efforts to cure such alleged material breach).

9.4. Material Breach Dispute Resolution. Notwithstanding anything to the contrary herein, any dispute arising out of an allegation of material breach of this Agreement under Section 9.3 will be resolved as follows:

9.4.1. the Senior Officers will meet to attempt to resolve the dispute by good faith negotiations;

9.4.2. if the Senior Officers cannot resolve the dispute within ***** after a Party requests such a meeting, then either Party may seek resolution of the dispute pursuant to Section 12.3; and

9.4.3. notwithstanding anything to the contrary in this Agreement, if either Party in its sole judgment believes that any such dispute could cause it irreparable harm, such Party shall be entitled to seek equitable relief in order to avoid such irreparable harm and will not be required to follow the procedures set forth in this Section 9.4.

9.5. Insolvency.

9.5.1. Either Party may terminate this Agreement in its entirety effective immediately upon written notice to the other Party if, at any time, such other Party (a) files in any court or agency pursuant to any statute or regulation of any state or country a petition in bankruptcy or insolvency or for reorganization (except for solvent reorganization or solvent reconstruction) or for an arrangement or for the appointment of a receiver or trustee of the Party or of substantially all of its assets, (b) proposes a written agreement of composition or extension of substantially all

of its debts, (c) is served with an involuntary petition against it, filed in any insolvency proceeding, and such petition is not be dismissed within ***** after the filing thereof, (d) proposes to be a party to any dissolution or liquidation, (e) admits in writing its inability generally to meet its obligations as they fall due in the general course or (f) makes an assignment of substantially all of its assets for the benefit of creditors (each of clauses (a) through (f), an "**Insolvency Event**").

9.5.2. All rights and licenses granted under or pursuant to any section of this Agreement are, for purposes of Section 365(n) of Title 11, United States Code (the "**Bankruptcy Code**") or any analogous provisions in any other country or jurisdiction, licenses of rights to "intellectual property" as defined in the Bankruptcy Code. Upon an Insolvency Event, Exicure agrees that Allergan, as licensee of such rights under this Agreement, will retain and may fully exercise all of its rights and elections under the Bankruptcy Code. Exicure will, during the Term, create and maintain current copies or, if not amenable to copying, detailed descriptions or other appropriate embodiments, to the extent feasible, of all intellectual property licensed under this Agreement. Each Party acknowledges and agrees that "embodiments" of intellectual property within the meaning of Section 365(n) include laboratory notebooks, cell lines, product samples and inventory, research studies and data, all Regulatory Documentation and rights of reference therein, the Exicure Technology and all information related to the Exicure Technology. If (i) a case under the Bankruptcy Code is commenced by or against Exicure, (ii) this Agreement is rejected as provided in section 365 of the Bankruptcy Code and (iii) Allergan elects to retain its rights hereunder as provided in Section 365(n) of the Bankruptcy Code, Exicure (in any capacity, including debtor-in-possession) and its successors and assigns (including a trustee) will:

(a) provide Allergan with embodiments of all Exicure Technology held by Exicure and such successors and assigns, or otherwise available to them, immediately upon Allergan's written request, and Allergan will have the right to perform Exicure's obligations hereunder and exercise all of the rights of a licensee of intellectual property under section 365(n) of the Bankruptcy Code, *provided* that neither such provision nor such performance by Allergan will release Exicure from liability resulting from rejection of the license or the failure to perform such obligations; and

(b) not interfere with Allergan's rights under this Agreement, or any agreement supplemental hereto, to such intellectual property (including such embodiments), including any right to obtain such intellectual property (or such embodiments) from another entity, to the extent provided in Section 365(n) of the Bankruptcy Code.

9.5.3. All rights, powers and remedies of Allergan provided herein are in addition to and not in substitution for any other rights, powers and remedies now or hereafter existing at law or in equity (including the Bankruptcy Code) in the event of the commencement of a case under the Bankruptcy Code with respect to Exicure. The Parties intend the following rights to extend to the maximum extent permitted by applicable Law, and to be enforceable under Bankruptcy Code Section 365(n):

(a) the right of access to any intellectual property rights (including all embodiments thereof) of Exicure, or any Third Party with whom Exicure contracts to perform an obligation of Exicure under this Agreement; and

(b) the right to contract directly with any Third Party to complete the contracted work.

9.6. Termination for Patent Challenge. If Allergan or any of its Affiliates (a) commences or actively, directly and voluntarily participates in any action or proceeding (including any patent opposition or re-examination proceeding), or otherwise asserts any claim, challenging or denying the validity or enforceability of any claim of any Exicure Patent that is licensed to Allergan under this Agreement or (b) assists any other person or entity in bringing or prosecuting any action or proceeding (including any patent opposition or re-examination proceeding) challenging or denying the validity or enforceability of any claim of any such Exicure Patent (each of (a) and (b), a "**Patent Challenge**"), then Exicure shall have the right, in its sole discretion, to give notice to Allergan that Exicure may terminate the license granted to Allergan under such Exicure Patent ***** following such notice, and, unless Allergan and its Affiliates withdraw or cause to be withdrawn all such challenge(s) or in the case of *ex-parte* proceedings, multi-party proceedings, or other Patent Challenges that Allergan or its Affiliate does not have the power to unilaterally withdraw or cause to be withdrawn, Allergan and its Affiliates cease assisting any other party to such Patent Challenge and, to the extent Allergan or any of its Affiliates is a party to such Patent Challenge, it withdraws from such Patent Challenge within such ***** period, Exicure shall have the right to terminate this Agreement by providing written notice thereof to Allergan. The foregoing right to terminate the applicable license shall not apply where the Patent Challenge is the assertion of a defense or counterclaim to an action first brought by Exicure against Allergan or its Affiliate. For the avoidance of doubt, any participation by Allergan or its Affiliates or its or their employees in any claim, challenge or proceeding in response to a subpoena or as required under a pre-existing agreement between Allergan's employee(s) or consultant(s) and their prior employer(s) shall not constitute active and voluntary participation or assistance and shall not give rise to Exicure's right to terminate any license hereunder. Each Sublicense Agreement shall contain a provision that is consistent with this Section 9.6 with respect to Patent Challenges by the applicable Sublicensee. If a Sublicensee commences or actively, directly and voluntarily participates in, or assists any other person or entity in bringing or prosecuting any Patent Challenge, and fails to withdraw or cause to be withdrawn or cease assisting any other party to such Patent Challenge in accordance with the requirements of this Section 9.6, then Allergan shall terminate the sublicense granted to such Sublicensee under the applicable Exicure Patent that is the subject of such Patent Challenge.

9.7. Effect of Expiration or Termination of this Agreement.

9.7.1. Accrued Obligations. Upon expiration or termination of this Agreement for any reason neither Party shall be released from any obligation or liability that, at the time of such expiration or the Termination Date, has already accrued to the other Party or that is attributable to a period prior to such expiration or the Termination Date.

9.7.2. Termination. If either Party terminates this Agreement in accordance with this Article 9:

(a) the license and rights granted to Allergan under Section 3.3 with respect to the terminated Collaboration Program or Licensed Product (or, if the Agreement is terminated in its entirety, with respect to all Collaboration Programs and Licensed Products), shall terminate;

(b) each Party shall promptly return to the other Party or destroy such Party's Confidential Information as applicable in accordance with Section 7.3; and

(c) except as otherwise expressly provided herein all rights and obligations of each Party hereunder will cease with respect to the terminated Collaboration Program or Licensed Product (or, if the Agreement is terminated in its entirety, with respect to all Collaboration Programs and Licensed Products), including all rights, options, licenses and sublicenses granted by a Party to the other hereunder.

9.7.3. License-Back to Exicure. Notwithstanding the foregoing, if the Agreement is terminated (in whole or in part) by Allergan pursuant to Section 9.2 or by Exicure pursuant to Section 9.3, in each case, with respect to a Licensed Product being Developed or Commercialized by Allergan or its Affiliates as of the applicable Termination Date (each such Licensed Product, in the form in which it is being Developed or Commercialized by Allergan or its Affiliates as of such date, a "**Terminated Product**"), then:

(a) Allergan shall and hereby does, and shall cause its Affiliates to, effective as of the Termination Date, grant to Exicure *****

(b) unless expressly prohibited by any Regulatory Authority, as soon as reasonably practicable and consistent with all applicable ethical and legal obligations, following Exicure's written request, Allergan shall and hereby does, and shall cause its Affiliates to, transfer control to Exicure of any or all Clinical Trials involving such Terminated Product (and not involving any other proprietary product of Allergan or its Affiliates) being conducted by or on behalf of Allergan or an Affiliate as of the Termination Date, at Exicure's sole cost and expense;

(c) at Exicure's sole cost and expense, Allergan shall and hereby does, and shall cause its Affiliates to, *****and

(d) at Exicure's written request, Allergan shall, and shall cause its Affiliates to, assign to Exicure's or its designee *****

9.7.4. In-Process Clinical Trials. Notwithstanding any other provision in this Section 9.6, if Allergan or any of its Affiliates is conducting any Clinical Trial of a Licensed Product as of the Termination Date, Allergan or its applicable Affiliate shall be entitled to continue Exploiting such Licensed Product, to the extent and for the period necessary to effect, and Allergan or its

Affiliate shall effect, an orderly transfer or wind down of such Clinical Trial, in a timely manner and in accordance with applicable Laws.

9.8. Allergan Option to Continue In-Lieu of Termination. If Allergan has the right to terminate this Agreement under Section 9.3 (subject, for clarity, to Section 9.3.2), Allergan may, by notice in writing to Exicure, elect to not exercise such right and instead elect to continue this Agreement under this Section 9.8, whereupon this Agreement shall continue in full force and effect except as follows:

9.8.1. the JDC shall, at Allergan's election, either disband or become solely an information-sharing body, and Allergan shall have sole decision-making authority, in its sole discretion, over matters previously determined by the JDC, except that Section 4.6.2(b) shall continue to apply;

9.8.2. without limitation of Allergan's other remedies hereunder, any Development and Regulatory Milestone Payments, Sales Milestone Payments or Royalty Payments that are due after the Termination Date shall be reduced by ***** percent ***** after applying all applicable deductions and reductions to such payments permitted under Article 6; and

9.8.3. if such termination right arose after the Extension Exercise for a Collaboration Program, then the Option Exercise Payment payable by Allergan to Exicure shall be reduced by ***** percent ***** if Allergan chooses to exercise its Option in accordance with Section 3.1.3 for such Collaboration Program.

The Parties acknowledge and agree that the remedies set forth in this Section 9.8 are reasonable remedies, in lieu of Allergan's exercise of its termination right, for the occurrence of any of the circumstances for which Allergan has the right to terminate this Agreement under Section 9.3 as described in this Section 9.8.

9.9. Survival. Upon the expiration or termination of this Agreement for any reason, all rights and obligations of the Parties under this Agreement shall terminate, *provided* that the rights and obligations of the Parties set forth in Sections 3.8 (No Implied Rights), 6.9 (Taxes), 6.10 (Value Added Tax), 6.12 (Currency Exchange), 6.13 (Payment Method), 6.14 (Records Retention; Financial Audit; Consolidation Reporting), 6.15 (Interest on Late Payments), 6.16 (Right to Offset), 6.17 (Third Party Agreements), 6.18 (Reverse Royalty) (if applicable), 7.1 (Protection of Confidential Information), 7.2 (Certain Permitted Disclosures), 7.3 (Return of Confidential Information), 7.4 (Unauthorized Use), 7.5.2 (Public Disclosure), 8.1 (Collaboration Technology), 8.2.2 (Jointly Owned Patents), 8.2.3 (Cooperation Regarding Prosecution of Patents) (solely with respect to the Joint Collaboration Patents), 8.3.1 (Notice) (solely with respect to the Joint Collaboration Patents), 8.3.2 (Enforcement of Patents Covering Licensed Products) (solely with respect to the Joint Collaboration Patents), 8.3.4 (Cooperation Regarding Enforcement of Patents) (solely with respect to the Joint Collaboration Patents), 8.4.2 (Control of Invalidity or Unenforceability Actions Involving Orange Book Patents, Product-Specific Patents or Joint Collaboration Patents) (solely with respect to the Joint Collaboration Patents), 8.4.4 (Cooperation) (solely with respect to the Joint Collaboration Patents), 8.8.1 (Ownership), 9.1 (Term) (solely with respect to the second sentence thereof), 9.7 (Effect of Expiration or Termination of Agreement), 9.9 (Survival), 9.10 (Effect of

Termination on Sublicenses) and 10.5 (Disclaimer), and Articles 1 (Definitions) (solely to the extent necessary to give meaning to the other surviving provisions), 11 (Indemnification) and 12 (Miscellaneous), together with any other provisions that by their terms are expressly stated to survive, shall survive any such expiration or termination.

9.10. Effect of Termination on Sublicenses. If this Agreement terminates for any reason, any Sublicensee will, from the Termination Date, automatically and without any additional consideration become a direct licensee of Exicure with respect to the rights sublicensed to the Sublicensee by Allergan under this Agreement, so long as (a) such Sublicensee is not in breach of its Sublicense Agreement, (b) such Sublicensee agrees in writing to comply with all of the terms of this Agreement to the extent applicable to the rights originally sublicensed to it by Allergan, (c) such Sublicensee agrees to pay directly to Exicure such Sublicensee's payments under this Agreement to the extent applicable to the rights sublicensed to it by Allergan, and (d) Exicure shall not assume any obligations under such sublicense in excess of its obligations hereunder. The foregoing shall not apply if a Sublicensee provides written notice to Exicure that it does not wish to receive and retain the rights afforded to it pursuant to this Section 9.10. At Allergan's request, Exicure will enter into a standby license with any Sublicensee confirming the benefits conferred on such Sublicensee by this Section 9.10.

ARTICLE 10
REPRESENTATIONS AND WARRANTIES

10.1. Mutual Representations and Warranties. Each of Exicure and Allergan represents and warrants to the other Party, as of the Effective Date, that:

10.1.1. such Party is an entity duly organized, validly existing and in good standing under the Laws of the state or country (as applicable) of its organization, is qualified to do business and is in good standing as a foreign entity in each jurisdiction in which the conduct of its business or the ownership of its properties requires such qualification and failure to have such qualification would prevent it from performing its obligations under this Agreement, and has full power and authority to enter into this Agreement and to carry out the provisions hereof;

10.1.2. such Party is duly authorized, by all requisite action, to execute and deliver this Agreement and the execution, delivery and performance of this Agreement by such Party does not require any shareholder action or approval, and the Person executing this Agreement on behalf of such Party is duly authorized to do so by all requisite action;

10.1.3. except as contemplated by this Agreement, no consent, approval, order or authorization of, or registration, qualification, designation, declaration or filing with, any Governmental Authority or a Third Party is required on the part of such Party in connection with the valid execution, delivery and performance of this Agreement;

10.1.4. this Agreement is a legal and valid obligation binding upon such Party and enforceable in accordance with its terms except as enforceability may be limited by (a) bankruptcy, insolvency, reorganization, moratorium or similar Laws affecting the enforcement of creditors' rights; and (b) equitable principles of general applicability; and

10.1.5. the execution, delivery and performance by it of this Agreement and its compliance with the terms and provisions of this Agreement does not and will not conflict with or result in a breach of any of the terms or provisions of (a) any other contractual or other obligations of such Party, (b) the provisions of its operating documents or bylaws, or (c) any order, writ, injunction or decree of any Governmental Authority entered against it or by which it or any of its property is bound.

10.2. Exicure's Additional Representations and Warranties. Exicure additionally represents and warrants to Allergan, as of the Effective Date, that:

10.2.1. it has full right and authority to grant the Options, licenses and rights granted under this Agreement, without any conflicting contractual obligation to any other Person, and no other rights or licenses are required from Exicure or its Affiliates, or, to its Knowledge, any other Person, for Allergan to exercise its rights to the Exicure Technology as contemplated under this Agreement;

10.2.2. there are no Patents owned by any Third Party (other than the Exicure Patents that are owned by Northwestern, if such Exicure Patents were not Controlled by Exicure) that, to Exicure's Knowledge, would be infringed by practicing the Exicure Technology or conducting the Collaboration Programs as contemplated by this Agreement;

10.2.3. no claim or litigation has been brought or asserted against Exicure (and Exicure has no Knowledge of any such claim, whether or not brought or asserted, or of any facts or circumstances that exist that would reasonably be expected to give rise to any such claim or litigation) by any Person alleging that (a) the Exicure Patents are invalid or unenforceable or (b) the conception, Development, reduction to practice, disclosing, copying, making, assigning or licensing of the Exicure Technology existing as of the Effective Date or the Exploitation of the Exicure Technology as contemplated herein, violates, infringes, constitutes misappropriation of or otherwise conflicts or interferes with any intellectual property or proprietary right of any Person;

10.2.4. to the Knowledge of Exicure, no Person is infringing or threatening to infringe or misappropriating or threatening to misappropriate the Exicure Technology existing as of the Effective Date;

10.2.5. it has not received written notice of any claims, and there are no judgments or settlements against Exicure or, to the Knowledge of Exicure, any pending or threatened claims or litigation, in each case relating to the Exicure Technology;

10.2.6. it is the exclusive owner of, or has the right to grant to Allergan the Options, licenses and rights granted to Allergan under this Agreement under, all of the Exicure Patents set out in Exhibit C and (other than the Northwestern Agreements) none of the Options, licenses and rights granted to Allergan under this Agreement are subject to any in-license or other similar agreement with another Person regarding any intellectual property rights licensed hereunder, including the Exicure Patents existing as of the Effective Date;

10.2.7. the Exicure Patents have not been challenged by any Third Party in any judicial or administrative proceeding and, to Exicure's Knowledge, the Exicure Patents are valid and enforceable (or in the case of patent applications, applied for);

10.2.8. Exicure and its Affiliates and, to Exicure's Knowledge, its licensors (a) have complied with all applicable Laws with respect to the filing, prosecution and maintenance of the Exicure Patents, (b) have presented all relevant references, documents and information of which it is aware to the relevant patent examiner at the relevant patent office with respect to the Exicure Patents (and, to Exicure's Knowledge, all inventors of the Exicure Patents have complied with their duties of disclosure with respect thereto) and (c) have paid all maintenance and annuity fees due with respect to the Exicure Patents;

10.2.9. no dispute regarding inventorship of any Exicure Patent has been alleged or, to Exicure's Knowledge, threatened;

10.2.10. to Exicure's Knowledge, each of the Exicure Patents in Exhibit C properly identifies each and every inventor of the claims thereof as determined in accordance with the Laws of the jurisdiction in which such Exicure Patent is issued or such application is pending;

10.2.11. all current and former officers, employees, agents and consultants of Exicure or any of its Affiliates who are inventors of or have otherwise contributed in a material manner to the creation or development of any Exicure Patent in Exhibit C or Exicure Know-How or who are or will be performing Exicure's Development activities hereunder, or who may otherwise have access to any Confidential Information of Allergan, have and will have executed and delivered to Exicure or such Affiliate an assignment or other agreement regarding the protection of proprietary information and the assignment to Exicure or such Affiliate of any Exicure Patents, Exicure Know-How and any and all other information that relates to the Exicure Technology. To Exicure's Knowledge, no such current officer, employee, agent or consultant of Exicure or any of its Affiliates is in violation of any term of any assignment or other agreement regarding the protection of Patents or other intellectual property or proprietary information of Exicure or such Affiliate or of any employment contract or any other contractual obligation relating to the relationship of any such Person with Exicure;

10.2.12. the development of the Exicure Technology has been conducted by Exicure and its Affiliates and its and their subcontractors, in compliance with all applicable Law in all material respects. Neither Exicure nor any of its Affiliates, nor any of their respective officers, employees or, to Exicure's Knowledge, agents, has made an untrue statement of a material fact or fraudulent statement to any Regulatory Authority or failed to disclose a material fact required to be disclosed to any Regulatory Authority;

10.2.13. to Exicure's Knowledge it has not misappropriated any intellectual property of a Third Party in connection with its development of the Exicure Technology;

10.2.14. Exicure has not subcontracted to any Third Party any activities contemplated to be conducted by Exicure under the Development Plans other than in accordance with Section 2.5;

10.2.15. to Exicure's Knowledge neither Exicure nor any of its Affiliates, nor any of its or their respective officers, employees or contractors, has (i) committed an act, (ii) made a statement or (iii) failed to act or make a statement, in any case ((i), (ii) or (iii)), that (A) would be or create an untrue statement of material fact or fraudulent statement to the FDA or any other Regulatory Authority with respect to the Exploitation of the Exicure Technology or (B) could reasonably be expected to provide a basis for the FDA to invoke its policy respecting "Fraud, Untrue Statements of Material Facts, Bribery and Illegal Gratuities", set forth in 56 Fed. Reg. 46191 (September 10, 1991) and any amendments thereto or any analogous laws or policies in the Territory, with respect the Exploitation of the Exicure Technology;

10.2.16. except for the inventions licensed pursuant to the Northwestern Agreement, the inventions claimed by the Exicure Patents existing as of the Effective Date (a) were not conceived, discovered, developed or otherwise made in connection with any research activities funded, in whole or in part, by the federal government of the US or any agency thereof and (b) are not a "subject invention" as that term is described in 35 U.S.C. §§ Section 201(e) and (c) are not otherwise subject to the provisions of the Patent and Trademark Law Amendments Act of 1980, as amended, codified at 35 U.S.C. §§ 200-212, as amended, as well as any regulations promulgated pursuant thereto, including in 37 C.F.R. Part 401;

10.2.17. Exicure has not employed (and, to its Knowledge, has not used a contractor or consultant that has employed) any Person debarred pursuant to Section 306 of the United States Federal Food, Drug, and Cosmetic Act (or subject to a similar sanction of EMA or foreign equivalent), or any Person that is the subject of an FDA debarment investigation or proceeding (or similar proceeding of EMA or foreign equivalent), in the conduct of its activities prior to the Effective Date of this Agreement, and no action, suit, claim, investigation or legal or administrative proceeding is pending or, to the best of its Knowledge, is threatened, relating to the debarment or conviction of it or, to the best of its Knowledge, any such Person who has performed services on its behalf prior to the Effective Date;

10.2.18. the Northwestern Agreements are in full force and effect and have not been modified or amended from the versions provided to Allergan prior to the Effective Date;

10.2.19. Exicure and its Affiliates and, to Exicure's Knowledge, the counterparties to the Northwestern Agreements are in compliance, in all material respects, with the Northwestern Agreements, and no circumstances exist that could reasonably be expected to result in a breach or default of, or otherwise give rise to a termination right of any counterparty under, the Northwestern Agreements; and

10.2.20. Exicure and its Affiliates have not waived any rights under the Northwestern Agreements, and, to its Knowledge, no such rights have lapsed or otherwise expired or been terminated.

10.3. Mutual Covenants. Each Party shall perform its responsibilities under this Agreement in accordance with all applicable Laws. Without limiting the foregoing, the Parties additionally agree as follows:

10.3.1. Data Privacy. Each Party shall comply with all applicable Law with respect to the collection, use, transfer, storage, destruction, aggregation or other use of subject health information or other personal information (collectively, "**Personal Information**") in connection with its activities under or in connection with the Development and Commercialization of any Licensed Product hereunder, including any activities under or in connection with the Development Plans. Each Party shall take such steps as necessary to comply with applicable Law to permit such Party to disclose Personal Information to the other Party and to permit the other Party to use and disclose such Personal Information for its own purposes in accordance with this Agreement.

10.3.2. Compliance. Each Party shall implement appropriate processes and controls with respect to technology and work flow methodologies in connection with its activities under or in connection with the Development Plans so as to protect the security and privacy of Personal Information in accordance with applicable Law.

10.3.3. Sunshine Act. Allergan and Exicure acknowledge that, under the provisions of Section 1128G of the Social Security Act, 42 U.S.C. § 1320a-7h and other similar provisions of applicable Law, Allergan and Exicure may be required to disclose certain payments and other transfers of value provided to health care professionals and institutions, including payments, reimbursements, Materials or equipment made or provided under or in connection with this Agreement or the Development Plans. Each of Exicure and Allergan will provide the other Party with all information necessary for the other Party to comply with such applicable Laws in the form reasonably requested by the requesting Party and at such times as the requesting Party may reasonably request to satisfy its obligations.

10.3.4. Anti-Corruption. Exicure and Allergan will strictly comply with all applicable Laws concerning bribery, money laundering, or corrupt practices or which in any manner prohibit the giving of anything of value to any official, agent or employee of any government, political party or public international organization, candidate for public office, health care professional, or to any officer, director, employee or representative of any other organization specifically including the U.S. Foreign Corrupt Practices Act, and the UK Bribery Act, in each case in connection with the activities conducted pursuant to this Agreement. Exicure and Allergan shall require any contractors, subcontractors, Distributors or other persons or entities that provide services to Exicure or Allergan, respectively, in connection with this Agreement to comply with such Party's obligations under this Section 10.3.4.

10.3.5. Neither Party shall, with respect to any Development or Commercialization activities conducted hereunder, (a) commit an act, (b) make a statement or (c) fail to act or make a statement, in any case ((a), (b) or (c)), that (x) would be or create an untrue statement of material fact or fraudulent statement to the FDA or any other Regulatory Authority with respect to the Exploitation of the Exicure Technology or the Licensed Products, or (y) could reasonably be expected to provide a basis for the FDA to invoke its policy respecting "Fraud, Untrue Statements of Material Facts, Bribery and Illegal Gratuities", set forth in 56 Fed. Reg. 46191 (September 10, 1991) and any amendments thereto or any analogous laws or policies in the Territory, with respect the Exploitation of the Exicure Technology or the Licensed Products.

10.3.6. Each Party shall not employ (or, to its Knowledge, use any contractor or consultant that employs) any Person debarred pursuant to Section 306 of the United States Federal Food, Drug, and Cosmetic Act (or subject to a similar sanction of EMA or foreign equivalent), or any Person that is the subject of an FDA debarment investigation or proceeding (or similar proceeding of EMA or foreign equivalent), in the conduct of its activities under this Agreement, and such Party agrees to inform the other Party in writing promptly if it or any such Person who is performing services hereunder is debarred or is the subject of a conviction described in Section 306 or if any action, suit, claim, investigation or legal or administrative proceeding is pending or, to the best of its Knowledge, is threatened, relating to the debarment or conviction of it or any such Person performing services hereunder.

10.4. Additional Exicure Covenants. Additionally, Exicure covenants to Allergan that:

10.4.1. Exicure shall ensure there are no amounts that will be required to be paid by Allergan to a Third Party as a result of the Exploitation of the Exicure Technology in accordance with the terms and conditions of this Agreement that arise directly out of any agreement to which Exicure or any of its Affiliates is a party;

10.4.2. Exicure shall not enter into any agreement with any Third Party that is in conflict with the Options, licenses or rights granted to Allergan under this Agreement, and shall not take any action that would in any way prevent it from granting the Options, licenses or rights granted to Allergan under this Agreement;

10.4.3. Exicure and its Affiliates shall fulfill their obligations under the Exicure Third Party Agreements and shall not, without the prior written consent of Allergan, take any action or make any omission that would reasonably be expected to give rise to a termination right of any Third Party under any of the Exicure Third Party Agreements, including pursuant to Section 10.6 of the Northwestern 2011 Agreement or Section 10.6 of the Northwestern 2014 Agreement, unless termination would not affect Exicure's license under the applicable Exicure Third Party Agreement to any Third Party IP;

10.4.4. Exicure and its Affiliates shall not terminate any Exicure Third Party Agreement without Allergan's prior written consent, unless such termination would not affect Exicure's license under the applicable Exicure Third Party Agreement to Third Party IP;

10.4.5. Exicure and its Affiliates shall not modify or amend any Exicure Third Party Agreement, or waive any of its rights under any Exicure Third Party Agreement, in a manner that could reasonably be expected to adversely affect any of Allergan's rights or obligations under this Agreement, without Allergan's prior written consent;

10.4.6. Exicure and its Affiliates shall (a) provide prompt written notice (and in any event within two days) to Allergan if Exicure receives notice from Northwestern (pursuant to Sections 2.8.1 and 2.8.2 of the Northwestern 2011 Agreement) regarding any Reverted Subject Matter (as defined in the Northwestern 2011 Agreement) that is necessary or useful to Exploit products for Hair Loss Disorders, (b) consult with Allergan in good faith following delivery of such

notice, and (c) at Allergan's request, use commercially reasonable efforts to obtain a license to such Reverted Subject Matter under economic terms to be negotiated by the Parties in good faith;

10.4.7. Exicure and its Affiliates shall not, without the prior written consent of Allergan, take any action or make any omission that would reasonably be expected to result in the loss or abandonment of any rights to the Exicure Technology under any Exicure Third Party Agreement (except, subject to Article 8, for any loss or abandonment resulting from ceasing to prosecute or maintain a Patent in the exercise of Exicure's reasonable business judgment), including pursuant to Sections 7.2 or 7.3 of the Northwestern 2011 Agreement or Section 7.2 of the Northwestern 2014 Agreement; and

10.4.8. Exicure shall promptly furnish Allergan with copies of all notices and correspondence that Exicure or any of its Affiliates receives from, or sends to, the applicable Third Party counterparty in connection with any Exicure Third Party Agreement that could reasonably be expected to affect any of Allergan's rights or obligations under this Agreement, including any notice pursuant to Sections 2.8, 4.3, 5.8, 7.1, 7.2, 8.1, 8.2, 8.5 or 12.1 or Article 10 of the Northwestern 2011 Agreement or Sections 4.3, 5.5, 7.1, 7.2, 8.1, 8.2, 8.5 or 12.1 or Article 10 of the Northwestern 2014 Agreement; *provided* that Exicure may redact financial and confidential portions of any such notices and correspondence and any other information contained in such notices and correspondence that could not reasonably be expected to adversely affect any of Allergan's rights or obligations under this Agreement.

10.5. Disclaimer. EXCEPT AS OTHERWISE EXPRESSLY SET FORTH IN THIS ARTICLE 10, NEITHER PARTY MAKES ANY REPRESENTATION OR EXTENDS ANY WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY THAT ANY PATENTS ARE VALID OR ENFORCEABLE, AND EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, EXCEPT AS OTHERWISE EXPRESSLY SET FORTH IN THIS ARTICLE 10, EACH PARTY DISCLAIMS ANY WARRANTIES WITH REGARD TO: (A) THE SUCCESS OF THE COLLABORATION PROGRAMS OR ANY COMPOUNDS OR LICENSED PRODUCTS EXPLOITED UNDER THIS AGREEMENT, (B) THE SAFETY OR USEFULNESS FOR ANY PURPOSE OF THE TECHNOLOGY OR MATERIALS IT PROVIDES OR DISCOVERS UNDER THIS AGREEMENT AND (C) THE VALIDITY, ENFORCEABILITY, OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS OR TECHNOLOGY IT PROVIDES OR LICENSES TO THE OTHER PARTY UNDER THIS AGREEMENT.

ARTICLE 11
INDEMNIFICATION

11.1. Exicure. Exicure shall defend, indemnify and hold harmless Allergan, its Affiliates and their respective directors, officers, employees and agents, and their respective successors, heirs and assigns (collectively, the "**Allergan Indemnitees**"), at Exicure's cost and expense, from and against any and all losses, costs, damages, fees or expenses (including reasonable attorney's fees and expenses) ("**Losses**") incurred in connection with or arising out of any Third Party claims, suits

or demands ("**Third Party Claims**") against any Allergan Indemnitees arising out of or in connection with:

(a) Exicure's performance of its activities under the Collaboration Programs;

(b) the alleged misappropriation or infringement of any intellectual property rights of any Third Party arising from the practice of the Exicure Platform;

(c) any breach by Exicure of the representations, warranties, obligations or covenants contained in this Agreement;

(d) any negligence or willful misconduct of Exicure or any Exicure Indemnitees in the exercise of any of its rights or the performance of any of its obligations under this Agreement;

(e) the Exploitation of any Terminated Product by Exicure, its Affiliates or its or their sublicensees; or

(f) any breach by Exicure or any of its Affiliates of any Exicure Third Party Agreement;

in each case, except to the extent that such Losses are (i) subject to indemnification by Allergan pursuant to Section 11.2 below; or (ii) or attributable to the negligence or willful misconduct or breach of applicable Laws of any Allergan Indemnitee.

11.2. Allergan. Allergan shall defend, indemnify and hold harmless Exicure, its Affiliates and their respective directors, officers, employees and agents, and their respective successors, heirs and assigns (collectively, the "**Exicure Indemnitees**"), at Allergan's cost and expense, from and against any and all Losses which are incurred in connection with or arising out of any Third Party Claims against any Exicure Indemnitees arising out of or in connection with:

(a) the Development or Commercialization of Compounds or Licensed Products by Allergan, its Affiliates or Sublicensees;

(b) any breach by Allergan of the representations, warranties, obligations or covenants contained in this Agreement; or

(c) any negligence or willful misconduct of Allergan or any Allergan Indemnitees in the exercise of any of its rights or the performance of any of its obligations under this Agreement;

in each case, except to the extent that such Losses are (i) subject to indemnification by Exicure pursuant to Section 11.1 above; or (ii) or attributable to the negligence or willful misconduct or breach of applicable Laws of any Exicure Indemnitee.

11.3. Notice of Claim. All indemnification claims in respect of any person seeking indemnification under Section 11.1 or 11.2 (collectively, the "**Indemnitees**" and each an "**Indemnitee**") shall be made by the corresponding Party (the "**Indemnified Party**"). The Indemnified Party shall give the indemnifying Party (the "**Indemnifying Party**") prompt written notice (an "**Indemnification Claim Notice**") of any Losses or the discovery of any fact upon which such Indemnified Party intends to base a request for indemnification under Section 11.1 or 11.2, but in no event shall the Indemnifying Party be liable for any Losses that result from any delay by the Indemnified Party in providing such notice that materially prejudices the defense of such Third Party Claim. Each Indemnification Claim Notice must contain a description of the claim and the nature and amount of such Losses (to the extent that the nature and amount of such Losses are known at such time). Together with the Indemnification Claim Notice, the Indemnified Party shall furnish promptly to the Indemnifying Party copies of all notices and documents (including court papers) received by any Indemnitee in connection with the Third Party Claim. The Indemnifying Party shall not be obligated to indemnify the Indemnified Party to the extent any admission or statement made by the Indemnified Party materially prejudices the defense of such Third Party Claim.

11.4. Indemnification Procedure. In respect of Third Party Claims, the obligations of an Indemnifying Party under this Section 11.4 shall be governed by and contingent upon the following:

(a) At its option, the Indemnifying Party may assume control of the defense of any Third Party Claim (which, for the avoidance of doubt, shall include the conduct of all dealings with such Third Party) by giving written notice to the Indemnified Party within 30 days after the Indemnifying Party's receipt of an Indemnification Claim Notice. The assumption of control of the defense of a Third Party Claim by the Indemnifying Party shall not be construed as an acknowledgement that the Indemnifying Party is liable to indemnify any Indemnitee in respect of the Third Party Claim, nor shall it constitute a waiver by the Indemnifying Party of any defenses it may assert against any Indemnified Party's claim for indemnification.

(b) Upon the assumption of the control of the defense of a Third Party Claim by the Indemnifying Party:

(i) subject to the provisions of Section 11.4(c), it shall have the right to and shall assume sole control and responsibility for dealing with the Third Party and the Third Party Claim, including the right to settle the claim on any terms the Indemnifying Party chooses, but at all times in accordance with the provisions of Sections 11.4(c) and (d);

(ii) if it chooses, the Indemnifying Party may appoint as counsel in the defense of the Third Party Claim any law firm or counsel selected by the Indemnifying Party; and

(iii) except as expressly provided in Section 11.4(c), the Indemnifying Party shall not be liable to the Indemnified Party for any legal expenses subsequently incurred by such Indemnified Party or any Indemnitee in connection with the analysis, defense or

settlement of the Third Party Claim. In the event that it is ultimately determined that the Indemnifying Party is not obligated to indemnify, defend or hold harmless an Indemnitee from and against the Third Party Claim, the Indemnified Party shall reimburse the Indemnifying Party for any and all costs and expenses (including lawyers' fees and costs of suit) and any Losses incurred by the Indemnifying Party in its defense of the Third Party Claim with respect to such Indemnified Party or Indemnitee.

(c) Without limiting the remainder of this Section 11.4, any Indemnitee shall be entitled to participate in, but not control, the defense of a Third Party Claim and to retain counsel of its choice for such purpose, *provided* that such retention shall be at the Indemnitee's own cost and expense unless (i) the Indemnifying Party has failed to assume the defense and retain counsel in accordance with Section 11.4(a) (in which case the Indemnified Party shall control the defense), or (ii) the interests of the Indemnitee and the Indemnifying Party with respect to such Third Party Claim are sufficiently adverse to prohibit the representation by the same counsel of both Parties under any legal requirement, ethical rules or equitable principles.

(d) With respect to any Losses relating solely to the payment of money to the Third Party to settle the Third Party Claim and that will not result in the Indemnified Party or the Indemnitee becoming subject to injunctive relief or any admission of wrongdoing or of the invalidity or unenforceability of intellectual property owned or Controlled by the Indemnified Party, and as to which the Indemnifying Party shall have acknowledged in writing the obligation to indemnify the Indemnitee under Section 11.4(a), the Indemnifying Party shall have authority to consent to the entry of any judgment, enter into any settlement or otherwise dispose of such Losses. With respect to all other Losses or where the Indemnified Party will be subject to injunctive relief or any admission of wrongdoing or of the invalidity or unenforceability of intellectual property owned or Controlled by the Indemnified Party, where the Indemnifying Party has assumed the defense of a Third Party Claim in accordance with Section 11.4(a), the Indemnifying Party will not consent to the entry of any judgment, enter into any settlement or otherwise dispose of such Losses, unless it obtains the prior written consent of the Indemnified Party (which consent shall not be unreasonably withheld, conditioned or delayed).

(e) If the Indemnifying Party chooses not to take control of the defense or prosecute any Third Party Claim, the Indemnified Party shall retain control of the defense thereof, but no Indemnified Party or Indemnitee shall admit any liability with respect to, or settle, compromise or discharge, any such Third Party Claim without the prior written consent of the Indemnifying Party, which consent shall not be unreasonably withheld, conditioned or delayed. The Indemnifying Party shall not be liable for any settlement or other disposition of Losses by an Indemnified Party or an Indemnitee under

such a Third Party Claim that is reached without the written consent of the Indemnifying Party, which consent will not be unreasonably withheld, conditioned or delayed.

(f) If the Indemnifying Party chooses to control the defense of any Third Party Claim, the Indemnified Party shall, and shall cause each other Indemnitee to, reasonably cooperate in the defense thereof and shall furnish such records, information and testimony, provide such witnesses and attend such conferences, discovery proceedings, hearings, trials and appeals as may be reasonably requested in connection therewith. Such cooperation shall include access during normal business hours by the Indemnifying Party to, and reasonable retention by the Indemnified Party of, records and information that are reasonably relevant to such Third Party Claim, and making the Indemnified Party, the Indemnitees and its and their employees and agents available on a mutually convenient basis to provide additional information and explanation of any records or information, to the extent the Third Party Claim is subject to indemnification hereunder.

11.5. Expenses. Except as expressly provided above, the reasonable and verifiable out-of-pocket costs and expenses, including fees and disbursements of counsel, incurred by the Indemnified Party where it participates in the defense under Sections 11.4(b)(i) or 11.4 11.4(b)(ii) or cooperates pursuant to Section 11.4(f) shall be reimbursed on a quarterly basis by the Indemnifying Party, without prejudice to the Indemnifying Party's right to contest the Indemnified Party's right to indemnification and subject to refund in the event the Indemnifying Party is ultimately held not to be obligated to indemnify the Indemnified Party.

11.6. Insurance. Each Party shall have and maintain, at its sole cost and expense, an adequate liability insurance policy (including product liability insurance) obtained from a reputable insurer to protect against potential liabilities and risk arising out of activities to be performed under this Agreement and any agreement related hereto and upon such terms (including coverages and deductible limits) as are customary in the pharmaceutical industry generally for the activities to be conducted by such Party under this Agreement. Such liability insurance shall insure against all types of liability, including personal injury, physical injury or property damage arising out of such Party's activities hereunder. This Section 11.6 shall not create any limitation on the Parties' liability under this Agreement. Such insurance information shall be kept in confidence in the same manner as any other Confidential Information disclosed by the Parties hereunder. Notwithstanding anything to the contrary in this Section 11.6, Allergan shall have the right to self-insure with respect to its liabilities under this Agreement.

11.7. Consequential Damages.

11.7.1. EXCEPT IN THE EVENT OF THE GROSS NEGLIGENCE, WILLFUL MISCONDUCT OR FRAUD OF A PARTY, IN NO EVENT SHALL EITHER PARTY OR THEIR AFFILIATES BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE, TREBLE OR CONSEQUENTIAL DAMAGES OR INDIRECT LOST PROFITS, WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY; *PROVIDED*, *HOWEVER*, THAT THIS

LIMITATION SHALL NOT LIMIT (A) EITHER PARTY'S LIABILITY FOR BREACHES OF CONFIDENTIALITY OBLIGATIONS UNDER ARTICLE 7, (B) EITHER PARTY'S LIABILITY FOR BREACHES OF ITS RESPECTIVE EXCLUSIVITY OBLIGATIONS UNDER SECTION 3.5 OR (C) THE INDEMNIFICATION OBLIGATION OF EITHER PARTY IN RESPECT OF AMOUNTS ACTUALLY AWARDED AGAINST AN INDEMNIFIED PARTY AS A PART OF A THIRD PARTY CLAIM UNDER THE PROVISIONS OF THIS ARTICLE 11.

11.7.2. Nothing in this Agreement shall limit a Party's liability for death or personal injury caused by its negligence or for fraud.

ARTICLE 12
MISCELLANEOUS

12.1. Assignment. Neither Party may assign or transfer (whether by operation of applicable Law or otherwise) this Agreement or any rights or obligations hereunder without the prior written consent of the other Party, except that a Party may make such an assignment without the other Party's consent, in whole or in part, to an Affiliate or to a successor to substantially all of the business to which this Agreement relates, whether in a merger, sale of stock, sale of assets, reorganization or other transaction. Further, Allergan shall have the right to cause the performance by an Affiliate of some or all of Allergan's obligations hereunder, without the prior written consent of Exicure; *provided, however*, Allergan will be responsible and liable for any and all acts or omissions of any such Affiliate which, if such action or omission was by Allergan, would constitute a breach of the terms and conditions hereof. In all cases, the assigning Party shall provide the other Party with prompt written notice of any such assignment and the permitted assignee shall assume the obligations of the assigning Party hereunder in writing. No assignment of this Agreement shall act as a novation or release of either Party from responsibility for the performance of any accrued obligations.

12.2. Governing Law. This Agreement and any dispute or claim arising out of or in connection with it (whether contractual or non-contractual in nature such as claims in tort, from breach of statute or regulation or otherwise) shall be governed by and construed in accordance with the laws of the State of New York, excluding any conflicts or choice of law rule or principle that might otherwise refer construction or interpretation of this Agreement to the substantive law of another jurisdiction. Notwithstanding the foregoing, any dispute with respect to infringement, validity, or enforceability of any Patent shall be governed by and construed and enforced in accordance with the laws of the jurisdiction in which such Patent is issued or published.

12.3. Dispute Resolution.

12.3.1. Subject to Section 9.4, any dispute or claim arising out of or in connection with this Agreement (including any question regarding the Agreement's existence, validity or termination), other than a dispute or claim (a) that may arise under Section 8.1, (b) that relates to the scope, construction, validity, or enforceability of any Patent in a country within the Territory, (c) that otherwise requires the interpretation or application of applicable Law regarding Patents to resolve such dispute or claim, (d) for which a Party or other Person has been granted final decision-making authority hereunder or (e) that is specified in Section 4.6.2(b), shall be referred to and finally

resolved by arbitration under this Section 12.3. The place of arbitration shall be New York. The language to be used in the arbitration procedures shall be English. The arbitrator(s) shall have experience in pharmaceutical licensing disputes. The arbitration proceedings, including any outcome, shall be confidential. Nothing in this Section 12.3 will preclude either Party from seeking equitable interim or provisional relief from a court of competent jurisdiction including a temporary restraining order, preliminary injunction or other interim equitable relief, concerning a dispute either prior to or during any arbitration if necessary to protect the interests of such Party or to preserve the status quo pending the arbitration proceeding.

12.3.2. With respect to any dispute or claim that is subject to this Section 12.3, such dispute or claim shall be finally resolved by arbitration pursuant to the rules of the International Chamber of Commerce, which are deemed incorporated into this Section 12.3.2. The number of arbitrators shall be three, of which each Party shall appoint one, the arbitrators so appointed will select the third and final arbitrator. The arbitrators shall be requested to render their decision within 90 days after the arbitrators declare the hearing closed, which decision shall include a written statement describing the essential findings and conclusions on which the decision is based. The decision rendered by the arbitrators shall be final, binding and non-appealable, and judgment may be entered upon it in any court of competent jurisdiction. Each Party shall bear its own attorney's fees, costs, and disbursements arising out of the arbitration, and shall pay an equal share of the fees and costs of the arbitrators.

12.4. Force Majeure. Neither Party shall be liable to the other for any failure or delay in the fulfillment of its obligations under this Agreement (other than the payment of monies due and owing to a Party under this Agreement), when any such failure or delay is caused by fire, flood, earthquakes, explosions, sabotage, terrorism, civil commotions, riots, invasions, wars, peril of the sea or requirements of Governmental Authorities (each, a "**Force Majeure Event**"). In the event that either Party is prevented from discharging its obligations under this Agreement on account of a Force Majeure Event, the performing Party shall promptly notify the other Party, and such other Party shall use good faith efforts to discharge its obligations, even if in a partial or compromised manner.

12.5. Expenses. Except as otherwise expressly provided herein or mutually agreed, all costs and expenses incurred in connection with this Agreement and the transactions contemplated hereby shall be borne by the Party incurring such costs and expenses.

12.6. No Agency. Nothing herein contained shall be deemed to create an agency, joint venture, amalgamation, partnership or similar relationship between Exicure and Allergan, including for tax purposes. Notwithstanding any of the provisions of this Agreement, neither Party shall at any time enter into, incur, or hold itself out to Third Parties as having authority to enter into or incur, on behalf of the other Party, any commitment, expense, or liability whatsoever, and all contracts, expenses and liabilities undertaken or incurred by one Party in connection with or relating to the Development, Manufacture or Commercialization of Licensed Product shall be undertaken, incurred or paid exclusively by that Party, and not as an agent or representative of the other Party.

12.7. No Third Party Beneficiaries. The warranties and agreements contained in this Agreement are for the sole benefit of the Parties, and in Allergan's case, Allergan's Affiliates, and

their respective successors and permitted assigns, and they shall not be construed as conferring any rights to any other Persons other than, with respect to the Parties' obligations in Sections 11.1 and 11.2, the other Persons expressly referenced as indemnitees thereunder.

12.8. Entire Agreement; Amendment. This Agreement (including all schedules and exhibits hereto) constitutes the entire agreement between the Parties with respect to the subject matter hereof and supersedes all prior agreements or understandings, oral or written, with respect to such matters. The Parties acknowledge that this Agreement has not been entered into wholly or partly in reliance on, nor has either party been given, any warranty, statement, promise or representation by the other or on its behalf other than as expressly set out in this Agreement. This Agreement may be amended or modified only by a writing signed by both Parties.

12.9. Severability. If any provision of this Agreement is held to be illegal, invalid or unenforceable under any present or future law and if the rights or obligations of either Party under this Agreement will not be materially and adversely affected thereby, (a) such provision shall be fully severable, (b) this Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part hereof, (c) the remaining provisions of this Agreement shall remain in full force and effect and shall not be affected by the illegal, invalid or unenforceable provision or by its severance herefrom, and (d) in lieu of such illegal, invalid or unenforceable provision, there shall be added automatically as a part of this Agreement a legal, valid and enforceable provision as similar in terms to such illegal, invalid or unenforceable provision as may be possible and reasonably acceptable to the Parties. To the fullest extent permitted by applicable Law, each Party hereby waives any provision of law that would render any provision hereof illegal, invalid or unenforceable in any respect.

12.10. Extension; Waiver. At any time, either Exicure or Allergan may (a) with respect to obligations owed to it or the performance of other acts for its benefit, extend the time for the performance of such obligations or such other acts to be performed hereunder by the other, (b) waive any inaccuracies in the representations and warranties of the other contained herein or in any document delivered pursuant hereto and (c) waive compliance with any of the conditions to the obligations of the other contained herein. Any agreement on the part of either Party to any such extension or waiver shall be valid only if set forth in an instrument executed by such Party. No such waiver shall be operative as a waiver of any other subsequent requirement of this Agreement. The failure of any Party to assert any of its rights under this Agreement or otherwise shall not constitute a waiver of such rights.

12.11. Notices. All communications required to be made under this Agreement shall be effective upon receipt, and shall be sent to the addresses set out below, or to such other addresses as may be designated by one Party to the other by notice pursuant hereto, by (a) internationally recognized overnight courier; or (b) prepaid registered or certified US mail, return receipt requested:

If to Exicure, as follows:

Exicure, Inc.
8045 Lamon Avenue, Suite 410
Skokie, IL 60077

Attention: CFO
With a copy (which shall not constitute notice) to:

Fenwick & West LLP
801 California Street
Mountain View, CA 94041
Attention: *****
If to Allergan, as follows:

Allergan Pharmaceuticals International Limited
Clonshaugh Business & Technology Park
Dublin 17, D17 E400, Ireland.
Attention: General Manager
Secretary
with copies (which shall not constitute notice) to:

Allergan plc
5 Giralda Farms
Madison, NY 07940
Attention: General Counsel
and

Ropes & Gray LLP
Prudential Tower
800 Boylston Street
Boston, MA 02199
Attention: *****

12.12. Further Assurances. Each Party shall perform all further acts and execute and deliver such further documents as may be necessary or as the other Party may reasonably require to implement or give effect to this Agreement.

12.13. No Strict Construction. This Agreement shall be construed as if it were drafted jointly by the Parties.

12.14. Headings. The headings herein are for convenience purposes only and shall not be used to interpret any of the provisions hereof.

12.15. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original and all of which taken together shall be deemed to constitute one and the same instrument. An executed signature page of this Agreement delivered by facsimile transmission or by electronic mail in "portable document format" (".pdf") shall be as effective as an original executed signature page.

12.16. Non-Exclusive Remedies. The remedies set forth in this Agreement shall be in addition to, and shall not be to the exclusion of, any other remedies available to the Parties at Law, in equity or under this Agreement.

{*Signature page follows*.}

IN WITNESS WHEREOF this Agreement has been signed by the duly authorized representatives of the Parties as of the Effective Date.

EXICURE, INC.

/s/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.

President and Chief Executive Officer

ALLERGAN PHARMACEUTICALS INTERNATIONAL LIMITED

/s/ Francis Bates

Francis Bates

Director

EXHIBIT A

Targets for Collaboration Programs

Collaboration Program	Targets
1	*****
2	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

EXHIBIT B

Development Plans *****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

EXHIBIT C

Exicure Patents

Filing Date	Application Number	Patent Number	Country	Status	Title
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****	*****	*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE “COMMISSION”) PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH “*****”.

Filing Date	Application Number	Patent Number	Country	Status	Title
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****
*****	*****		*****	*****	*****

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

EXHIBIT D

Knowledge Parties

For Exicure:

- Exicure's Chief Executive Officer or person having the equivalent position.
- Exicure's Chief Financial Officer or person having the equivalent position.
- Exicure's Chief Operating Officer or person having the equivalent position.

For Allergan:

- Allergan's Global Chief Compliance Officer or person having the equivalent position.

Schedule 3.10

Provisions of Northwestern Agreements

Northwestern 2011 Agreement (as modified by the Northwestern Side Agreement):

- Section 2.6, with respect to subcontractors of Allergan and its Affiliates
- Section 2.7, with respect to sublicenses granted by Allergan or its Affiliates
- Section 6.1
- Sections 8.1 through 8.3, in the case of enforcement by Allergan or its Affiliates of any of the Patent Rights (as defined in the Northwestern 2011 Agreement) in accordance with this Agreement and the Northwestern Side Agreement

Northwestern 2014 Agreement (as modified by the Northwestern Side Agreement):

- Section 2.6, with respect to subcontractors of Allergan and its Affiliates
- Section 2.7, with respect to sublicenses granted by Allergan or its Affiliates
- Section 6.1
- Sections 8.1 through 8.3, in the case of enforcement by Allergan or its Affiliates of any of the Patent Rights (as defined in the Northwestern 2014 Agreement) in accordance with this Agreement and the Northwestern Side Agreement

Schedule 7.5.1(c)

Press Release

Exicure and Allergan Enter into Collaboration, Option and License Agreement to Discover and Develop SNA-based Treatments for Hair Loss Disorders

- *Exicure to Receive $25 Million Upfront Payment and Up to $725 Million in potential Milestones*
- *Exicure to Host Conference Call Today at 8:30am ET/7:30am CT*

CHICAGO, Ill. [DATE] -- Exicure, Inc., (NASDAQ:XCUR) a pioneer in gene regulatory and immunotherapeutic drugs utilizing spherical nucleic acid (SNA™) technology, today announced that Allergan's wholly-owned subsidiary, Allergan Pharmaceuticals International Limited, and Exicure, Inc. have entered into a global collaboration agreement to discover and develop novel treatments for hair loss disorders based on Exicure's proprietary SNA technology.

Under the terms of the agreement, Allergan will receive exclusive access and options to license SNA-based therapeutics arising from two collaboration programs related to the treatment of hair loss disorders. Exicure will receive an upfront payment of $25 million and will conduct discovery and development in two collaboration programs for hair loss disorders. In the event that Allergan exercises an option, Allergan will be responsible for clinical development and commercialization of the licensed products. Exicure will be eligible to receive development and regulatory milestones of up to $97.5 million per program and commercial milestones of up to $265 million per program. Exicure will also be eligible to receive tiered royalties on worldwide net product sales of mid-single digit to mid-teens percentages on worldwide net product sales.

"We are excited to combine our knowledge of nucleic acid therapeutics with Allergan's deep expertise in medical aesthetics to develop and commercialize innovative treatments for hair loss disorders." said Dr. David Giljohann, chief executive officer of Exicure. "This collaboration is an exciting opportunity to advance Exicure's SNA technology in an important new therapeutic area."

Additional Details about the Collaboration and Hair Loss Program

One of the most common hair loss disorders and a subject of the collaboration is androgenetic alopecia also known as pattern baldness, affecting approximately 50 million men and 30 million women in the United States. It is estimated that over $3.5 billion a year is spent on treatments, the majority of which are ineffective.

Conference Call Today at 8:30am ET/7:30am CT

Exicure will hold a conference call at 8:30am ET to discuss the strategic collaboration announced today. A live webcast of the conference call can be accessed in the Investors section of the company's website at www.exicuretx.com. To participate in the conference call, please dial XXX-XXX-XXXX or XXX-XXX-XXXX five minutes prior to start time. The conference ID is XXXXXX. An archived version of the webcast will be available on Exicure's website for 30 days.

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

About Allergan plc

Allergan plc (NYSE: AGN), headquartered in Dublin, Ireland, is a global pharmaceutical leader focused on developing, manufacturing and commercializing branded pharmaceutical, device, biologic, surgical and regenerative medicine products for patients around the world. Allergan markets a portfolio of leading brands and best-in-class products primarily focused on four key therapeutic areas including medical aesthetics, eye care, central nervous system and gastroenterology. As part of its approach to delivering innovation for better patient care, Allergan has built one of the broadest pharmaceutical and device research and development pipelines in the industry.

With colleagues and commercial operations located in approximately 100 countries, Allergan is committed to working with physicians, healthcare providers and patients to deliver innovative and meaningful treatments that help people around the world live longer, healthier lives every day.

For more information, visit Allergan's website at www.Allergan.com.

About Exicure

Exicure, Inc. is a clinical-stage biotechnology company developing therapeutics for immuno-oncology, inflammatory diseases and genetic disorders based on our proprietary Spherical Nucleic Acid, or SNA technology. Exicure believes that its proprietary SNA architecture has distinct chemical and biological properties that may provide advantages over other nucleic acid therapeutics and may have therapeutic potential to target diseases not typically addressed with other nucleic acid therapeutics. Exicure's lead program is in a Phase 1b/2 trial in patients with advanced solid tumors. Exicure is based outside of Chicago, IL and in Cambridge, MA.

For more information, visit Exicure's website at www.exicuretx.com.

Exicure Forward-Looking Statements

This press release contains forward-looking statements (including within the meaning of Section 21E of the United States Securities Exchange Act of 1934, as amended, and Section 27A of the United States Securities Act of 1933, as amended) concerning the Company, the Company's technology, potential therapies, cash requirements and other matters. Forward-looking statements generally include statements that are predictive in nature and depend upon or refer to future events or conditions, and include words such as "may," "will," "should," "would," "expect," "plan," "believe," "intend," "look forward," and other similar expressions among others. Statements that are not historical facts are forward-looking statements. Forward-looking statements are based on current beliefs and assumptions that are subject to risks and uncertainties and are not guarantees of future performance. Actual results could differ materially from those contained in any forward-looking statement as a result of various factors, including, without limitation: unexpected costs,

charges or expenses that reduce cash runway; that Exicure's pre-clinical or clinical programs do not advance or result in approved products on a timely or cost effective basis or at all; the cost, timing and results of clinical trials; that many drug candidates that have completed Phase 1 trials do not become approved drugs on a timely or cost effective basis or at all; the ability to enroll patients in clinical trials; possible safety and efficacy concerns; regulatory developments; and the ability of Exicure to protect its intellectual property rights. Risks facing the Company and its programs are set forth in the Company's filings with the SEC. Except as required by applicable law, the Company undertakes no obligation to revise or update any forward-looking statement (including without limitation its cash runway guidance) or to make any other forward-looking statements, whether as a result of new information, future events or otherwise.

EXICURE CONTACTS:

Investors:
Stern Investor Relations
Kerry Conlin
212-362-1200
kerry.conlin@sternir.com

Media:
MacDougall
Karen Sharma
781-235-3060
ksharma@macbiocom.com

THE COMPANY HAS REQUESTED AN ORDER FROM THE SECURITIES AND EXCHANGE COMMISSION (THE "COMMISSION") PURSUANT TO RULE 406 UNDER THE SECURITIES ACT OF 1933, AS AMENDED, GRANTING CONFIDENTIAL TREATMENT TO SELECTED PORTIONS. ACCORDINGLY, THE CONFIDENTIAL PORTIONS HAVE BEEN OMITTED FROM THIS EXHIBIT, AND HAVE BEEN FILED SEPARATELY WITH THE COMMISSION. OMITTED PORTIONS ARE INDICATED IN THIS EXHIBIT WITH "*****".

Exhibit 21.1

Subsidiaries of Exicure, Inc.

Name:	**Jurisdiction of Organization:**
Exicure Operating Company	Delaware

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

The Board of Directors

Exicure, Inc.:

We consent to the incorporation by reference in the registration statements (No. 333-222999) on Form S-8 and (No. 333-230175) on Form S-3, as amended, of Exicure, Inc. of our report dated March 9, 2020, with respect to the consolidated balance sheets of Exicure, Inc. and subsidiary as of December 31, 2019 and 2018, the related consolidated statements of operations, comprehensive loss, changes in stockholders' equity, and cash flows for each of the years in the two-year period ended December 31, 2019, and the related notes, which report appears in the December 31, 2019 annual report on Form 10-K of Exicure, Inc. Our report dated March 9, 2020, on the consolidated financial statements refers to the adoption of Financial Accounting Standards Board Accounting Standards Codification (ASC) Topic 842, *Leases*.

/s/ KPMG LLP

Chicago, Illinois

March 9, 2020

Exhibit 31.1

CERTIFICATIONS

I, David A. Giljohann, Ph.D., certify that:

1. I have reviewed this Annual Report on Form 10-K of Exicure, 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/ David A. Giljohann, Ph.D.

David A. Giljohann, Ph.D.

President and Chief Executive Officer

Exhibit 31.2

CERTIFICATIONS

I, David S. Snyder, certify that:

1. I have reviewed this Annual Report on Form 10-K of Exicure, 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 my 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/ David S. Snyder

David S. Snyder

Chief Financial Officer

Exhibit 32.1

SECTION 1350 CERTIFICATIONS*

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), David A. Giljohann, Ph. D., President and Chief Executive Officer of Exicure, Inc. (the "Company"), and David S. Snyder, 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 year 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 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.

Dated: March 9, 2020

/s/ David A. Giljohann, Ph.D.	/s/ David S. Snyder
David A. Giljohann, Ph.D.	**David S. Snyder**
President and Chief Executive Officer	**Chief Financial Officer**

* This certification accompanies the Annual Report on 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 the Company 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 Annual Report on Form 10-K), irrespective of any general incorporation language contained in such filing.