UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

WASHINGTON, DC 20549

Form 10-K

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

For the fiscal year ended December 31, 2019

or

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

For the transition period from _____ to _____

Commission file number: 001-34962

Zogenix, Inc.

Delaware (State of Incorporation)	**20-5300780** (I.R.S. Employer Identification No.)
5959 Horton Street, Suite 500 Emeryville, California	**94608**

(510) 550-8300

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

Title of each class	Trading symbol	Name of exchange registered
Common Stock, $0.001 par value per share	ZGNX	The Nasdaq Global Market

Securities registered pursuant to Section 12(g) of the Act: None

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

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

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

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

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See 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 ☒

As of June 30, 2019, the aggregate market value of the registrant’s common stock held by non-affiliates was approximately $1.8 billion, based on the closing price of the registrant’s common stock on June 28, 2019, the last trading day of the registrant’s most recently completed second fiscal quarter.

As of February 28, 2020, there were 45,378,246 shares of the registrant’s common stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant’s definitive Proxy Statement to be filed for its 2020 Annual Meeting of Stockholders are incorporated by reference into Part III of this Annual Report on Form 10-K. Such proxy statement will be filed with the Securities and Exchange Commission within 120 days of the registrant’s fiscal year ended December 31, 2019.

ZOGENIX, INC.

FORM 10-K

For the Year Ended December 31, 2019

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PART I

Forward-Looking Statements and Market Data

This Annual Report on Form 10-K and the information incorporated herein by reference contain forward-looking statements that involve substantial risks and uncertainties. These forward looking statements include, but are not limited to, statements about:

- the progress and timing of clinical trials of our lead product candidate Fintepla;
- the safety and efficacy of our product candidates;
- the timing of submissions to, and decisions made by the U.S. Food and Drug Administration (FDA) and other regulatory agencies, including foreign regulatory agencies, with regards to the demonstration of the safety and efficacy of our product candidates and adequacy of the manufacturing processes related to our product candidates to the satisfaction of the FDA and such other regulatory agencies;
- our ability to obtain, maintain and successfully enforce adequate patent and other intellectual property or regulatory exclusivity protection of our product candidates and the ability to operate our business without infringing the intellectual property rights of others;
- the goals of our development activities and estimates of the potential markets for our product candidates, and our ability to compete within those markets;
- our ability to obtain and maintain adequate levels of coverage and reimbursement from third-party payors for any of our product candidates that may be approved for sale, the extent of such coverage and reimbursement and the willingness of third-party payors to pay for our products versus less expensive therapies;
- the impact of healthcare reform laws; and
- projected cash needs and our expected future revenues, operations and expenditures.

The forward-looking statements are contained principally in the sections entitled “Risk Factors,” “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and “Business.” In some cases, you can identify forward-looking statements by the following words: “may,” “will,” “could,” “would,” “should,” “expect,” “intend,” “plan,” “anticipate,” “believe,” “estimate,” “predict,” “project,” “potential,” “continue,” “ongoing” or the negative of these terms or other comparable terminology, although not all forward-looking statements contain these words. These statements relate to future events or our future financial performance or condition and involve known and unknown risks, uncertainties and other factors that could cause our actual results, levels of activity, performance or achievement to differ materially from those expressed or implied by these forward-looking statements. We discuss many of these risks, uncertainties and other factors in this Annual Report on Form 10-K in greater detail under the heading “Item 1A — Risk Factors.”

Given these risks, uncertainties and other factors, we urge you not to place undue reliance on these forward-looking statements, which speak only as of the date of this report. You should read this Annual Report on Form 10-K completely and with the understanding that our actual future results may be materially different from what we expect. For all forward-looking statements, we claim the protection of the safe harbor for forward-looking statements contained in the Private Securities Litigation Reform Act of 1995. We undertake no obligation to revise or update publicly any forward-looking statements, whether as a result of new information, future events or otherwise, unless required by law.

This Annual Report on Form 10-K also contains estimates, projections and other information concerning our industry, our business, and the markets for Fintepla and other product candidates, including data regarding the estimated size of those markets, their projected growth rates, the incidence of certain medical conditions, statements that certain drugs, classes of drugs or dosages are the most widely prescribed in the United States or other markets, the perceptions and preferences of patients and physicians regarding certain therapies and other prescription, prescriber and patient data, as well as data regarding market research, estimates and forecasts prepared by our management. Information that is based on estimates, forecasts, projections, market research 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 this industry, business, market and other data from reports, research surveys, studies and similar data prepared by market research firms and other third parties, industry, medical and general publications, government data and similar sources. In particular, unless otherwise specified, all prescription, prescriber and patient data in this Annual Report on Form 10-K is from Source Healthcare Analytics, Source® Pharmaceutical Audit Suite (PHAST) Institution/Prescription, Source® PHAST Prescription, Source® Prescriber or Source® Dynamic Claims. In some cases, we do not expressly refer to the sources from which this data is

derived. In that regard, when we refer to one or more sources of this type of data in any paragraph, you should assume that other data of this type appearing in the same paragraph is derived from the same sources, unless otherwise expressly stated or the context otherwise requires.

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

Unless the context requires otherwise, references in this Annual Report on Form 10-K to "Zogenix," "we," "us" and "our" refer to Zogenix, Inc., a Delaware corporation, and its consolidated subsidiaries.

Item 1. Business

Company Overview

Zogenix, Inc. (Zogenix, We or the Company) is a global pharmaceutical company committed to developing and commercializing transformative therapies to improve the lives of patients and their families living with rare diseases. We are primarily focused on developing and commercializing two therapeutic product candidates: Fintepla, a low-dose fenfluramine, for two pediatric epilepsy disorders and MT1621 for a mitochondrial depletion disorder.

We own and control worldwide development and commercialization rights to Fintepla, our lead product candidate, for which we have filed a new drug application (NDA) with the United States Food and Drug Administration (FDA) seeking approval to market and sell the product in the treatment of Dravet syndrome, a rare and devastating pediatric epilepsy disorder. In March 2019, we entered into an exclusive distribution agreement with Nippon Shinyaku Co., Ltd. to support the sales and distribution of the product in Japan, if approved. Fintepla is also under late-stage development for the treatment of seizures associated with Lennox-Gastaut syndrome (LGS), another rare and devastating form of childhood-onset epilepsy. Additionally, we are evaluating Fintepla in other rare epileptic syndromes and diseases in Phase 2 and Investigator Initiated Studies.

In September 2019, we acquired all the outstanding equity interests of Modis Therapeutics, Inc. (Modis), a privately-held biopharmaceutical company based in Oakland, California. Modis holds an exclusive worldwide license from Columbia University in New York City (Columbia) to certain intellectual property rights owned or controlled by Columbia to develop and commercialize MT1621. MT1621 is an investigational deoxynucleoside-combination substrate enhancement therapy in development for the treatment of thymidine kinase 2 deficiency (TK2d), an inherited mitochondrial DNA depletion disorder that predominantly affects children and is often fatal. For the acquisition of Modis, we transferred aggregate upfront transaction consideration of approximately $246.5 million, which consisted of cash payments of $175.5 million and common stock with a fair value of $68.1 million. Also included in the aggregate upfront consideration were $3.5 million of transaction costs incurred, reduced by a net working capital adjustment receivable of $0.6 million.

Our Strategy

Our mission is to develop and commercialize transformative therapies to improve the lives of patients and their families living with rare diseases. To achieve this mission, we are executing on the following strategy:

- **Seek regulatory approval and commence commercialization of Fintepla, if approved, for the treatment of patients with Dravet syndrome.** In November 2019, the FDA accepted for review our NDA resubmission for Fintepla for the treatment of seizures associated with Dravet syndrome. The FDA granted priority review for the NDA for Fintepla, which established a target decision date of six months from the date of receipt, with an assigned Prescription Drug User Fee Act (PDUFA) date of March 25, 2020. On February 27, 2020, we announced that the FDA extended the PDUFA target action date to June 25, 2020 to provide time to review additional data we submitted in response to the FDA's information requests. In addition, our Marketing Authorization Application (MAA) for Fintepla in Dravet syndrome submitted to the European Medicines Agency (EMA) has been under review since its acceptance in March 2019 and we anticipate a decision on the MAA from the EMA in the fourth quarter of 2020. We have entered into manufacturing and supply agreements for Fintepla and are continuing to build our internal commercial capabilities for potential commercialization.

- **Seek regulatory approval of Fintepla for the treatment of LGS.** In February 2020, we reported positive top-line results from our global Phase 3 clinical trial (Study 1601) of Fintepla for the treatment of LGS. The trial met its primary objective of demonstrating that Fintepla at a dose of 0.7 mg/kg/day was superior to placebo in reducing the frequency of drop seizures and demonstrated statistically significant improvements versus placebo in key secondary efficacy measures, including the proportion of patients with a greater than 50% in drop seizure frequency. We plan to submit a supplemental new drug application (sNDA) for LGS, the timing of which will be based on discussions with the FDA.

- **Advance the development of MT1621 for the treatment of TK2d.** In October 2019, we announced positive top-line results from our global, retrospective Phase 2 study (the RETRO study) at the World Muscle Society congress in Copenhagen. 94.7% of treated patients had either improved (68%) or stabilized (26%) overall responses in major functional domains. A survival analysis using a time-dependent Cox regression model showed that the difference in probability of survival between treated patients and untreated natural history control patients was statistically significant ($p<0.0006$). Among clinical responders, a subset demonstrated profound responses, in some cases re-acquiring previously lost motor milestones such as ambulation, respiratory function and feeding. Safety data from RETRO indicated that MT1621 was generally well-tolerated. We plan to seek feedback from regulatory authorities during the second quarter of 2020 to determine the path forward to a potential submission of an NDA.

- **Pursue development of additional indications for Fintepla**. In addition to Dravet syndrome and LGS, we believe that the unique mechanism of action of Fintepla has the potential to treat other epileptic encephalopathies where there is a significant unmet medical need. We are currently conducting a Phase 2 exploratory clinical trial by enrolling patients with rare epilepsy disorders including Doose syndrome, Tuberous Sclerosis Complex, Dup 15q syndrome, CDKL5 deficiency disorder, mutations in PCDH19 gene, mutations in Na+ channel genes who do not meet diagnostic criteria for Dravet syndrome and patients between one and two years of age with Dravet syndrome. The objective of the study is to evaluate the safety and efficacy of Fintepla in these patient populations to potentially support future Phase 3 studies. In addition, ongoing Investigator Initiated Studies are being conducted in Sunflower Syndrome, CDKL5, and Doose syndrome.

Our Clinical Product Candidates

Fintepla for Patients with Dravet Syndrome

Dravet syndrome is a rare form of pediatric-onset epilepsy with life threatening consequences for patients and for which current treatment options are limited. Fintepla has received orphan drug designation in the United States and the European Union (the EU) for the treatment of Dravet syndrome. In addition, Fintepla for the treatment of Dravet syndrome received Fast Track designation from the FDA in January 2016.

We initiated our Phase 3 clinical trials for Fintepla for the treatment of seizures associated with Dravet syndrome in North America (Study 1501) in January 2016 and in Europe and Australia in June 2016 (Study 1502). Study 1501 and Study 1502 are each identical randomized, double-blind placebo-controlled studies of Fintepla as adjunctive therapy for patients with uncontrolled seizures who have Dravet syndrome. In January 2017, we announced our plan to report top-line results from Study 1501 and Study 1502 via a prospective merged study analysis approach whereby top-line results from the first approximately 120 subjects randomized into either Study 1501 or 1502 would have their study results analyzed and be reported initially as “Study 1”. In April 2017, we completed enrollment of Study 1 and, in September 2017, we announced positive top-line results for the 119 patients included in the Study 1 Phase 3 trial. The Study 1 trial met its primary objective of demonstrating that Fintepla, at a dose of 0.7 mg/kg/day (26 mg/day maximum), is superior to placebo as adjunctive therapy in the treatment of Dravet syndrome in children and young adults based on change in the frequency of convulsive seizures between the 6-week baseline observation period and the 14-week treatment period ($p<0.001$). In the trial, Fintepla at a dose of 0.7 mg/kg/day also demonstrated statistically significant improvements versus placebo in all key secondary measures, including the proportion of patients with clinically meaningful reductions in seizure frequency (50% or greater) and longest seizure-free interval. The same analyses comparing a 0.2 mg/kg/day Fintepla dose versus placebo also demonstrated statistically significant improvement compared with placebo. Fintepla was generally well-tolerated and no case of valvular heart disease or pulmonary arterial hypertension was observed in any patients.

We originally presented Study 1 data results in December 2017 at the 71st American Epilepsy Society (AES) Annual Meeting. In that and other presentations, we expressed doses of Fintepla as doses of the HCl salt, with an upper limit of 0.8 mg/kg/day and 30 mg maximum daily dose. Due to current regulatory guidelines, we have chosen to express Fintepla doses from all Fintepla studies as the fenfluramine base-equivalent, with an upper limit dosing of 0.7 mg/kg/day and 26 mg maximum daily dose.

In September 2016, we initiated Part 1 of Study 1504, a two-part, double blind, randomized, two arm pivotal Phase 3 clinical trial of Fintepla in Dravet syndrome patients who are taking stiripentol with valproate and/or clobazam as part of their baseline standard care. Part 1 investigated the pharmacokinetic profile and safety of Fintepla when co-administered with the stiripentol regimen (stiripentol with valproate and/or clobazam). Based on the results of the pharmacokinetic and safety portion of the trial, in February 2017 we initiated the safety and efficacy portion of Study 1504 utilizing Fintepla at a dose of 0.4 mg/kg/day (14 mg/day maximum). Part 2 of Study 1504, a two-arm study, compared Fintepla versus placebo across the titration and 12-week maintenance periods at multiple sites located in the Netherlands, United States, Canada, Germany, the United Kingdom (the UK) and Spain. In January 2018, we announced patient enrollment was complete at 87 patients, with 43 patients randomized into the Fintepla-arm and 44 patients randomized to the placebo arm. In July 2018, we reported positive top-line results from the safety and efficacy portion of Study 1504. The study results, which are consistent with those reported in Study 1, successfully met the primary objective of demonstrating that Fintepla, at a dose of 0.4 mg/kg/day, when co-administered with the stiripentol regimen, was superior to placebo as adjunctive therapy in the treatment of Dravet syndrome in children and young adults based on change in the frequency of convulsive seizures between the 6-week baseline observation period and the 15-week treatment period ($p<0.001$). In the trial, Fintepla at a dose of 0.4 mg/kg/day when co-administered with the stiripentol regime also demonstrated statistically significant improvements versus placebo in all key secondary measures, the proportion of patients with clinically meaningful reductions in seizure frequency (50% or greater) and longest seizure-free interval. Fintepla

was generally well-tolerated in this study, with adverse events consistent with those observed in Study 1 and the known safety profile of fenfluramine and no case of valvular heart disease or pulmonary arterial hypertension was observed in any patient.

Upon completion of our Fintepla Phase 3 trials, eligible patients were permitted to enroll in Study 1503, an ongoing open-label extension (OLE) trial to study the long-term safety and effectiveness of Fintepla. In December 2018, we presented interim data from Study 1503 regarding the effectiveness and overall safety of Fintepla observed in the study, including the long-term cardiovascular assessments and findings at the 72nd Annual Meeting of the AES. A total of 232 patients from Study 1503 were included in the interim analysis of Study 1503. As of March 13, 2018, the interim cutoff date, the median duration of treatment with Fintepla was 256 days and the range was 58-634 days (equivalent to 161 patient-years of exposure to Fintepla). In this interim analysis population of 232 patients, a total of 22 (9.5%) patients had discontinued treatment for the following reasons: lack of efficacy (16), subject withdrawal (2), adverse event (1), Sudden Unexpected Death in Epilepsy (SUDEP), (1), physician decision (1), and withdrawal by caregiver (1). Approximately 90% of patients remained in the study at the time of the interim analysis. The median percent reduction in monthly convulsive seizure frequency over the entire OLE treatment period was 66.8% (compared with baseline frequency established in the core Phase 3 studies). Over the same period, 64.4% of children and young adults showed a >50% reduction in convulsive seizure frequency and 41.2% showed a >75% reduction. The occurrence of adverse events was consistent with the Phase 3 placebo-controlled studies. The most common adverse events occurring in more than 10% of children and young adults were pyrexia (22%), nasopharyngitis (20%), decreased appetite (16%), influenza (12%), diarrhea (11%), and upper respiratory tract infection (10%). A total of 13.4% of children lost >7% body weight at some point during the trial; in 42% of those children, weight loss abated during the period covered by the interim analysis. Over the course of the OLE treatment period included in the interim analysis, one patient died from SUDEP that was deemed unrelated to Fintepla. A total of 703 color doppler echocardiograms were performed to assess cardiovascular health at baseline, week 4 or 6, and then every 3 months during Study 1503. No patient developed valvular heart disease or pulmonary arterial hypertension at any time during the study while receiving daily treatment with Fintepla. We conducted an additional interim analysis of data from Study 1503 as of February 2019, which will be presented at the American Academy Neurology Annual meeting in Toronto in April 2020. This analysis included a total of 330 patients with a median treatment duration of 445 days (range 7-899 days). In patients treated up to one year (n=222), there was a 77% decrease ($p<0.001$) in median convulsive seizure frequency when comparing treatment effect at months 10 - 12 to baseline; and for those treated up to two years (n=52), the median decrease in convulsive seizure frequency as of two years on study drug was 83% ($p<0.001$) compared to baseline.

In October 2019, we presented additional data from Study 1503 at the Childhood Neurology Society (CNS) Congress which showed long-term, clinically meaningful reduction in convulsive seizure frequency in young Dravet syndrome patients (under six years of age). A total of 42 of 158 (26.6%) subjects enrolled in Study 1503 were under six years of age. The median baseline monthly convulsive seizure frequency for this age group prior to treatment was 10.7 seizures per month (ranging from 4.0 to 147.3). The median decrease in monthly convulsive seizure frequency for the under six years of age group over the entire observation period compared to baseline was 75.5% ($p<0.001$). This compared to a median decrease of 60.1% ($p<0.001$) in the older, over-six years of age group and a median decrease of 63.6% ($p<0.001$) in the overall study population (aged 2-18 years). Fintepla was generally well-tolerated and no case of valvular heart disease or pulmonary arterial hypertension was observed in any patient at any time.

Also at the October 2019 CNS Congress, we presented a post-hoc pooled analysis from Study 1 and Study 1504 which demonstrated that Fintepla reduced frequency of generalized tonic-clonic seizures and focal-to-bilateral tonic-clonic seizures. A total of 206 enrolled patients were randomized to placebo (n=84), or to treatment with Fintepla 0.7 (n=40), 0.4 (n=43), or 0.2 (n=39) mg/kg/day. The median baseline monthly frequency of generalized tonic-clonic seizures ranged from 8.0 to 12.3 per month in the four dose groups, and decreased by 80%, 64%, and 48% in the Fintepla 0.7, 0.4, and 0.2 mg/kg/day groups, respectively, compared to 10% in the placebo group. Focal-to-bilateral tonic-clonic seizures were experienced by fewer patients and had a median baseline frequency of 2.0 to 4.7 per month. During treatment, median percent reductions in focal-to-bilateral tonic-clonic seizure frequency were 97%, 33% and 69% in the Fintepla 0.7, 0.4, and 0.2 mg/kg/day groups, respectively, and 39% in the placebo group. Fintepla was generally well-tolerated and no case of valvular heart disease or pulmonary arterial hypertension occurred in any patient. The most common treatment emergent adverse events occurring in $\geq$10% of patients in any treatment group were decreased appetite, lethargy, fatigue, somnolence, and diarrhea.

In October 2019, at CNS Congress, we also presented data from a Single-Dose, Open-Label Pharmacokinetic Study to Investigate the Drug-Drug Interaction Potential of Fintepla and Cannabidiol. This poster described data from a Phase 1, single-dose, open-label study to assess the tolerability and pharmacokinetic profiles (potential drug-drug interaction) of fenfluramine with and without co-administration of cannabidiol (CBD). The results of the study showed that the effects of CBD on fenfluramine are unlikely to require dose adjustments when the drugs are co-administered.

In February 2019, we completed our rolling submission of an NDA with the FDA and submitted a MAA to the EMA for Fintepla for the treatment of seizures associated with Dravet syndrome. In March 2019, the EMA accepted the MAA and initiated its review and we anticipate a decision on the MAA in the fourth quarter of 2020.

In April 2019, we received a Refusal to File (RTF) letter from the FDA regarding our NDA for Fintepla for the treatment of seizures associated with Dravet syndrome. Upon its preliminary review, the FDA determined that the NDA submitted in February 2019 was not sufficiently complete to permit a substantive review. In the RTF letter, the FDA cited two reasons for the RTF decision: first, certain non-clinical studies were not submitted to allow assessment of the chronic administration of fenfluramine; and, second, the application contained an incorrect version of a clinical dataset, which prevented the completion of the review process that is necessary to support the filing of the NDA.

We held a Type A meeting with the FDA in May 2019 to review the two issues identified in the RTF letter. Based on the final meeting minutes received, the FDA agreed with our plan to resubmit the NDA for Fintepla without the inclusion of the new chronic toxicity studies requested in the RTF letter. With regards to the second issue, we conducted a root cause analysis identifying the issue with the incorrect clinical dataset submitted in the original NDA, and we discussed the analysis with the FDA and the FDA requested that we include certain findings from our analysis in the resubmitted NDA. In September 2019, we resubmitted the NDA for Fintepla for the treatment of seizures associated with Dravet syndrome to the FDA, and in November 2019, the FDA accepted the NDA for filing. The FDA granted priority review for the NDA for Fintepla, which established a target decision date of six months from the date of receipt, with an assigned PDUFA date of March 25, 2020.

As part of their review, the FDA requested additional information. We provided the FDA with additional data to conduct additional efficacy analyses from our two pivotal studies in Dravet syndrome. On February 27, 2020, we announced that the FDA extended the PDUFA target action date to June 25, 2020, which provides the FDA additional time to review.

Fintepla for Patients with LGS

LGS is another rare, refractory, debilitating pediatric-onset epilepsy with life threatening consequences for patients and for which current treatment options are limited and suboptimal. Beginning in the first quarter of 2016, we funded an open-label, dose-finding, investigator-initiated study of the effectiveness and tolerability of Fintepla as an adjunctive therapy in patients with LGS. In December 2016, we presented initial data from an interim analysis of the first 13 patients to have completed at least 12 weeks of this Phase 2 clinical trial at the 70th Annual Meeting of the AES. In this interim analysis, Fintepla was observed to provide clinically meaningful improvement in major motor seizure frequency in patients with severe refractory LGS, with 7 out of 13 patients (54%) achieving at least a 50% reduction in the number of major motor seizures, at doses below the 0.7 mg/kg/ day maximum allowed dose. In addition, Fintepla was generally well-tolerated without any observed signs or symptoms of valvular heart disease or pulmonary hypertension. We believe these data indicate that Fintepla has the potential to be a safe and effective adjunctive treatment of major motor seizures for patients with LGS. Based on the strength of the LGS data generated, in the first quarter of 2017, we submitted an Investigational New Drug Application (IND) to the FDA to initiate a Phase 3 program of Fintepla in LGS. Our IND for Fintepla as a potential treatment for LGS became effective in April 2017. In the first half of 2017, Fintepla received orphan drug designation for the treatment of LGS from the FDA in the United States and the EMA in the EU.

In November 2017, we announced the initiation of our multicenter global Phase 3 clinical trial of Fintepla as an adjunctive treatment for seizures in patients with LGS (Study 1601). Study 1601 has two parts: Part 1 was a double-blind, placebo-controlled study to assess the safety, tolerability and efficacy of Fintepla when added to a patient's current anti-epileptic regimen. The study included a total of 263 patients between the ages of 2 and 35 years whose seizures were currently uncontrolled while on one or more anti-epileptic drugs (AEDs) randomized into three treatment groups: Fintepla 0.7 mg/kg/day (26 mg maximum daily dose; n=87), Fintepla 0.2 mg/kg/day (n=89), and placebo (n=87). The median age of patients was 13 years, with 29% being 18 years or older. Patients entering the study were taking between one and four AEDs and previously had tried and discontinued an average of seven other AEDs. The median baseline drop seizure frequency across the study groups was 77 seizures per month. After establishing baseline seizure frequency for 4 weeks, randomized patients were titrated to their dose over a 2-week titration period, followed by a 12-week fixed dose maintenance period. Patients who completed Part 1 were eligible to enter Part 2 of the clinical trial, an ongoing 12-month OLE study to evaluate the long-term safety, tolerability and effectiveness of Fintepla.

Announcement of Top-line Clinical Trial Results for Study 1601

On February 6, 2020, we announced positive top-line results from Study 1601. The trial met its primary objective of demonstrating that Fintepla at a dose of 0.7 mg/kg/day was superior to placebo in reducing the frequency of drop seizures,

based on the change between baseline and the titration and maintenance treatment period (p=0.0012). The same dose of Fintepla (0.7 mg/kg/day) also demonstrated statistically significant improvements versus placebo in key secondary efficacy measures, including the proportion of patients with a clinically meaningful reduction (≥50%) in drop seizure frequency. A decrease in the frequency of drop seizures between baseline and the treatment period was observed for a lower dose of Fintepla (0.2 mg/kg/day) compared to placebo, but this change did not reach statistical significance (p=0.0915). Fintepla was generally well-tolerated, with the adverse events consistent with those observed in our two prior Phase 3 studies in Dravet syndrome.

Study 1601 met its primary endpoint of showing a highly statistically significant reduction from baseline compared to placebo in the median percent change in monthly drop seizure frequency. Patients taking Fintepla 0.7 mg/kg/day achieved a median reduction of 26.5% compared to a median reduction of 7.8% in patients taking placebo (p=0.0012). Using a parametric analysis, patients taking Fintepla 0.7 mg/kg/day demonstrated a 26.5% greater reduction in mean monthly drop seizure frequency compared to placebo (p=0.0034). The median percent reduction in monthly drop seizures between baseline and the treatment period for the lower study dose of Fintepla (0.2 mg/kg/day), a secondary endpoint, was 13.2% and did not reach statistical significance compared to placebo (p=0.0915).

Additional secondary endpoints of the study were to compare the proportion of study patients treated with Fintepla 0.7 mg/kg/day who achieved a (≥50%) reduction in monthly drop seizures versus placebo and to compare Clinical Global Impression of Improvement ratings (CGI-I, a measure of improvement of worsening relative to baseline) as assessed by the investigator. Results are shown in the following table:

	Fintepla 0.7 mg/kg/day (N=87)	**Placebo (N=87)**
Patients with ≥50% reduction in monthly drop seizures (T+M Period)	25.3% (p=0.0165)[1]	10.3%
CGI-I (Proportion of Patients Improved)	48.8% (p=0.0567)[1]	33.8%
CGI-I (Proportion of Patients Much Improved or Very Much Improved)	26.3% (p=0.0007)[1]	6.3%

[1]p-values versus Placebo

Fintepla was generally well-tolerated in this study, with the adverse events consistent with those observed in our two prior Phase 3 studies in Dravet syndrome. The incidence of patients who experienced at least one treatment emergent adverse event was 89.7% of patients in the Fintepla 0.7 mg/kg/day group, 76.4% in the Fintepla 0.2 mg/kg/day group and 79.3% in the placebo group. The most common adverse events (≥10%) in the Fintepla-treated groups were decreased appetite, somnolence, fatigue, vomiting, diarrhea, and pyrexia. The incidence of serious treatment emergent adverse events was 11.5% (n=10) in the 0.7 mg/kg/day group, 4.5% (n=4) in the 0.2 mg/kg/day group, and 4.6% (n=4) in the placebo group. Six patients in the 0.7 mg/kg/day group had an adverse event leading to study discontinuation compared to four subjects in the 0.2 mg/kg/day group and one patient in the placebo group; the majority of these were considered treatment-related. There was one death during the trial (0.7 mg/kg/day group) caused by SUDEP, which was assessed by the investigator to be unrelated to the study drug.

No cases of valvular heart disease or pulmonary hypertension have been observed in Study 1601, including both Part 1 and Part 2. A total of 247 (93.9%) patients entered the OLE phase. We plan to submit an sNDA for LGS, the timing of which will be based on discussions with the FDA.

Fintepla for Other Potential Indications

In addition to Dravet syndrome and LGS, we have initiated an exploratory Phase 2 study to understand the characteristics of additional rare epilepsy disorders in separate cohorts and evaluate whether Fintepla is safe and effective versus placebo in these patient populations. The study protocol has been finalized and we are currently seeking IRB approvals and proceeding with opening study sites in the U.S. We expect to enroll the first patient in this Phase 2 “basket study” in the second quarter of 2020.

MT1621 for Patients with TK2d

TK2d is a rare, debilitating, and often fatal genetic disorder that primarily affects infants and children and for which there are currently no approved therapies. As of September 6, 2019, the date we acquired Modis, Modis had completed the

RETRO study of MT1621 in patients with TK2d and commenced a Phase 2 prospective, OLE study of patients with TK2d, Study MT-1621-101. MT1621 has received Breakthrough Therapy designation from the FDA and access to the PRIME scheme by the EMA and we intend to seek accelerated regulatory review pathways in both the United States and Europe.

RETRO was a global retrospective study of MT1621, a fixed combination treatment of two pyrimidine nucleosides deoxycytidine and deoxythymidine (dC/dT), in 38 pediatric and adult patients with TK2d (median age of disease onset, 2.5 years) treated at eight clinical sites in the United States, Spain and Israel.

Subjects received MT1621 for a median of 71 weeks (range 92 days – 7 years). Each subject was scored across motor, respiratory, and feeding domains according to pre-defined response criteria and was compared to pre-treatment status to assess whether responses improved, remained stable, or worsened. Parallel to RETRO, we compiled a comprehensive, global TK2d Natural History dataset from published studies and individual case reports to document untreated patients' disease course. From this natural history dataset, 68 patients reflecting the range of disease severity, age, and age of disease onset, were selected as a control group for treated patients in the RETRO study.

In October 2019, we announced positive top-line results from the pivotal Phase 2 RETRO study at the World Muscle Society congress in Copenhagen. 94.7% of treated patients had either improved (68%) or stabilized (26%) overall responses in major functional domains. A survival analysis using a time-dependent Cox regression model showed that the difference in probability of survival between treated patients and untreated natural history control patients was statistically significant ($p<0.0006$). Among clinical responders, a subset demonstrated profound responses, in some cases re-acquiring previously lost motor milestones such as ambulation, respiratory function and feeding. Safety data from RETRO indicated that MT1621 was generally well-tolerated. Most reported adverse events were considered not related to study drug (199 of 292), with mild or moderate diarrhea being the most common treatment-related adverse event (AE), occurring in 63% of patients. Serious AEs (SAEs) were reported in 14 subjects (37%). The majority of SAEs were deemed related to TK2d; two patients experienced three events related to study drug alone (kidney stone, kidney stone removal, diarrhea). Two adult-onset patients stopped treatment due to asymptomatic increases in aminotransferase liver enzymes (no increase in bilirubin levels), which resolved upon discontinuation of treatment. We plan to seek feedback from regulatory authorities during the second quarter of 2020 to determine the path forward to a potential submission of an NDA.

Competition

The pharmaceutical industry is characterized by rapidly advancing technologies, intense competition and a strong emphasis on proprietary and differentiated therapeutics. We face competition from a number of sources, some of which may target the same indications as our product candidates, including large pharmaceutical companies, smaller biopharmaceutical companies, biotechnology companies, academic institutions, government agencies and private and public research institutions, many of which have greater financial resources, research and development capabilities, sales and marketing capabilities, manufacturing capabilities, experience in obtaining regulatory approvals for product candidates and/or other resources than us. We will face competition not only in the commercialization of any product candidates for which we obtain marketing approval from the FDA or other regulatory authorities, but also for the in-licensing or acquisition of additional product candidates.

Fintepla

Prior to 2018, there were no FDA-approved treatments indicated for the treatment of seizures associated with Dravet syndrome. The standard of care for the treatment of seizures in patients with Dravet syndrome usually involved a combination of the following anticonvulsant drugs: clobazam, clonazepam, levetiracetam, topiramate, valproic acid, ethosuximide and zonisamide. In June 2018, the FDA approved the first treatment of seizures associated with Dravet syndrome, as well as LGS, GW Pharmaceuticals' Epidiolex® (cannabidiol or CBD). Epidiolex is a liquid drug formulation of plant-derived purified CBD, which is a chemical component of the Cannabis sativa plant, more commonly known as marijuana. GW's CBD was subsequently approved for the treatment of Dravet syndrome and LGS by the European Commission (as Epidyolex®) in September of 2019. In August 2018, the FDA approved a second treatment, Biocodex's Diacomit® (stiripentol), for the treatment of seizures associated with Dravet syndrome in patients who are also taking clobazam. Stiripentol is approved in Europe, Canada and Japan for the treatment of Dravet syndrome when used in conjunction with valproate and/or clobazam.

Fintepla has a novel mechanism of action (selective serotonin activity and possibly sigma-1 activity) that is different from the other antiepileptic drugs currently available and in clinical development in the United States and the EU for the treatment of epileptic encephalopathies like Dravet syndrome, including cannabidiol or stiripentol. Currently approved drugs have a different and distinct mechanism of action from Fintepla. As such, we do not expect the recent approvals of cannabidiol or stiripentol in the United States or Europe will block the FDA or EMA from granting approval of Fintepla.

Multiple companies are developing clinical-staged product candidates for the potential treatment of Dravet syndrome. Ovid Therapeutics, Inc. is currently evaluating its product candidate OV935, a first-in-class inhibitor of the enzyme cholesterol 24-hydroxylase (CH24H), for the potential treatment of adult and pediatric patients with Dravet syndrome and LGS in Phase 2 clinical trials. Additional clinical stage candidates for the treatment of Dravet syndrome include Ataluren from PTC Therapeutics (exploratory Phase 2), Huperzine-A from Supernus Pharmaceuticals (Phase 1/2), and clemizole (Phase 1) being evaluated by Epygenix Therapeutics, Inc.

Several other companies, including Encoded Therapeutics, Inc., Neucyte, Inc., NeuroCycle Therapeutics, Sarepta Therapeutics, Inc., Stoke Therapeutics, Inc., and Xenon Pharmaceuticals, Inc. have disclosed that they are evaluating preclinical drug candidates, including gene therapies and small molecules, for the potential treatment of Dravet syndrome.

MT1621

Currently, we are not aware of any pharmaceutical product candidates that have been approved for the treatment of a primary mitochondrial disease. Similarly, we are not aware of any pharmaceutical companies who are developing a pharmaceutical product candidate for the treatment of TK2d.

Beyond TK2d, a number of pharmaceutical companies are developing clinical-staged product candidates for the potential treatment of other mitochondrial diseases, including Metro International Biotech LLC, PTC Therapeutics, Inc., Reata Pharmaceuticals, Inc., Reneo Pharmaceuticals, Inc., Stealth BioTherapeutics, Inc., and Wellstat Therapeutics Corp.

Manufacturing and Supply

We do not own or operate, and currently have no plans to establish or own any manufacturing facilities with respect to the manufacture of Fintepla, MT1621 or any future product candidates.

Fintepla

In February 2019, we entered into a master supply agreement with Aptuit (Oxford) Limited, an Evotec company (Aptuit) pursuant to which Aptuit will be our commercial manufacturer and supplier of the fenfluramine active pharmaceutical ingredient (API) used in Fintepla. The term of the master supply agreement is five years, which term shall be automatically extended for successive two-year periods thereafter, unless terminated earlier. Aptuit has been providing the API to us for our clinical trial material supply needs and registration batches for the past several years. In July 2019, we entered into a supply agreement (PCI Pharma Agreement) with Penn Pharmaceutical Services Limited, trading as PCI Pharma Services (PCI Pharma), pursuant to which PCI Pharma will procure the raw materials (other than the active pharmaceutical ingredient) for, test, bottle and package an oral solution of Fintepla. Pursuant to the PCI Pharma Agreement, at a specified time prior to the anticipated receipt of the first marketing authorization by a regulatory agency to market Fintepla, and then each month following such receipt, we are required to deliver a rolling forecast of our expected commercial orders, a portion of which will be considered a binding, firm order.

The term of the PCI Pharma Agreement is five years, which term shall be automatically extended for successive two-year periods thereafter, unless terminated earlier. After the second anniversary of the Effective Date, either party may terminate the PCI Pharma Agreement at any time without cause following a specified notice period applicable to the respective party. In addition, either party may terminate the agreement (1) upon written notice if the other party has failed to remedy a material breach of any of its representations, warranties or other obligations under the PCI Pharma Agreement within a specified period following receipt of written notice of such breach, (2) immediately in the event of a material breach of the other party's representations, warranties or other obligations under the PCI Pharma Agreement and in the event that such breach is not capable of remedy and (3) in the event that the other party files for bankruptcy, reorganization, liquidation, administration or receivership proceedings, or a substantial portion of the assets of such party is assigned for the benefit of such party's creditors. We may also terminate the PCI Pharma Agreement immediately in the event PCI Pharma is unable to supply Fintepla at specified quantities and within certain times. PCI Pharma may also terminate the Agreement upon notice if it determines its performance of services would violate applicable law. PCI Pharma's manufacturing services under the PCI Pharma Agreement will also terminate automatically if Fintepla is withdrawn as a result of regulatory review or we decide to cease development activities of Fintepla.

We expect to continue to rely on third-party manufacturers to produce sufficient quantities of our product candidates and their component raw materials for use in our internal research efforts and clinical trials and in relation to any future commercialization of our product candidates. Our third-party manufacturers are responsible for obtaining the raw materials necessary to manufacture our product candidates. Additional third-party manufacturers are and will be used to formulate, fill,

label, package and distribute investigational drug products and eventually our products, if and when our product candidates receive approval. This approach allows us to maintain a more efficient infrastructure while enabling us to focus our expertise on developing and commercializing our product candidates. Although we believe we have multiple potential sources for the manufacture of our product candidates and their related raw materials, we currently rely on single manufacturers for different aspects of manufacturing of our products.

MT1621

As a part of our acquisition of Modis in September 2019, we assumed a manufacturing supply agreement with ST Pharm Co. LTD (ST Pharm), pursuant to which ST Pharm will be our clinical materials manufacturer and supplier of both 2'-deoxycytidine and 2'-deoxythymidine APIs used in MT1621. The term of the supply agreement is five (5) years from the date of agreement (October 2017), which term can be extended for successive two-year periods thereafter, unless terminated earlier. ST Pharm has been providing the API for the clinical trial material supply needs and registration batches since the beginning of MT1621 clinical trials. In addition, we also assumed a supply agreement with Catalent Pharma Solutions (Catalent), pursuant to which Catalent will procure all materials other than the API, test, fill into drug product packs and package and release the MT1621 powder for oral solution finished product.

Strategic and License Agreements

Fintepla

In October 2014, we acquired Brabant Pharma Limited (Brabant) in a business acquisition and obtained worldwide development and commercialization rights to Fintepla, one of our lead product candidates. Under the terms of the acquisition, we agreed to make future milestone payments to the former owners of Brabant for up to $95.0 million in the event we achieve certain milestones with respect to Fintepla, consisting of $50.0 million in regulatory milestones and $45.0 million in sales milestones. In 2019, our Fintepla MAA submission for the treatment of Dravet syndrome was accepted by the EMA for filing and our NDA submission for the treatment of Dravet syndrome was accepted by the FDA for filing. Each acceptance by the respective regulatory agency triggered a $10.0 million milestone payment. To date, we have paid $20.0 million of the maximum $50.0 million in regulatory milestones under the purchase agreement.

In addition, we have a collaboration and license agreement with the Universities of Antwerp and Leuven in Belgium (the Universities) that runs through September 2045. Under the terms of the agreement, the Universities granted us an exclusive worldwide license to use the data obtained from a study related to low-dose fenfluramine for the treatment of Dravet syndrome, as well as certain other intellectual property. We are required to pay a mid-single-digit percentage royalty on net sales of products containing low-dose fenfluramine for the treatment of Dravet syndrome or, in the case of a sublicense of products containing low-dose fenfluramine for the treatment of Dravet syndrome, a percentage in the mid-twenties of the sub-licensing revenues. The agreement may be terminated by the Universities if we (a) do not use commercially reasonable efforts to (i) develop and commercialize products containing low-dose fenfluramine for the treatment of Dravet syndrome or related conditions stemming from infantile epilepsy, or (ii) seek approval of products containing low-dose fenfluramine for the treatment of Dravet syndrome in the United States; or (b) if we become insolvent or makes an assignment for the benefit of creditors or should any petition in bankruptcy, or similar relief, be filed by or against us. We can terminate the agreement upon specified prior written notice to the Universities.

MT1621

As a result of our acquisition of Modis, we became party to the Exclusive License Agreement, by and between Modis and Columbia, dated as of September 26, 2016 (the Columbia Agreement), related to MT1621. We are required to use commercially reasonable efforts to develop and commercialize licensed products worldwide, including to meet certain development and commercialization milestones within specified periods of time. Upon the achievement of certain regulatory and commercial milestones, we are required to pay Columbia up to $2.9 million and $25.0 million, respectively, as well as tiered royalties on sales for each licensed product, at percentages ranging from the mid-single digits to the high single-digits. The royalty obligations and Columbia Agreement will expire on a country-by-country and product-by-product basis upon the later of (i) 15 years after the first bona fide commercial sale of a licensed product, (ii) the expiration of the last to expire valid patent claim covering a licensed product in a country or (iii) expiration of any regulatory exclusivity covering such licensed product. The Columbia Agreement may be terminated by either by Columbia or by us in the event of an uncured material breach by the other party, or by Columbia in the event we are subject to specified bankruptcy, insolvency or similar circumstances. We can terminate the Columbia Agreement either in its entirety or on a product-by-product and country-by-country basis, upon specified prior written notice to Columbia, provided we are not exploiting licensed products in such countries.

We also became party to a license agreement between two other research institutions related to MT1621 where we may be required to pay up to $3.0 million for research, development and regulatory milestone events and up to $10.0 million for certain sales milestone events. We are also required to pay tiered royalties ranging from low to mid-single digits on net sales of licensed product.

Intellectual Property

Our success will depend to a significant extent on our ability to obtain, expand and protect our intellectual property estate, enforce patents, maintain trade secret and trademark protection and operate without infringing the proprietary rights of other parties.

Fintepla

As of December 31, 2019, we have rights to six issued U.S. patents and three issued foreign patents, one of which is involved in an Opposition Proceeding in the European Patent Office. These patents, entitled “Method for the Treatment of Dravet Syndrome,” cover claims related to methods for treatment of seizures associated with Dravet syndrome with Fintepla and are expected to provide protection of the associated claims in the U.S. and other countries through 2033 and 2034, respectively. In addition, we also have 8 currently pending U.S. patent applications (which includes two provisional applications) and 97 pending foreign applications (which includes two allowed South Africa applications and three Patent Cooperation Treaty applications) in the Fintepla series of patent cases.

MT1621

We have certain patent rights that we obtained through our acquisition of Modis. In September 2016, Modis entered into the Columbia Agreement under which Modis was granted an exclusive worldwide license and sublicense to certain intellectual property rights owned or controlled by Columbia to develop and commercialize MT1621 and certain backup compounds for any application or purpose. These licensed patent rights include patents owned by Columbia and patents jointly owned by Columbia and Vall d’Hebron Research Institute (VHIR). VHIR delegated to Columbia the rights to enter into the Columbia Agreement on VHIR’s behalf. The patent family jointly owned by Columbia and VHIR is directed to the use of MT1621 to treat TK2d and includes an issued U.S. patent, and European and Japanese granted patents, each of which expire in 2036. In addition, there are pending patent applications in Australia, Brazil, Canada, China, Hong Kong, Israel, India, Japan, Korea, Mexico and Russia, as well as continuing applications in the United States and Europe. There are no patents covering the composition of matter in MT1621.

Our ability to maintain and solidify our proprietary and intellectual property position for our product candidates and technologies will depend on our success in obtaining effective patent claims and enforcing those claims if granted. However, pending patent applications we have filed or licensed from third parties may not result in the issuance of patents.

Government Regulation

FDA Approval Process

In the United States, pharmaceutical products are subject to extensive regulation by the FDA. The Federal Food, Drug, and Cosmetic Act (FFDCA) and other federal and state statutes and regulations govern, among other things, the research, development, testing, manufacture, storage, record keeping, approval, labeling, promotion and marketing, distribution, post-approval monitoring and reporting, sampling and import and export of pharmaceutical products. Failure to comply with applicable FDA or other requirements may subject a company to a variety of administrative or judicial sanctions, such as the FDA's refusal to approve pending applications, a clinical hold, warning letters, recall or seizure of products, partial or total suspension of production, withdrawal of the product from the market, injunctions, fines, civil penalties or criminal prosecution.

FDA approval is required before any new drug or dosage form, including a new use of a previously approved drug, can be marketed in the United States. The process required by the FDA before a drug may be marketed in the United States generally involves:

- completion of pre-clinical laboratory and animal testing and formulation studies in compliance with the FDA's good laboratory practice (GLP) regulations;
- submission to the FDA of an IND for human clinical testing which must become effective before human clinical trials may begin in the United States;
- approval by an independent institutional review board (IRB) or ethics committee at each clinical site before each trial may be initiated;
- performance of adequate and well-controlled human clinical trials in accordance with good clinical practice (GCP) regulations, to establish the safety and efficacy of the proposed drug product for each intended use;
- submission to the FDA of an NDA after completion of all pivot trials;
- satisfactory completion of an FDA advisory committee review, if applicable;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities where the product is produced to assess compliance with current Good Manufacturing Practice (cGMP) requirements to ensure that the facilities, methods and controls are adequate to preserve the drug's identity, strength, quantity and purity, and of selected clinical investigation sites to assess compliance with GCPs; and
- FDA review and approval of the NDA to permit commercial marketing of the product for particular indications for use in the U.S.

Pre-clinical tests include laboratory evaluation of product chemistry, potency, biological activity, formulation, stability and toxicity, as well as animal studies to assess the characteristics and potential safety and efficacy of the product. The results of pre-clinical tests, together with manufacturing information, analytical data and a proposed clinical trial protocol and other information, are submitted as part of an IND to the FDA. An IND is a request for authorization from the FDA to administer an investigational new drug product to humans. Some pre-clinical testing may continue after the IND is submitted. 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 relating to one or more proposed clinical trials, pre-clinical information or cGMP requirements and places a trial on clinical hold, 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. As a result, our submission of an IND may not result in FDA authorization to commence a clinical trial. A separate submission to an existing IND must also be made for each successive clinical trial conducted during product development.

Clinical trials involve the administration of an investigational drug to human subjects under the supervision of qualified investigators in accordance with GCP requirements, which include the requirement that all research subjects provide their informed consent in writing for their participation in any clinical trial. Clinical trials are conducted under protocols detailing, among other things, the objectives of the study, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated. Furthermore, an independent IRB for each site proposing to conduct the clinical trial must review and approve the plan for any clinical trial and its informed consent form before the clinical trial begins at that site and must monitor the study until completed. Regulatory authorities, the IRB or the sponsor may suspend a clinical trial at any time on various grounds, including a finding that the subjects are being exposed to an unacceptable health risk or that the trial is unlikely to meet its

stated objectives. Some studies also include oversight by an independent group of qualified experts organized by the clinical study sponsor, known as a data safety monitoring board, which provides authorization for whether or not a study may move forward at designated check points based on access to certain data from the study and may halt the clinical trial if it determines that there is an unacceptable safety risk for subjects or other grounds, such as no demonstration of efficacy. There are also requirements governing the reporting of ongoing clinical studies and clinical study results to public registries.

For purposes of an NDA submission and approval, human clinical trials are typically conducted in the following sequential phases, which may overlap or be combined:

- Phase 1: The drug is initially introduced into healthy human subjects or patients and tested for safety, dose tolerance, absorption, metabolism, distribution and excretion and, if possible, to gain an early indication of its effectiveness.
- Phase 2: The drug is administered to a limited patient population to identify possible adverse effects and safety risks, to preliminarily evaluate the efficacy of the product for specific targeted indications and to determine dose tolerance and optimal dosage.
- Phase 3: When Phase 2 evaluations demonstrate that a dose range of the product appears to be effective and has an acceptable safety profile, Phase 3 trials are undertaken in larger patient populations to obtain additional evidence of clinical efficacy and safety in an expanded patient population at multiple, geographically-dispersed clinical trial sites.

In some cases, the FDA may condition the approval of the NDA on the sponsor's agreement to conduct additional pre-clinical and clinical studies to further assess the drug's safety and effectiveness after NDA approval. Such post-approval studies are typically referred to as post-marketing or Phase 4 studies.

During the development of a new drug, sponsors are given opportunities to meet with the FDA at certain points. These points may be prior to 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, for the FDA to provide advice, and for the sponsor and the FDA to reach agreement on the next phase of development. Sponsors typically use the meetings at the end of the Phase 2 trial to discuss Phase 2 clinical results and present plans for the pivotal Phase 3 clinical trials that they believe will support approval of the new drug.

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

Assuming successful completion of all required testing in accordance with all applicable regulatory requirements, the results of product development, pre-clinical studies and clinical trials are submitted to the FDA as part of an NDA. NDAs must also contain extensive information relating to the product's pharmacology, chemistry, manufacturing, and controls (CMC) and proposed labeling, among other things.

The submission of an NDA may be subject to a substantial application user fee, and the manufacturer and/or sponsor under an approved NDA are also subject to annual program user fees. The FDA has 60 days from its receipt of an NDA to determine whether the application will be accepted for filing based on the agency's threshold determination that it is sufficiently complete to permit substantive review. Once the submission has been accepted for filing, the FDA begins an in-depth substantive review. Under the PDUFA goals that are currently in effect, the FDA has a standard review goal of ten months from the date of filing of a NDA for a new molecular entity, and ten months from the date of receipt for an NDA for a non-new molecular entity, to review and act on the submission. The FDA conducts a preliminary review of all NDAs within the first 60 days after submission, before accepting them for filing, to determine whether they are sufficiently complete to permit substantive review The FDA may request additional information rather than accept an NDA for filing. In this event, the NDA must be resubmitted with the additional information. The resubmitted application also is subject to review before the FDA accepts it for filing.

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 to assure and preserve the product's identity, strength, quality and purity. During the FDA's review of an NDA the FDA may inspect the facility or facilities where the product is manufactured. The

FDA will not approve an application unless it determines that the manufacturing processes and facilities are in compliance with cGMP, and if applicable, quality system regulation (QSR) requirements (for any medical device components), and are adequate to assure consistent production of the product within required specifications. Additionally, the FDA will typically inspect one or more clinical sites to assure compliance with GCP requirements before approving an NDA. The FDA may also refer applications for novel drug products or drug products which present difficult questions of safety or efficacy to an advisory committee for review, evaluation 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.

Once the FDA's NDA review process is substantially complete, it may issue an approval letter, or it may issue a complete response letter (CRL) to indicate that the review cycle for an application is complete and that the application is not ready for approval. CRLs generally outline the deficiencies in the submission and may require substantial additional testing or information in order for the FDA to reconsider the application. Even with submission of this additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval. If and when the deficiencies have been addressed to the FDA's satisfaction, the FDA will typically issue an approval letter. An approval letter authorizes commercial marketing of the drug with specific prescribing information for specific indications.

For some drugs, the FDA may determine that a Risk Evaluation and Mitigation Strategy (REMS) is necessary to ensure that the benefits of the drug outweigh the risks of the drug, and may require submission of a REMS as a condition of approval. In determining whether a REMS is necessary, the FDA considers the seriousness of known or potential adverse events, the expected benefit of the drug, the seriousness of the disease or condition to be treated, the size of the population likely to use the drug, the duration of treatment, and whether the drug is a new molecular entity. A REMS 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 drug's risks, limitations on who may prescribe or dispense the drug, requirements that patients enroll in a registry or undergo certain health evaluations and other measures that the FDA deems necessary to assure the safe use of the drug. In addition, the REMS must include a timetable to assess the strategy, at a minimum, at 18 months, three years, and seven years after the strategy's approval.

In addition, the Pediatric Research Equity Act (PREA) requires a sponsor to conduct pediatric clinical trials for most drugs for a new active ingredient, new indication, new dosage form, new dosing regimen or new route of administration. Under PREA, original NDAs and supplements must contain a pediatric assessment unless the sponsor has received a deferral or waiver. The required assessment must evaluate the safety and effectiveness of the product for the claimed indications in all relevant pediatric subpopulations and support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The sponsor or FDA may request a deferral of pediatric clinical trials for some or all of the pediatric subpopulations. A deferral may be granted for several reasons, including a finding that the drug is ready for approval for use in adults before pediatric clinical trials are complete or that additional safety or effectiveness data needs to be collected before the pediatric clinical trials begin. The FDA must send a non-compliance 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.

Expedited Development and Review Programs

The FDA has a fast track designation program that is intended to expedite or facilitate the process for reviewing new drug products that meet certain criteria. Specifically, new drugs are eligible for Fast Track designation if they are intended to treat a serious or life-threatening disease or condition and demonstrate the potential to address unmet medical needs for the disease or condition. For a Fast Track product, the FDA may consider for review sections of the NDA on a rolling basis before the complete application is submitted, if the sponsor provides a schedule for the submission of the sections of the NDA, the FDA agrees to accept sections of the NDA and determines that the schedule is acceptable, and the sponsor pays any required user fees upon submission of the first section of the NDA.

Any product submitted to the FDA for approval, including a product with a fast track designation, may also be eligible for other types of FDA programs intended to expedite development and review, such as priority review and accelerated approval. A product is eligible for priority review if it treats a serious condition, and if approved, would provide a significant improvement in the treatment, diagnosis or prevention of a disease compared to marketed products. The FDA will attempt to direct additional resources to the evaluation of an application for a new drug designated for priority review in an effort to facilitate the review. Under its current review goals, the FDA endeavors to review applications with priority review designations within six months of the filing date as compared to ten months for review of new molecular entity NDAs, and within six months of the receipt date for non-new molecular entity NDA.

In addition, a product may be eligible for accelerated approval. Drug products intended to treat serious or life-threatening diseases or conditions may be eligible for accelerated approval upon a determination that the product has 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, that is reasonably likely to predict an effect on irreversible morbidity or mortality or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the availability or lack of alternative treatments. As a condition of approval, the FDA may require that a sponsor of a drug receiving accelerated approval perform adequate and well-controlled post-marketing clinical trials. Products receiving accelerated approval may be subject to expedited withdrawal procedures if the sponsor fails to conduct the required post-marketing clinical trials or if such trials fail to verify the predicted clinical benefit. In addition, the FDA currently requires as a condition for accelerated approval pre-approval of promotional materials, which could adversely impact the timing of the commercial launch of the product.

A sponsor may also seek FDA designation of a product candidate as a "breakthrough therapy" if the product is intended, alone or in combination with one or more other products, to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the product may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. The designation includes all of the Fast Track program features, as well as more intensive FDA interaction and guidance. The Breakthrough Therapy designation is a distinct status from both accelerated approval and priority review, which can also be granted to the same drug if relevant criteria are met.

Fast Track designation, priority review, and Breakthrough Therapy designation do not change the standards for approval but may expedite the development or approval process. Even if a product qualifies for one or more of these programs, the FDA may later decide that the product no longer meets the conditions for qualification or decide that the time period for FDA review or approval will not be shortened.

Post-Approval Requirements

Once an NDA is approved, a product will be subject to continuing regulation by the FDA, including, among other things, requirements relating to drug/device listing, recordkeeping, periodic reporting, product sampling and distribution, advertising and promotion and reporting of adverse experiences with the product. There also are extensive U.S. Drug Enforcement Administration (DEA) regulations applicable to marketed controlled substances.

Drug manufacturers and other entities involved in the manufacture and distribution of approved drugs are required to register their establishments with the FDA and state agencies, and are subject to periodic unannounced inspections by the FDA and these state agencies for compliance with cGMP and, if applicable, QSR requirements. Changes to the manufacturing process are strictly regulated and generally require prior FDA approval before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP or QSR and impose reporting and documentation requirements upon us and any third-party manufacturers that we may decide to use. Accordingly, manufacturers must continue to expend time, money, and effort in the area of production and quality control to maintain cGMP or QSR compliance.

The FDA may withdraw the approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market, though the FDA must provide an application holder with notice and an opportunity for a hearing in order to withdraw its approval of an application. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in, among other things:

- restrictions on the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- fines, warning letters or holds on post-approval clinical trials;
- refusal of the FDA to approve pending applications or supplements to approved applications, or suspension or revocation of product approvals;
- consent decrees, corporate integrity agreements, debarment or exclusion from federal healthcare programs;
- mandated modification of promotional materials and labeling and the issuance of corrective information;
- the issuance of safety alerts, Dear Healthcare Provider letters, press releases and other communications containing warnings or other safety information about the product;
- product seizure or detention, or refusal to permit the import or export of products; or

- injunctions or the imposition of civil or criminal penalties.

The FDA strictly regulates the marketing, labeling, advertising and promotion of drug and device products that are placed on the market. While physicians may prescribe drugs and devices for off label uses, manufacturers may only promote for the approved indications and in accordance with the provisions of the approved label. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off label uses, and a company that is found to have improperly promoted off label uses may be subject to significant liability.

In addition, the distribution of prescription pharmaceutical products is subject to the Prescription Drug Marketing Act (PDMA) and associated FDA regulations, which governs the distribution of drugs and drug samples at the federal level, and sets minimum standards for the registration and regulation of drug distributors by the states. Both the PDMA and state laws limit the distribution of prescription pharmaceutical product samples and impose requirements to ensure accountability in distribution, including a drug pedigree which tracks the distribution of prescription drugs. With the enactment of the Drug Quality and Security Act in November 2013, drug manufacturers will also be subject to requirements for identifying and tracking prescription drugs as they are distributed in the United States. The requirements of this law will be phased in over a ten-year period, including requirements for unique product identifiers and provision of product handling information to the FDA.

The FDA may require post-approval studies and clinical trials if the FDA finds they are appropriate based on available data, including information regarding related drugs. The purpose of such studies would be to assess a known serious risk or signals of serious risk related to the drug or to identify an unexpected serious risk when available data indicate the potential for a serious risk. The FDA may also require a labeling change if it becomes aware of new safety information that it believes should be included in the labeling of a drug. In addition, the FDA may also require a REMS for an approved product when new safety information emerges.

With respect to post-market product advertising and promotion, the FDA imposes a number of complex requirements on entities that advertise and promote pharmaceuticals, which include, among others, standards for direct-to-consumer advertising, off-label promotion, industry-sponsored scientific and educational activities, and promotional activities involving the internet and social media. The FDA has very broad enforcement authority under the FFDCA, and failure to abide by these regulations can result in penalties, including the issuance of a warning letter directing entities to correct deviations from FDA standards, a requirement that future advertising and promotional materials be pre-cleared by the FDA, and state and federal civil and criminal investigations and prosecutions.

Section 505(b)(2) New Drug Applications

An applicant may submit an NDA under Section 505(b)(2) of the FFDCA to seek approval for modifications or new uses of products previously approved by the FDA. Section 505(b)(2) was enacted as part of the Drug Price Competition and Patent Term Restoration Act of 1984, also known as the Hatch-Waxman Amendments, and permits the filing of an NDA where at least some of the information required for approval comes from studies not conducted by or for the applicant and for which the applicant has not obtained a right of reference. The applicant may rely upon published literature and the FDA's previous findings of safety and effectiveness for an approved product based on the prior pre-clinical or clinical trials conducted for the approved product. The FDA may also require companies to perform new studies or measurements to support the change from the approved product. The FDA may then approve the new product candidate for all or some of the label indications for which the referenced product has been approved, as well as for any new indication sought by the Section 505(b)(2) applicant.

To the extent that a Section 505(b)(2) NDA relies on studies conducted for a previously approved drug product, the applicant is required to certify to the FDA concerning any patents listed for the approved product in the FDA's current list of "Approved Drug Products with Therapeutic Equivalence Evaluations," known as the Orange Book. Specifically, the applicant must certify for each listed patent that (1) the required patent information has not been filed; (2) the listed patent has expired; (3) the listed patent has not expired, but will expire on a particular date and approval is sought after patent expiration; or (4) the listed patent is invalid, unenforceable or will not be infringed by the new product. A certification that the new product will not infringe the already approved product's listed patent or that such patent is invalid is known as a Paragraph IV certification. If the applicant does not challenge the listed patents through a Paragraph IV certification, the Section 505(b)(2) NDA application will not be approved until all the listed patents claiming the referenced product have expired. The Section 505(b)(2) NDA application also will not be accepted or approved until any non-patent exclusivity, such as exclusivity for obtaining approval of a New Chemical Entity, listed in the Orange Book for the referenced product, has expired.

If the 505(b)(2) NDA applicant has provided a Paragraph IV certification to the FDA, the applicant must also send notice of the Paragraph IV certification to the referenced NDA and patent holders once the 505(b)(2) NDA has been accepted for filing by the FDA. The NDA and patent holders may then initiate a legal challenge based on the Paragraph IV certification. Under the FFDCA, if a patent infringement lawsuit is filed against the 505(b)(2) NDA applicant within 45 days of receipt of the Paragraph IV certification notice, an automatic stay of approval is imposed, which prevents the FDA from approving the Section 505(b)(2) NDA for 30 months, or until a court decision or settlement finding that the patent is invalid, unenforceable or not infringed, whichever is earlier. The court also has the ability to shorten or lengthen the 30 month stay if either party is found not to be reasonably cooperating in expediting the litigation. Thus, the 505(b)(2) NDA applicant may invest a significant amount of time and expense in the development of its product only to be subject to significant delay and patent litigation before its product may be commercialized.

The 505(b)(2) NDA applicant may be eligible for its own regulatory exclusivity period, such as three-year new product exclusivity. The first approved 505(b)(2) applicant for a particular condition of approval, or change to a marketed product, such as a new extended-release formulation for a previously approved product, may be granted three-year Hatch-Waxman exclusivity if one or more clinical trials, other than bioavailability or bioequivalence studies, was essential to the approval of the application and was conducted/sponsored by the applicant. Should this occur, the FDA is precluded from making effective any other application for the same condition of use or for a change to the drug product that was granted exclusivity until after that three-year exclusivity period has expired. Additional exclusivities may also apply, such as an added six-month pediatric exclusivity period based on studies conducted in pediatric patients under a written request from the FDA.

Additionally, the 505(b)(2) NDA applicant may list its own relevant patents in the Orange Book, and if it does, it can initiate patent infringement litigation against subsequent applicants that challenge such patents, which could result in a 30-month stay delaying those applicants.

Orphan Drug Designation

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

If a product that has orphan designation subsequently receives the first FDA approval for the disease or condition for which it has such designation, the product is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications to market the same drug for the same indication for seven years, except in limited circumstances, such as a showing of clinical superiority to the product with orphan exclusivity or inability to manufacture the product in sufficient quantities. The designation of such drug also entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages and user-fee waivers. However, competitors, may receive approval of different products for the indication for which the orphan product has exclusivity or obtain approval for the same product but for a different indication for which the orphan product has exclusivity. Orphan exclusivity also could block the approval of one of our product candidates for seven years if a competitor obtains approval of the same drug as defined by the FDA or if our product candidate is determined to be contained within the competitor’s product for the same indication or disease. In addition, if an orphan designated product receives marketing approval for an indication broader than what is designated, it may not be entitled to orphan exclusivity.

In the EU, medicinal products: (a) that are used to treat or prevent life-threatening or chronically debilitating conditions that affect no more than five in ten thousand people in the EU when the application is made; or (b) that are used to treat or prevent life-threatening or chronically debilitating conditions and that, for economic reasons, would be unlikely to be developed without incentives; and (c) where no satisfactory method of diagnosis, prevention or treatment of the condition concerned exists, or, if such a method exists, the medicinal product would be of significant benefit to those affected by the condition, may be granted an orphan designation. The application for orphan designation must be submitted to the EMA and approved before an application is made for marketing authorization for the product. Once authorized, orphan medicinal products are entitled to up to ten years of market exclusivity (which may be extended for an additional two years if pediatric data have been produced in accordance with an agreed pediatric investigational plan). During this ten year period, with a limited number of exceptions, neither the competent authorities of the EU Member States, the EMA, or the EC are permitted to accept applications or grant marketing authorization for other similar medicinal products with the same therapeutic indication. However, marketing

authorization may be granted to a similar medicinal product with the same orphan indication during the ten year period with the consent of the marketing authorization holder for the original orphan medicinal product or if the manufacturer of the original orphan medicinal product is unable to supply sufficient quantities. Marketing authorization may also be granted to a similar medicinal product with the same orphan indication if this latter product is safer, more efficacious or otherwise clinically superior to the original orphan medicinal product. The period of market exclusivity may, in addition, be reduced to six years if it can be demonstrated on the basis of available evidence that the criteria for orphan designation are no longer met or if the orphan medicinal product is sufficiently profitable not to justify maintenance of market exclusivity. Fintepla has received orphan drug designation for the treatment of patients with Dravet Syndrome in the United States, EU and Japan, and in the United States. for the treatment of patients with LGS.

Rare Pediatric Disease Priority Review Voucher Program

In 2012, Congress authorized the FDA to award priority review vouchers to sponsors of certain rare pediatric disease product applications. This program is designed to encourage development of new drug and biological products for prevention and treatment of certain rare pediatric diseases. Specifically, under this program, a sponsor who receives an approval for a drug or biologic for a "rare pediatric disease" may qualify for a voucher that can be redeemed to receive a priority review of a subsequent marketing application for a different product. The sponsor of a rare pediatric disease drug product receiving a priority review voucher may transfer (including by sale) the voucher to another sponsor. The voucher may be further transferred any number of times before the voucher is used, as long as the sponsor making the transfer has not yet submitted the application. The FDA may also revoke any priority review voucher if the rare pediatric disease drug for which the voucher was awarded is not marketed in the United States within one year following the date of approval.

For purposes of this program, a "rare pediatric disease" is a (a) serious or life-threatening disease in which the serious or life-threatening manifestations primarily affect individuals aged from birth to 18 years, including age groups often called neonates, infants, children, and adolescents; and (b) rare diseases or conditions within the meaning of the Orphan Drug Act. Congress has only authorized the Rare Pediatric Disease Priority Review Voucher program until September 30, 2020. Consequently, sponsors of marketing applications approved after that date will not receive the voucher unless Congress reauthorizes the Rare Pediatric Disease Priority Review Voucher program, for which legislation has been proposed in the current Congress. However, even if the program is not reauthorized, if a drug candidate receives Rare Pediatric Disease Designation before October 1, 2020, the sponsor of the marketing application for such drug will be eligible to receive a voucher if the application for the designated drug is approved by the FDA before October 1, 2022.

DEA Regulation

The Controlled Substances Act of 1970 (CSA) establishes registration, security, recordkeeping, reporting, storage, distribution and other requirements administered by the DEA. The DEA is concerned with the control of handlers of controlled substances, and with the equipment and raw materials used in their manufacture and packaging, in order to prevent loss and diversion into illicit channels of commerce.

The DEA regulates controlled substances as Schedule I, II, III, IV or V substances. Schedule I substances by definition have no established medicinal use, and may not be marketed or sold in the United States. A pharmaceutical product may be listed as Schedule II, III, IV or V, with Schedule II substances considered to present the highest risk of abuse and Schedule V substances the lowest relative risk of abuse among such substances.

Fenfluramine, the active ingredient in Fintepla, is currently regulated as a Schedule IV drug in the United States. Substances in Schedule IV are considered to have a low potential for abuse relative to substances in Schedule III. A prescription for controlled substances in Schedule IV issued by a practitioner may be communicated either orally, in writing, or by facsimile to the pharmacist, and may be refilled if so authorized on the prescription or by call-in. Many commonly prescribed sleep aids (e.g., Ambien®, Sonata®), most benzodiazepines (e.g., Ativan®, Valium®, Versed®, Diastat®, Onfi®) and some weight loss drugs (e.g., Belviq®, Qsymia®) are also regulated as Schedule IV drugs.

Annual registration is required for any facility that manufactures, distributes, dispenses, imports or exports any controlled substance. The registration is specific to the particular location, activity and controlled substance schedule. For example, separate registrations are needed for import and manufacturing, and each registration will specify which schedules of controlled substances are authorized.

The DEA typically inspects a facility to review its security measures prior to issuing a registration. Security requirements vary by controlled substance schedule, with the most stringent requirements applying to Schedule I and Schedule II substances. Required security measures include background checks on employees and physical control of inventory through measures such

as cages, surveillance cameras and inventory reconciliations. Records must be maintained for the handling of all controlled substances, and periodic reports made to the DEA. Reports must also be made for thefts or losses of any controlled substance, and authorization must be obtained to destroy any controlled substance. In addition, special authorization and notification requirements apply to imports and exports.

To meet its responsibilities, the DEA conducts periodic inspections of registered establishments that handle controlled substances. Failure to maintain compliance with applicable requirements, particularly as manifested in loss or diversion, can result in enforcement action that could have a material adverse effect on our business, results of operations and financial condition. The DEA may seek civil penalties, refuse to renew necessary registrations, or initiate proceedings to revoke those registrations. In certain circumstances, violations could eventuate in criminal proceedings.

Individual states also regulate controlled substances, and we and our contract manufacturers will be subject to state regulation on distribution of these products.

Foreign Regulation of Drug Development and Approval

In addition to regulations in the U.S., we are subject to a variety of foreign regulatory requirements including those governing drug development, pre-clinical trials, human clinical trials, marketing approval, manufacturing, pharmacovigilance and post-marketing regulation for drugs. The foreign regulatory approval process includes all of the risks associated with FDA approval set forth above, as well as additional country-specific regulations. Whether or not we obtain FDA approval for a product, we must obtain approval of a product by the comparable regulatory authorities of foreign countries before we can commence clinical trials or marketing of the product in those countries. Approval by one regulatory authority does not ensure approval by regulatory authorities in other jurisdictions. The approval process varies from country to country, can involve additional testing beyond that required by FDA, and may be longer or shorter than that required for FDA approval. The requirements governing the conduct of clinical trials, product licensing, pricing, promotion, and reimbursement vary greatly from country to country.

Under the EU regulatory system, we may submit applications for marketing authorizations in more than one EU Member State either under a centralized, decentralized, or mutual recognition marketing authorization procedure. The centralized procedure provides for the grant of a single marketing authorization for a medicinal product by the EC on the basis of a positive opinion by the EMA Committee for Medicinal Products for Human Use (ChMP) and is mandatory for certain categories of medicinal products, including orphan medicinal products. A centralized marketing authorization is valid for all EU Member States and the European Economic Area states. The decentralized procedure and the mutual recognition procedure apply between EU Member States. The decentralized marketing authorization procedure involves the submission of an application for marketing authorization to the competent authority of all EU member states in which the product is to be marketed. One national competent authority, selected by the applicant, assesses the application for marketing authorization. The competent authorities of the other EU Member States are subsequently required to grant marketing authorization for their territory on the basis of this assessment, except where grounds of potential serious risk to public health require this authorization to be refused. The mutual recognition procedure provides for mutual recognition of marketing authorizations delivered by the national competent authorities of EU Member States by the competent authorities of other EU Member States. The holder of a national marketing authorization may submit an application to the competent authority of an EU Member State member state requesting that this authority recognize the marketing authorization delivered by the competent authority of another EU Member State member state for the same medicinal product. The EC may agree upon recommendation of the EMA to grant for medicines including those designated as orphan medicines a (i) conditional marketing authorization in the interest of public health under certain conditions; namely that unmet medical needs will be fulfilled, the benefit-risk balance of the product is positive, the benefit to public health of the medicinal product's immediate availability on the market outweighs the risks due to need for further data and it is likely that the applicant will be able to provide comprehensive data; or (ii) marketing authorization under "exceptional circumstances" when the applicant can show that it is unable to provide comprehensive data on the efficacy and safety under normal conditions of use and subject to specific procedures being introduced. This may arise in particular when the intended indications are very rare, in the present state of scientific knowledge, it is not possible to provide comprehensive information, or when generating data may be contrary to generally accepted ethical principles.

In 2016, the EMA launched its Priority Medicines, or PRIME, scheme. PRIME is a voluntary scheme aimed at enhancing the EMA's support for the development of medicines that target unmet medical needs. It is based on increased interaction and early dialogue with companies developing promising medicines, to optimize their product development plans and speed up their evaluation to help them reach patients earlier. The scheme focuses on medicines that may offer a major therapeutic advantage over existing treatments, or benefit patients without treatment options. These medicines are considered priority medicines by the EMA. To be accepted for PRIME, a medicine has to show its potential to benefit patients with unmet

medical needs based on early clinical data. The benefits of a PRIME designation include the appointment of a CHMP rapporteur before submission of the marketing authorization application, early dialogue and scientific advice at key development milestones, and the potential to qualify products for accelerated review earlier in the application process.

Similar Similarly to the U.S., both marketing authorization holders and manufacturers of medicinal products are subject to comprehensive regulatory oversight by the EMA and the competent authorities of the individual EU Member States both before and after grant of the manufacturing and marketing authorizations. This includes control of compliance by the companies within the EU legal framework (i.e., GCP, GLP, cGMP and pharmacovigilance rules, which govern quality control of the manufacturing process and require documentation policies and procedures). We and our third party manufacturers are required under regulations to ensure that all of our processes, methods, and equipment are compliant with GCP, GLP, cGMP and pharmacovigilance rules. The EMA and national competent authorities have in the past, and expect that they will continue to, may arrange inspections to ensure that we adhere to these principles and regulations. Any adverse findings from such inspections, depending on their severity, may result in significant delays in obtaining a marketing authorization, may impose penalties or may result in other action by regulatory authorities.

Failure by us or by any of our third party partners, including suppliers, manufacturers, marketers and distributors to comply with EU laws and the related national laws of individual EU Member States governing the conduct of clinical trials, manufacturing approval, marketing authorization of medicinal products, pre-approval promotion of products, reporting of adverse health events, both before and after grant of marketing authorization, and marketing/promotion of such products following grant of authorization may result in administrative, civil, or criminal penalties. These penalties could include delays in or refusal to authorize the conduct of clinical trials or to grant marketing authorization, product withdrawals and recalls, product seizures, suspension, or variation of the marketing authorization, total or partial suspension of production, distribution, manufacturing, or clinical trials, operating restrictions, injunctions, suspension of licenses, fines, and criminal penalties.

Healthcare Fraud and Abuse Laws

We are subject to various federal, state and local laws targeting fraud and abuse in the healthcare industry. These laws are applicable to manufacturers of products regulated by the FDA, such as us, and hospitals, physicians and other potential purchasers of such products.

In particular, the federal Anti-Kickback Statute prohibits persons from knowingly and willfully soliciting, receiving, offering or providing remuneration, directly or indirectly, to induce either the referral of an individual, or the furnishing, recommending, or arranging for a good or service, for which payment may be made under a federal healthcare program such as the TRICARE, Medicare and Medicaid programs. The term “remuneration” is not defined in the federal Anti-Kickback Statute and has been broadly interpreted to include anything of value, including for example, gifts, discounts, the furnishing of supplies or equipment, credit arrangements, payments of cash, waivers of payments, ownership interests and providing anything at less than its fair market value. Moreover, the lack of uniform court interpretation of the Anti-Kickback Statute makes compliance with the law difficult. In addition, 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.

Additionally, many states have adopted laws similar to the federal Anti-Kickback Statute. Some of these state prohibitions apply to referral of patients for healthcare items or services reimbursed by any third-party payor, not only the Medicare and Medicaid programs in at least some cases, and do not contain safe harbors or statutory exceptions. Government officials have focused their enforcement efforts on marketing of healthcare services and products, among other activities, and have brought cases against numerous pharmaceutical and medical device companies, and certain sales and marketing personnel for allegedly offering unlawful inducements to potential or existing customers in an attempt to procure their business or reward past purchases or recommendations.

Another development affecting the healthcare industry is the increased use of the federal civil and criminal false claims laws, including the federal civil False Claims Act and, in particular, actions brought pursuant to the False Claims Act’s “whistleblower” or “qui tam” provisions. The civil False Claims Act imposes liability on any person or entity who, among other things, knowingly presents, or causes to be presented, a false or fraudulent claim for payment by a federal healthcare program. In addition, the government may assert that a claim including items or services resulting from a violation of the federal Anti-Kickback Statute constitutes a false or fraudulent claim for purposes of the civil False Claims Act. The qui tam provisions of the False Claims Act allow a private individual to bring civil actions on behalf of the federal government alleging that the defendant has submitted a false claim to the federal government, and to share in any monetary recovery. In recent years, the number of suits brought by private individuals has increased dramatically. When an entity is determined to have violated the False Claims Act, it may be required to pay up to three times the actual damages sustained by the government, plus civil

penalties for each separate false claim. The False Claims Act has been used to assert liability on the basis of inadequate care, kickbacks and other improper referrals, improperly reported government pricing metrics such as Best Price or Average Manufacturer Price and improper promotion of off-label uses (i.e., uses not expressly approved by FDA in a drug's label). In addition, various states have enacted false claim laws analogous to the False Claims Act. Many of these state laws apply where a claim is submitted to any third-party payor and not merely a federal healthcare program.

The federal Civil Monetary Penalties Law 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. Noncompliance with such beneficiary inducement provision of the federal Civil Monetary Penalties Law can result in civil money penalties for each wrongful act, assessment of three times the amount claimed for each item or service and exclusion from the federal healthcare programs.

The Health Insurance Portability and Accountability Act of 1996 (HIPAA) created several new federal crimes, including health care fraud, and false statements relating to health care matters. The health care fraud statute prohibits knowingly and willfully executing a scheme to defraud any health care benefit program, including private third-party payors. The false statements statute prohibits knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false, fictitious or fraudulent statement in connection with the delivery of or payment for health care benefits, items or services. Similar to the federal Anti-Kickback Statute, a person or entity does not need to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation.

The Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, (collectively, the ACA) also imposes new reporting and disclosure requirements on drug manufacturers for any "transfer of value" made or distributed to prescribers and other healthcare providers, and any ownership or investment interests held by physicians and their immediate family members during the preceding calendar year. Failure to submit required information may result in civil monetary penalties for any payments, transfers of value or ownership or investment interests not reported in an annual submission, and additional penalties for "knowing failures". Manufacturers are required to report such data to the government by the 90th day of each calendar year.

Under California law, pharmaceutical companies must adopt a comprehensive compliance program that is in accordance with both the Office of Inspector General Compliance Program Guidance for Pharmaceutical Manufacturers (OIG Guidance) and the Pharmaceutical Research and Manufacturers of America Code on Interactions with Healthcare Professionals (PhRMA Code). The PhRMA Code seeks to promote transparency in relationships between health care professionals and the pharmaceutical industry and to ensure that pharmaceutical marketing activities comport with the highest ethical standards. The PhRMA Code contains strict limitations on certain interactions between health care professionals and the pharmaceutical industry relating to gifts, meals, entertainment and speaker programs, among others. Also, certain states have imposed restrictions on the types of interactions that pharmaceutical companies or their agents (e.g., sales representatives) may have with health care professionals, including bans or strict limitations on the provision of meals, entertainment, hospitality, travel and lodging expenses, and other financial support, including funding for continuing medical education activities.

Federal and state government price reporting laws require manufacturers to calculate and report complex pricing metrics to government programs. Such reported prices may be used in the calculation of reimbursement and/or discounts on marketed products. Participation in these programs and compliance with the applicable requirements subject manufacturers to potentially significant discounts on products, increased infrastructure costs, and potentially limit the ability to offer certain marketplace discounts.

Data Privacy and Security Laws

We may be subject to, or our marketing activities may be limited by, HIPAA, and its implementing regulations, including the final omnibus rule published on January 25, 2013, which established uniform standards for certain "covered entities" (healthcare providers, health plans and healthcare clearinghouses) governing the conduct of certain electronic healthcare transactions and protecting the security and privacy of protected health information. The American Recovery and Reinvestment Act of 2009, commonly referred to as the economic stimulus package, included sweeping expansion of HIPAA's privacy and security standards called the Health Information Technology for Economic and Clinical Health Act (HITECH) which became effective on February 17, 2010. Among other things, the new law makes HIPAA's privacy and security standards directly applicable to "business associates" — independent contractors or agents of covered entities that receive or obtain protected health information in connection with providing a service 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. In addition to HIPAA and HITECH, there are state data breach notification laws, state health information privacy laws, and federal and state consumer protection laws.

We are also subject to foreign privacy laws in the foreign jurisdictions in which we sell our testing products. The interpretation, application and interplay of consumer and health-related data protection laws in the U.S., Europe and elsewhere are often uncertain, contradictory and in flux. For example, the EU enacted Regulation (EU) 2016/679 (General Data Protection Regulation (GDPR)), has been enacted in the EU and went into full effect in May 2018. These texts introduce many changes to privacy and security in the EU, including stricter rules on consent and security duties for critical industries, including for the health sector. The interpretation of some rules is still unclear, and some requirements will be completed by national legislation. More generally, foreign laws and interpretations governing data privacy and security are constantly evolving and it is possible that laws may be interpreted and applied in a manner that is inconsistent with current practices, subjecting entities to government-imposed fines or orders. Additionally, following the UK's withdrawal from the EU, we will have to comply with the GDPR and the UK GDPR, each regime having the ability to fine up to the greater of €20 million/ £17.5 million or 4% of global turnover. The relationship between the UK and the EU in relation to certain aspects of data protection law remains unclear, for example around how data can lawfully be transferred between each jurisdiction, which exposes us to further compliance risk.

Third-Party Payor Coverage and Reimbursement

The commercial success of our product candidates, if and when commercialized, will depend, in part, upon the availability of coverage and reimbursement from third-party payors at the federal, state and private levels. Third-party payors include governmental programs such as Medicare or Medicaid, private insurance plans and managed care plans. These third-party payors may deny coverage or reimbursement for a product or therapy in whole or in part if they determine that the product or therapy was not medically appropriate or necessary. Also, third-party payors have attempted to control costs by limiting coverage through the use of formularies and other cost-containment mechanisms and the amount of reimbursement for particular procedures or drug treatments.

Changes in third-party payor coverage and reimbursement rules can impact our business. For example, the ACA changes include increased rebates a manufacturer must pay to the Medicaid program, addressed a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted or injected, and established a new Medicare Part D coverage gap discount program, in which manufacturers must now provide 70% point-of-sale discounts on products covered under Part D. Further, the law imposes a significant annual, nondeductible fee on companies that manufacture or import branded prescription drug products. Substantial new provisions affecting compliance have also been enacted, which may require us to modify our business practices with health care practitioners.

Since its enactment, there have been judicial and Congressional challenges to certain aspects of the ACA. By way of example, the Tax Cuts and Jobs Acts, or Tax Act, was enacted, which, among other things, removes penalties for not complying with the individual mandate to carry health insurance. On December 14, 2018, a U.S. District Court Judge in the Northern District of Texas ("Texas District Court Judge"), ruled that the entire ACA is invalid based primarily on the fact that the Tax Act repealed the tax-based shared responsibility payment imposed by the ACA, on certain individuals who fail to maintain qualifying health coverage for all or part of a year, which is commonly referred to as the "individual mandate". On December 18, 2019, the U.S. Court of Appeals for the 5th Circuit upheld the district court's decision that the individual mandate was unconstitutional but remanded the case back to the District Court to determine whether the remaining provisions of the ACA are invalid as well. It is unclear how these decisions, subsequent appeals, if any, or other efforts to challenge, repeal or replace the ACA will impact the law.

Other legislative changes have also been proposed and adopted in the United States since the ACA was enacted. For example, in August 2011, the Budget Control Act of 2011, among other things included aggregate reductions to Medicare payments to providers of 2% per fiscal year, which went into effect on April 1, 2013, and, due to subsequent legislative amendments to the statute, will remain in effect through 2029 unless additional Congressional action is taken. In January 2013, the American Taxpayer Relief Act of 2012, among other things, further reduced Medicare payments to several providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years.

Recently, there has been heightened governmental scrutiny over the manner in which drug manufacturers set prices for their marketed products, which has resulted in several Congressional inquiries and proposed and enacted legislation designed

to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drug products. 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 to encourage importation from other countries and bulk purchasing. These new laws may result in additional reductions in Medicare and other health care funding, and/or continue to put pressure on pharmaceutical pricing, as well as increase our regulatory burdens and operating costs, any of which could have a material adverse effect on our customers and accordingly, our financial operations.

In international markets, reimbursement and healthcare payment systems vary significantly by country, and many countries have instituted price ceilings on specific products and therapies. There can be no assurance that our products will be considered medically reasonable and necessary for a specific indication, that our products will be considered cost-effective by third-party payors, that an adequate level of reimbursement will be established even if coverage is available or that the third-party payors' reimbursement policies will not adversely affect our ability to sell our products profitably.

Manufacturing Requirements

We and our third-party manufacturers must comply with applicable FDA regulations relating to FDA's cGMP regulations and, if applicable, QSR requirements. The cGMP regulations include requirements relating to, among other things, organization of personnel, buildings and facilities, equipment, control of components and drug product containers and closures, production and process controls, packaging and labeling controls, holding and distribution, laboratory controls, records and reports, and returned or salvaged products. The manufacturing facilities for our products must meet cGMP requirements to the satisfaction of the FDA pursuant to a pre-approval inspection before we can use them to manufacture our products. We and our third-party manufacturers are also subject to periodic unannounced inspections of facilities by the FDA and other authorities, including procedures and operations used in the testing and manufacture of our products to assess our compliance with applicable regulations. Failure to comply with statutory and regulatory requirements subjects a manufacturer to possible legal or regulatory action, including, among other things, warning letters, the seizure or recall of products, injunctions, consent decrees placing significant restrictions on or suspending manufacturing operations and civil and criminal penalties.

Other Regulatory Requirements

We are also subject to various laws and regulations regarding laboratory practices, the experimental use of animals, and the use and disposal of hazardous or potentially hazardous substances in connection with our research. In each of these areas, as above, the FDA has broad regulatory and enforcement powers, including, among other things, the ability to levy fines and civil penalties, suspend or delay issuance of approvals, seize or recall products, and withdraw approvals, any one or more of which could have a material adverse effect on us.

Employees

As of December 31, 2019, we employed 141 full-time employees. Of the full-time employees, 77 were engaged in product development, quality assurance and clinical development and regulatory activities, 22 were engaged in sales and marketing and 42 were engaged in general and administrative activities (including business and corporate development).

None of our employees are represented by a labor union, and we consider our employee relations to be good. We currently utilize two employer services companies to provide human resource services. These service companies are the employer of record for payroll, benefits, employee relations and other employment-related administration.

About Zogenix

We were formed as a Delaware corporation on May 11, 2006 as SJ2 Therapeutics, Inc. We changed our name to Zogenix, Inc. on August 28, 2006. Our principal executive offices are located at 5959 Horton Street, Suite 500, Emeryville, California 94608, and our telephone number is (510) 550-8300. We conduct our research and development activities and general and administrative functions primarily from our Emeryville, California location.

Available Information

Our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and amendments to those reports, are available free of charge at www.zogenix.com as soon as reasonably practicable after they are electronically filed with or furnished to the Securities and Exchange Commission (SEC). They are also available on the SEC's website at www.sec.gov. The information in or accessible through the SEC and our website are not incorporated into, and are not considered part of, this filing.

Item 1A. Risk Factors

We operate in a dynamic and rapidly changing environment that involves numerous risks and uncertainties. Certain factors may have a material adverse effect on our business prospects, financial condition and results of operations, and you should carefully consider them. Accordingly, in evaluating our business, we encourage you to consider the following discussion of risk factors, in its entirety, in addition to other information contained in this Annual Report on Form 10-K and our other public filings with the SEC. Other events that we do not currently anticipate or that we currently deem immaterial may also affect our business, prospects, financial condition and results of operations.

Risks Related to Our Business and Industry

Our success depends substantially on our product candidates in development, Fintepla and MT1621. We cannot be certain that Fintepla, MT1621 or any future product candidates will receive regulatory approval or be successfully commercialized.

We have only two product candidates in clinical development, Fintepla and MT1621, and our business depends substantially on the successful development and commercialization of these product candidates. We currently have no drug products approved for sale, and we may not be able to develop marketable drug products in the future. Fintepla, MT1621 and any future product candidates will require additional clinical and pre-clinical development, regulatory review and approval in multiple jurisdictions, substantial investment, access to sufficient commercial manufacturing capacity and significant marketing efforts before we can generate any revenues from product sales. The research, testing, manufacturing, labeling, approval, sale, marketing, distribution and promotion of drug products are subject to extensive regulation by the FDA and other regulatory authorities in the United States and other countries, whose regulations differ from country to country.

We are not permitted to market our product candidates in the United States until we receive approval of an NDA from the FDA, or in any foreign countries until we receive the requisite approval from the regulatory authorities of such countries, and we may never receive such regulatory approvals. In February 2019, we completed our rolling submission of an NDA with the FDA and submitted an MAA to the EMA for Fintepla for the treatment of seizures associated with Dravet syndrome. The EMA has accepted the MAA and initiated its review. However, on April 5, 2019, we received RTF letter from the FDA regarding our NDA for Fintepla for the treatment of seizures associated with Dravet syndrome. The RTF letter provided the FDA's determination that the NDA, as submitted on February 5, 2019, was not sufficiently complete to permit a substantive review of the NDA. In the RTF letter, the FDA cited two reasons for the RTF decision: first, certain non-clinical studies were not submitted to allow assessment of the chronic administration of fenfluramine; and, second, the application contained an incorrect version of a clinical dataset, which prevented the completion of the review process that is necessary to support the filing of the NDA. The FDA did not request or recommend in the RTF letter that we conduct any additional clinical efficacy or safety studies.

We held a Type A meeting with the FDA in May 2019 to review the two issues identified in the RTF letter. Based on the final meeting minutes received, the FDA has concurred with our plan to resubmit the NDA for Fintepla without the inclusion of the new chronic toxicity studies requested in the RTF letter. With regards to the second issue, we conducted and discussed with the FDA a root cause analysis identifying the issue with the incorrect clinical dataset submitted in the original NDA, and the FDA has requested that we include certain findings from our analysis in the resubmitted NDA. In September 2019, we resubmitted the NDA for Fintepla for the treatment of seizures associated with Dravet syndrome to the FDA. On November 25, 2019, we announced that the FDA accepted for filing such NDA and granted priority review of the application, with a target PDUFA action date of March 25, 2020. As part of their review, the FDA requested additional information. We provided the FDA with additional data to conduct additional efficacy analyses from our two pivotal studies in Dravet syndrome. On February 27, 2020, we announced that the FDA extended the PDUFA target action date to June 25, 2020, which provides the FDA additional time to review. Although we do not believe the approvability of the NDA is affected by these analyses, we cannot be certain the FDA will concur with our analyses or otherwise approve the NDA by the revised PDUFA target action date or at all. The FDA may determine later to require us to conduct additional non-clinical or clinical studies or may otherwise impose other requirements to be completed before or after approval of the NDA. In addition, the RTF letter could cause potential delays by the EMA on an approvability decision, or otherwise negatively affect such decision.

MT1621 has been evaluated in a Phase 2 retrospective treatment clinical study called RETRO, which demonstrated increased survival probability and improved functional abilities for patients treated with MT1621 compared with untreated natural history control patients. However, the FDA or EMA may disagree with the design of the RETRO and the reliance on a natural history dataset as the comparator, and we may be required to conduct additional trials prior to seeking regulatory approval.

Obtaining regulatory approval for a product candidate is a lengthy, expensive and uncertain process, and may not be successful. Any failure to obtain regulatory approval of Fintepla, MT1621 or any future product candidate, or failure to obtain such approval for all of the indications and labeling claims we deem desirable, would limit our ability to generate future revenues, would potentially harm the development prospects of Fintepla and MT1621 and would have a material and adverse impact on our business.

Even if we successfully obtain regulatory approvals to market our product candidates, our revenues will be dependent, in part, on our ability to commercialize such products as well as the size of the markets in the territories for which we gain regulatory approval. If the markets for our product candidates are not as significant as we estimate, our business and prospects will be harmed.

Our clinical trials may fail to demonstrate acceptable levels of safety and efficacy for Fintepla, MT1621 or any future product candidates, which could prevent or significantly delay their regulatory approval.

Fintepla, MT1621 and any future product candidates are prone to the risks of failure inherent in drug development. Before obtaining U.S. regulatory approval for the commercial sale of Fintepla, MT1621 or any future product candidates, we must gather substantial evidence from well-controlled clinical trials that demonstrate to the satisfaction of the FDA that the product candidate in question is safe and effective, and similar regulatory approvals would be necessary to commercialize our product candidates in other countries. Failure can occur at any stage of our clinical trials, and we could encounter problems that cause us to abandon or repeat clinical trials.

A number of companies in the biotechnology and pharmaceutical industries have suffered significant setbacks in advanced clinical trials, even after promising results in earlier trials. If Fintepla or MT1621 is not shown to be safe and effective in clinical trials, the programs could be delayed or terminated, which could have a material adverse effect on our business, results of operations, financial condition and prospects.

The results of previous clinical trials may not be predictive of future results, and the results of our current and planned clinical trials may not satisfy the requirements of the FDA or non-U.S. regulatory authorities.

The results from the prior clinical trials of Fintepla or MT1621 may not necessarily be predictive of the results of future clinical trials or preclinical studies. The results of prior clinical trials of Fintepla or MT1621 may not be replicated in any future clinical trials of these product candidates. Clinical data are often susceptible to varying interpretations and analyses, and many companies that believed their product candidates performed satisfactorily in prior clinical trials nonetheless have failed to obtain FDA approval. If we fail to produce positive results in our clinical trials of our product candidates, the development timeline and regulatory approval and commercialization prospects for our product candidates and our business and financial prospects, would be adversely affected.

Further, Fintepla may not be approved even though recent, positive topline results from our ongoing Phase 3 trial of Fintepla for LGS showed that Fintepla met its primary and certain key secondary endpoints. Similarly, MT1621 may not be approved even though the RETRO data demonstrated improved survival probability of patients treated with MT1621 compared with a natural history patient control group. The FDA or non-U.S. regulatory authorities may disagree with our trial design and our interpretation of data from preclinical studies and clinical trials, including with the design of the Phase 2 retrospective study comparing the outcomes from the MT1621 active treatment group against outcomes from a natural history dataset. In addition, any of these regulatory authorities may change its requirements for the approval of a product candidate even after reviewing and providing comments or advice on a protocol for a pivotal clinical trial that, if successful, would potentially form the basis for an application for approval by the FDA or another regulatory authority. Furthermore, any of these regulatory authorities may also approve our product candidates for fewer or more limited indications than we request or may grant approval contingent on the performance of costly post-marketing clinical trials.

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

From time to time, we may publicly disclose preliminary or topline data from our clinical studies, which are based on preliminary analyses of then-available data, such as the topline data from our Phase 3 trial of Fintepla for LGS we announced in January 2020 and the RETRO Phase 2 trial of MT1621 we announced in October 2019. Such preliminary results and related findings and conclusions are subject to change following more comprehensive reviews of the data related to the particular study or trial. We also make assumptions, estimations, calculations and conclusions as part of our analyses of data, and we may not have received or had the opportunity to fully and carefully evaluate all data. As a result, the topline results that we report may

differ from future results of the same studies, or different conclusions or considerations may qualify such results once additional data have been received and fully evaluated. Topline data also remain subject to audit and verification procedures that may result in the final data being materially different from the preliminary data we previously published. As a result, topline data should be viewed with caution until the final data are available.

From time to time, we may also disclose interim data from our clinical studies. Interim data from this clinical trial and future clinical trials that we may complete are subject to the risk that one or more of the clinical outcomes may materially change as patient enrollment continues, following more comprehensive reviews of the data, and as more patient data become available. Adverse differences between preliminary or interim data and final data could significantly harm our business prospects.

Further, others, including regulatory agencies, may not accept or agree with our assumptions, estimates, calculations, conclusions or analyses of data from preclinical studies or clinical trials of its product candidates, or may interpret or weigh the importance of data differently, which could impact the value of the particular product candidate, the approvability or prospects for commercialization of the product candidate, or our company in general. In addition, the information we choose to publicly disclose regarding a particular study or clinical trial is based on what is typically extensive information, and stockholders and others may not agree with what we determine is the material or otherwise appropriate information to include in our disclosure. Information that we decide not to disclose may ultimately be deemed significant with respect to future decisions, conclusions, views, activities or otherwise regarding a particular product, product candidate or our business. If the interim, topline or preliminary data that we disclose differ from actual results, or if others, including regulatory authorities, disagree with the conclusions we reach based on our analyses of such data, our ability to obtain approval for, and commercialize our product candidates may be harmed, which could harm our business, operating results, prospects or financial condition.

Delays in the commencement or completion of clinical testing for Fintepla or MT1621 or pre-clinical or clinical testing for any future product candidates could result in increased costs to us and delay or limit our ability to pursue regulatory approval for, or generate revenues from, such product candidates.

Clinical trials are very expensive, time consuming and difficult to design and implement. Delays in the commencement or completion of clinical testing for Fintepla or MT1621 or pre-clinical or clinical testing for any future product candidates could significantly affect our product development costs and business plan.

The completion of clinical trials can be delayed for a number of reasons, including delays related to:

- obtaining regulatory authorization to commence a clinical trial;
- reaching agreement on acceptable terms with clinical research organization (CROs), clinical investigators and trial sites;
- manufacturing or obtaining sufficient quantities of a product candidate and placebo for use in clinical trials;
- obtaining IRB approval to initiate and conduct a clinical trial at a prospective site;
- identifying, recruiting and training suitable clinical investigators;
- identifying, recruiting and enrolling subjects to participate in clinical trials for a variety of reasons, including competition from other clinical trial programs for the treatment of similar indications;
- retaining patients who have initiated a clinical trial but may be prone to withdraw due to side effects from the therapy, lack of efficacy, personal issues, or for any other reason they choose, or who are lost to further follow-up;
- uncertainty regarding proper dosing; and
- scheduling conflicts with participating clinicians and clinical institutions.

In addition, if a significant number of patients fail to stay enrolled in any of our current or future clinical trials of Fintepla or MT1621 and such failure is not adequately accounted for in our trial design and enrollment assumptions, our clinical development program could be delayed.

Clinical trials may also be delayed or repeated as a result of ambiguous or negative interim results or unforeseen complications in testing. In addition, a clinical trial may be suspended or terminated by us, the FDA, the IRB overseeing the clinical trial at issue, any of our clinical trial sites with respect to that site, or other regulatory authorities due to a number of factors, including:

- inability to design appropriate clinical trial protocols;
- inability by us, our employees, our CROs or their employees to conduct the clinical trial in accordance with all applicable FDA, DEA or other regulatory requirements or our clinical protocols;
- inspection of the clinical trial operations or trial sites by the FDA or other regulatory authorities resulting in the imposition of a clinical hold;
- discovery of serious or unexpected toxicities or side effects experienced by study participants or other unforeseen safety issues;
- lack of adequate funding to continue the clinical trial, including the incurrence of unforeseen costs due to enrollment delays, requirements to conduct additional trials and studies and increased expenses associated with the services of our CROs and other third parties;
- lack of effectiveness of any product candidate during clinical trials;
- slower than expected rates of subject recruitment and enrollment rates in clinical trials;
- inability of our CROs or other third-party contractors to comply with all contractual requirements or to perform their services in a timely or acceptable manner;
- inability or unwillingness of medical investigators to follow our clinical protocols; and
- unfavorable results from on-going clinical trials and pre-clinical studies.

Additionally, changes in applicable regulatory requirements and guidance may occur and we may need to amend clinical trial protocols to reflect these changes. Amendments may require us to resubmit our clinical trial protocols to the FDA and IRBs for reexamination, which may impact the costs, timing or successful completion of a clinical trial. If we experience delays in the completion of, or if we terminate, any of our clinical trials, the commercial prospects for Fintepla, MT1621 and any future product candidates may be harmed, which may have a material adverse effect on our business, results of operations, financial condition and prospects.

Breakthrough therapy designation and access to the PRIME scheme for MT1621 may not lead to a faster development or regulatory review or approval process, and it does not increase the likelihood that MT1621 or any of our product candidates will receive marketing approval.

In February 2019, the FDA granted breakthrough therapy designation for MT1621 in the United States for the treatment of TK2d. A breakthrough therapy is defined as a drug that is intended, alone or in combination with one or more other drugs, to treat a serious or life-threatening disease or condition, and preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints. For drugs that have been designated as breakthrough therapies, interaction and communication between the FDA and the sponsor of the trial can help to identify the most efficient path for clinical development while minimizing the number of patients placed in ineffective control regimens. Drugs designated as breakthrough therapies by the FDA may also be eligible for accelerated approval. Designation as a breakthrough therapy is within the discretion of the FDA. Accordingly, even if we believe one of our product candidates meets the criteria for designation as a breakthrough therapy, the FDA may disagree and instead determine not to make such designation. We cannot be sure that any evaluation we may make of our product candidates as qualifying for breakthrough therapy designation will meet the FDA's expectations. In any event, the receipt of a breakthrough therapy designation for a product candidate may not result in a faster development process, review or approval compared to drugs considered for approval under conventional FDA procedures and does not assure ultimate approval by the FDA. In addition, even though MT1621 qualifies as a breakthrough therapy, the FDA may later decide that MT1621, or any of our other product candidates that may qualify as a breakthrough therapy, no longer meets the conditions for qualification, or decide that the time period for FDA review or approval will not be shortened. For example, the FDA rescinded breakthrough therapy designation for Fintepla for Dravet syndrome due to the existence of two recently approved therapies for Dravet syndrome and, therefore, the administrative criteria for designation were no longer met.

The EMA has established the PRIME scheme to expedite the development and review of product candidates that show a potential to address to a significant extent an unmet medical need, based on early clinical data. In November 2018, the EMA admitted MT1621 to the PRIME scheme for the treatment of patients with TK2d was admitted to the PRIME scheme of the EMA. Even though we have access to PRIME for MT1621, this may not result in a materially faster development process, review or approval compared to conventional EMA procedures. Further, obtaining access to PRIME does not assure or increase the likelihood of EMA's grant of a marketing authorization (MA).

If the FDA does not conclude that certain of our product candidates satisfy the requirements for the Section 505(b)(2) regulatory approval pathway, or if the requirements for such product candidates under Section 505(b)(2) are not as we expect, the approval pathway for those product candidates will likely take significantly longer, cost significantly more and entail significantly greater complications and risks than anticipated, and in either case may not be successful.

We are developing proprietary product candidates, including Fintepla, for which we may seek FDA approval through the Section 505(b)(2) regulatory pathway. The Drug Price Competition and Patent Term Restoration Act of 1984, also known as the Hatch-Waxman Act, added Section 505(b)(2) to the Federal Food, Drug and Cosmetic Act (FDCA). Section 505(b)(2) permits the filing of an NDA where at least some of the information required for approval comes from trials that were not conducted by or for the applicant and for which the applicant has not obtained a right of reference. Section 505(b)(2), if applicable to us under the FDCA, would allow an NDA we submit to the FDA to rely in part on data in the public domain or the FDA's prior conclusions regarding the safety and effectiveness of approved compounds, which could expedite the development program for our product candidates by potentially decreasing the amount of clinical data that we would need to generate in order to obtain FDA approval. If the FDA does not allow us to pursue the Section 505(b)(2) regulatory pathway as we anticipated, we may need to conduct additional clinical trials, provide additional data and information and meet additional standards for regulatory approval.

Even if we are allowed to pursue the Section 505(b)(2) regulatory pathway, we cannot assure you that our product candidates will receive the requisite approvals for commercialization. In addition, the pharmaceutical industry is highly competitive, and Section 505(b)(2) NDAs are subject to special requirements designed to protect the patent rights of sponsors of previously approved drugs that are referenced in a Section 505(b)(2) NDA. These requirements may give rise to patent litigation and mandatory delays in approval of our NDAs for up to 30 months or longer depending on the outcome of any litigation. It is not uncommon for a manufacturer of an approved product to file a citizen petition with the FDA seeking to delay approval of, or impose additional approval requirements for, pending competing products. If successful, such petitions can significantly delay, or even prevent, the approval of the new product. However, even if the FDA ultimately denies such a petition, the FDA may substantially delay approval while it considers and responds to the petition. In addition, even if we are able to utilize the Section 505(b)(2) regulatory pathway, there is no there is no guarantee this would ultimately lead to accelerated product development or earlier approval.

Moreover, even if our product candidates are approved under Section 505(b)(2), the approval may be subject to limitations on the indicated uses for which the products may be marketed or to other conditions of approval, or may contain requirements for costly post-marketing testing and surveillance to monitor the safety or efficacy of the products.

We may not be successful in executing our sales and marketing strategy for the commercialization of Fintepla, if approved.

We have recently built a commercial sales and marketing organization, including sales, marketing and customer support functions, to prepare for the potential commercial launch of Fintepla, if approved, in the United States. If the commercial launch of Fintepla is delayed or does not occur for any reason, we would have prematurely or unnecessarily incurred these commercialization expenses. In addition, as a company, we have no prior experience in the marketing and sale of a rare disease product, and there are significant risks involved in managing a sales organization, including our ability to retain and incentivize qualified individuals, provide adequate training to sales and marketing personnel, generate sufficient sales leads, effectively manage a sales and marketing team, and handle any unforeseen costs and expenses. If we are unable to successfully maintain our sales and marketing organization, implement our commercialization plans and drive adoption by patients and physicians of Fintepla, then we will not be able to generate significant revenue which will have a material adverse effect on our business, results of operations, financial condition and prospects.

We face intense competition, and if our competitors market and/or develop treatments for any of our product candidates' indications that are marketed more effectively, approved more quickly than our product candidates or demonstrated to be safer or more effective than our products, our commercial opportunities will be reduced or eliminated.

The pharmaceutical industry is characterized by rapidly advancing technologies, intense competition and a strong emphasis on proprietary therapeutics. We face competition from a number of sources, some of which may target the same indications as our product candidates, including large pharmaceutical companies, smaller pharmaceutical companies, biotechnology companies, academic institutions, government agencies and private and public research institutions, many of which have greater financial resources, sales and marketing capabilities, including larger, well-established sales forces, manufacturing capabilities, experience in obtaining regulatory approvals for product candidates and other resources than we do.

If approved for the chronic treatment of Dravet syndrome, Fintepla may compete against other products and product candidates. In June 2018, the FDA approved the first treatment of seizures associated with Dravet syndrome, as well as LGS, GW Pharmaceuticals' Epidiolex® (cannabidiol or CBD). Epidiolex is a liquid drug formulation of plant-derived purified CBD, which is a chemical component of the Cannabis sativa plant, more commonly known as marijuana. GW's CBD was subsequently approved for the treatment of Dravet syndrome and LGS by the European Commission (as Epidyolex®) in September of 2019. In August 2018, the FDA approved a second treatment, Biocodex's Diacomit® (stiripentol), for the treatment of seizures associated with Dravet syndrome in patients who are also taking clobazam. Stiripentol is approved in Europe, Canada and Japan for the treatment of Dravet syndrome when used in conjunction with valproate and/or clobazam. Multiple companies are developing clinical-staged product candidates for the potential treatment of Dravet syndrome. Ovid Therapeutics, Inc. is currently evaluating its product candidate OV935, a first-in-class inhibitor of the enzyme cholesterol 24-hydroxylase (CH24H), for the potential treatment of adult and pediatric patients with Dravet syndrome and LGS in Phase 2 clinical trials. Additional clinical stage candidates for the treatment of Dravet syndrome include Ataluren from PTC Therapeutics (exploratory Phase 2), Huperzine-A from Supernus Pharmaceuticals (Phase 1/2), and clemizole (Phase 1) being evaluated by Epygenix Therapeutics, Inc.

We expect Fintepla, if approved, to compete on the basis of, among other things, product efficacy and safety, time to market, price, coverage and reimbursement by third-party payors, extent of adverse side effects and convenience of treatment procedures. While we currently are not aware of any pharmaceutical companies who are developing a pharmaceutical product candidate for the treatment of TK2d that would compete against MT1621, one or more of our competitors may develop other products that compete with ours, obtain necessary approvals for such products from the FDA, or other agencies, if required, more rapidly than we do or develop alternative products or therapies that are safer, more effective and/or more cost effective than any products developed by us. The competition that we will encounter with respect to any of our product candidates that receive the requisite regulatory approval and classification and are marketed will have an effect on our product prices, market share and results of operations. We may not be able to successfully differentiate any products that we are able to market from those of our competitors, successfully develop or introduce new products that are less costly or offer better results than those of our competitors or offer purchasers of our products payment and other commercial terms as favorable as those offered by our competitors. In addition, competitors may seek to develop alternative formulations of our product candidates and/or alternative drug delivery technologies that address our targeted indications.

The commercial opportunity for our product candidates could be significantly harmed if competitors are able to develop alternative formulations and/or drug delivery technologies outside the scope of our products. Compared to us, many of our potential competitors have substantially greater:

- capital resources;
- research and development resources, expertise and experience, including personnel and technology;
- drug development, clinical trial and regulatory resources and experience;
- sales and marketing resources and experience;
- manufacturing and distribution resources and experience;
- name recognition; and
- resources, experience and expertise in prosecution and enforcement of intellectual property rights.

As a result of these factors, our competitors may obtain regulatory approval of their products more rapidly than we are able to or may obtain patent protection or other intellectual property rights that limit or block us from developing or commercializing our product candidates. Our competitors may also develop drugs that are more effective, more useful, better tolerated, subject to fewer or less severe side effects, more widely prescribed or accepted or less costly than ours and may also be more successful than we are in manufacturing and marketing their products. If we are unable to compete effectively with the marketed therapeutics of our competitors or if such competitors are successful in developing products that effectively compete with any of our product candidates that are approved, our business, results of operations, financial condition and prospects may be materially adversely affected.

If Fintepla or MT1621 receives regulatory approval but does not achieve broad market acceptance or coverage by third-party payors, the revenues that we generate will be limited.

The commercial success of Fintepla or MT1621, if approved by the FDA or other regulatory authorities will depend upon the acceptance of these products by physicians, patients, healthcare payors and the medical community. Adequate

coverage and reimbursement of our approved product by third-party payors will also be critical for commercial success. The degree of market acceptance of any product candidates for which we may receive regulatory approval will depend on a number of factors, including:

- acceptance by physicians and patients of the product as a safe and effective treatment;
- any negative publicity or political action related to our or our competitors' products;
- the relative convenience and ease of administration;
- the prevalence and severity of adverse side effects;
- demonstration to authorities of the pharmacoeconomic benefits;
- demonstration to authorities of the improvement in burden of illness;
- limitations or warnings contained in a product's FDA-approved or EMA-approved labeling;
- the clinical indications for which a product is approved;
- availability and perceived advantages of alternative treatments;
- the effectiveness of our or any current or future collaborators' sales, marketing and distribution strategies;
- pricing and cost effectiveness;
- our ability to obtain sufficient U.S. third-party payor coverage and reimbursement;
- our ability to obtain European countries' pricing authorities' coverage and reimbursement; and
- the willingness of patients to pay out of pocket in the absence of third-party payor coverage.

Our efforts to educate the medical community, U.S. third-party payors and European countries' health authorities on the benefits of Fintepla or any of our product candidates for which we obtain marketing approval from the FDA or other regulatory authorities and gain broad market acceptance may require significant resources and may never be successful. If our products do not achieve an adequate level of acceptance by physicians, third-party payors, pharmacists, patients, and the medical community, we may not generate sufficient revenue from these products to become or remain profitable.

We have a history of significant net losses and negative cash flow from operations. We cannot predict if or when we will become profitable and anticipate that our net losses and negative cash flow from operations will continue for at least the next year.

We were organized in 2006, began commercialization of Sumavel DosePro in January 2010 and launched the commercial sale of Zohydro ER in the United States in March 2014. We sold our Sumavel DosePro business in April 2014 and sold our Zohydro ER business in April 2015. Our business and prospects must be considered in light of the risks and uncertainties frequently encountered by pharmaceutical companies developing and commercializing new products.

Excluding gains from two discrete business divestitures, we have incurred significant net losses from our operations since the inception and have an accumulated deficit of $1.1 billion as of December 31, 2019. During the year ended December 31, 2019, net cash used in operating activities was $111.5 million. We expect to continue to incur operating losses and negative cash flow from operating activities for at least the next year primarily as a result of costs incurred related to the development and commercialization of Fintepla and MT1621. Additionally, in the event that Fintepla or MT1621 is approved in the United States or the EU, we will owe milestone payments related to our 2014 acquisition of development and commercialization rights to Fintepla and our 2019 acquisition of development and commercialization rights to MT1621, respectively. Our ability to generate revenues from Fintepla or MT1621 will depend on a number of factors including our ability to successfully complete clinical trials, obtain necessary regulatory approvals and negotiate arrangements with third parties to help finance the development of, and market and distribute, any product candidates that receive regulatory approval. In addition, we are subject to the risk that the marketplace will not accept our products.

Because of the numerous risks and uncertainties associated with our commercialization and product development efforts, we are unable to predict the extent of our future losses or when or if we will become profitable, if at all. If we do not generate significant sales from Fintepla or MT1621 or any future product candidate that may receive regulatory approval, there would likely be a material adverse effect on our business, results of operations, financial condition and prospects which could result in our inability to continue operations.

We rely on third parties to conduct our pre-clinical studies and clinical trials. If these third parties do not successfully carry out their contractual duties or meet expected deadlines, we may not be able to obtain regulatory approval for or commercialize our product candidates and our business could be substantially harmed.

We have agreements with third-party CROs to conduct our ongoing Phase 3 program for Fintepla and our clinical development program of MT1621. We rely heavily on these parties for the execution of our clinical trials and pre-clinical studies, and control only certain aspects of their activities. Nevertheless, we are responsible for ensuring that each of our studies is conducted in accordance with the applicable protocol and regulatory requirements. We and our CROs are required to comply with GCP requirements for clinical studies of our product candidates, and GLP requirements for certain pre-clinical studies. The FDA enforces these regulations through periodic inspections of trial sponsors, principal investigators and trial sites. If we or our CROs fail to comply with applicable regulations, the data generated in our pre-clinical studies and clinical trials may be deemed unreliable and the FDA may require us to perform additional pre-clinical studies or clinical trials before approving our marketing applications. We cannot assure you that, upon inspection, the FDA and similar foreign regulators will determine that any of our clinical trials comply or complied with GCP regulations. In addition, our clinical trials must be conducted with product produced under cGMP, regulations, and require a large number of test subjects. Our inability to comply with these regulations may require us to repeat clinical trials, which would delay the regulatory approval process.

If any of our relationships with these third-party CROs terminates, we may not be able to enter into arrangements with alternative CROs on commercially reasonable terms, or at all. If CROs do not successfully carry out their contractual duties or obligations or meet expected deadlines, if they need to be replaced or if the quality or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our clinical protocols or regulatory requirements or for other reasons, our clinical trials may be extended, delayed or terminated and we may not be able to obtain regulatory approval for or successfully commercialize our product candidates. As a result, our results of operations and the commercial prospects for our product candidates would be harmed, our costs could increase and our ability to generate additional revenues could be delayed.

Switching or adding additional CROs can involve substantial cost and require extensive management time and focus. In addition, there is a natural transition period when a new CRO commences work. As a result, delays may occur, which can materially impact our ability to meet our desired clinical development timelines. Though we carefully manage our relationships with our CROs, there can be no assurance that we will not encounter similar challenges or delays in the future or that these delays or challenges will not have a material adverse impact on our business, results of operations, financial condition and prospects.

We may engage in strategic transactions that could impact our liquidity, increase our expenses and present significant distractions to our management.

From time to time we may consider strategic transactions, such as acquisitions of companies, asset purchases and out-licensing or in-licensing of products, product candidates or technologies. For example, in September 2019, we completed the acquisition of Modis, which owns worldwide development and commercialization rights to MT1621. Additional potential transactions that we may consider include a variety of different business arrangements, including spin-offs, strategic partnerships, joint ventures, restructurings, divestitures, business combinations and investments. Any such transaction may require us to incur non-recurring or other charges, may increase our near and long-term expenditures and may pose significant integration challenges or disrupt our management or business, which could adversely affect our operations and financial results. For example, these transactions may 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 develop acquired products, product candidates or technologies;
- incurrence of substantial debt or dilutive issuances of equity securities to pay for acquisitions;
- significant or higher than expected acquisition and integration costs;
- write-downs of assets or goodwill or impairment charges;
- increased amortization expenses;
- difficulty and cost in combining the operations and personnel of any acquired businesses with our operations and personnel;
- impairment of relationships with key suppliers or customers of any acquired businesses due to changes in management, personnel and ownership; and

- inability to retain key employees of any acquired businesses.

Accordingly, although there can be no assurance that we will undertake or successfully complete any additional transactions of the nature described above, any additional transactions that we do complete could have a material adverse effect on our business, results of operations, financial condition and prospects.

We are dependent on numerous third parties in our manufacturing supply chain, all of which are currently single source suppliers, for the clinical supply of Fintepla, and if we experience problems with any of these suppliers, the development of Fintepla could be delayed.

We do not own or operate manufacturing facilities and have no plans to build our own clinical or commercial scale manufacturing capabilities. We outsource all manufacturing and packaging of the clinical trial materials for Fintepla and MT1621 to third parties and will rely on third parties for commercial manufacturing and packaging of our product candidates, if approved. In February 2019, we entered into a master supply agreement with Aptuit, pursuant to which Aptuit will be our commercial manufacturer and supplier of the fenfluramine API. In addition, in July 2019 we entered into the PCI Pharma Agreement, pursuant to which PCI Pharma will be our commercial manufacturer and supplier for Fintepla. Fintepla, if approved, would require us to complete process validation under FDA regulations, for which there can be no assurance of success. We may never be able to establish additional sources of supply for Fintepla.

The facilities used by third-party manufacturers to manufacture our product candidates must be approved by the FDA or other regulatory agencies pursuant to inspections that will be conducted after we submit a an NDA to the FDA or their equivalent to other regulatory agencies. We do not control the manufacturing process of, and are completely dependent on, third-party manufacturers for compliance with cGMP requirements for manufacture of our drug products. If these third-party manufacturers cannot successfully manufacture material that conforms to our specifications and the strict regulatory requirements of the FDA or others, including requirements related to the manufacturing of high potency and pure compounds or other products, they will not be able to secure and/or maintain regulatory approval for their manufacturing facilities. In addition, we have no control over the ability of third-party manufacturers to maintain adequate quality control, quality assurance and qualified personnel. If the FDA or a comparable foreign regulatory authority does not approve these facilities for the manufacture of our product candidates, or if regulatory authorities withdraw any such approval in the future, we may need to find alternative manufacturing facilities, which would significantly impact our ability to develop, obtain regulatory approval for or market our product candidates, if approved. Our failure, or the failure of our third-party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us, including clinical holds, fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, seizures or recalls of product candidates or products, operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supplies of our products. Our or a third-party's failure to execute on our manufacturing requirements, to do so on commercially reasonable terms, or to comply with cGMP could adversely affect our business in a number of ways, including an inability to initiate or continue clinical trials of any future product candidates under development, delays in submitting regulatory applications, or receiving marketing approvals, for our product candidates, requirements to cease development or to recall batches of our product candidates, and an inability to meet commercial demands for our products, if approved. In addition, reliance on suppliers entails risks to which we would not be subject if we manufactured our product candidate ourselves, including:

- reliance on the third parties for regulatory compliance and quality assurance;
- the possible breach of the manufacturing agreements by the third parties because of factors beyond our control or the insolvency of any of these third parties or other financial difficulties, labor unrest, natural disasters or other factors adversely affecting their ability to conduct their business; and
- the possibility of termination or non-renewal of the agreements by the third parties, at a time that is costly or inconvenient for us, because of our breach of the manufacturing agreement or based on their own business priorities.

If our contract manufacturers or suppliers are unable to provide the quantities of our product candidate required for our clinical trials and, if approved, for commercial sale, on a timely basis and at commercially reasonable prices, and we are unable to find one or more replacement manufacturers or suppliers capable of production at a substantially equivalent cost, in substantially equivalent volumes and quality, and on a timely basis, we would likely be unable to meet demand for our products and would have to delay or terminate our pre-clinical or clinical trials, and we would lose potential revenue. It may also take a significant period of time to establish an alternative source of supply for our products, product candidates and components and to have any such new source approved by the FDA or any applicable foreign regulatory authorities. Furthermore, any of the above factors could cause the delay or suspension of initiation or completion of clinical trials, regulatory submissions or

required approvals of our product candidates, cause us to incur higher costs and could prevent us from commercializing our product candidates successfully.

If we are unable to attract and retain key personnel, we may not be able to manage our business effectively or develop our product candidates or commercialize our products.

Our success depends on our continued ability to attract, retain and motivate highly qualified management and key clinical development, regulatory, sales and marketing and other personnel. As of December 31, 2019, we employed 141 full-time employees. Of the full-time employees, 77 were engaged in product development, quality assurance and clinical development and regulatory activities, 22 were engaged in sales and marketing and 42 were engaged in general and administrative activities (including business and corporate development). If we are not able to retain our employee base, we may not be able to effectively manage our business or be successful in commercializing our products.

We are highly dependent on the development, regulatory, commercial and financial expertise of our senior management team. We may not be able to attract or retain qualified management and scientific and clinical personnel in the future due to the intense competition for qualified personnel among biotechnology, pharmaceutical and other businesses, especially in the San Francisco Bay Area where we operate. If we are not able to attract, retain and motivate necessary personnel to accomplish our business objectives, we may experience constraints that will significantly impede the achievement of our development and commercialization objectives, our ability to raise additional capital, our ability to implement our business strategy and our ability to maintain effective internal controls for financial reporting and disclosure controls and procedures as required by the Sarbanes-Oxley Act of 2002 (the Sarbanes-Oxley Act). The loss of the services of any members of our senior management team, especially our Chief Executive Officer and President, Stephen J. Farr, Ph.D., could delay or prevent the development and commercialization of Fintepla and our product candidates. Further, if we lose any members of our senior management team, we may not be able to find suitable replacements, and our business may be harmed as a result.

Although we have employment agreements with each of our executive officers, these agreements are terminable by them at will at any time with or without notice and, therefore, do not provide any assurance that we will be able to retain their services. We do not maintain “key man” insurance policies on the lives of our senior management team or the lives of any of our other employees. In addition, we have clinical advisors who assist us in formulating our clinical strategies. These advisors are not our employees and may have commitments to, or consulting or advisory contracts with, other entities that may limit their availability to us, or may have arrangements with other companies to assist in the development of products that may compete with ours. If we are unable to attract and retain key personnel, our business, results of operations, financial condition and prospects will be adversely affected.

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

Despite the implementation of security measures, our internal computer systems and those of our current and our partners, contractors and consultants are vulnerable to damage from cyber-attacks, computer viruses, unauthorized access, natural disasters, terrorism, war and telecommunication and electrical failures. For example, we have been the target of cyber-attacks seeking to misappropriate our funds and have also experienced failures in our information systems and computer servers. We cannot be sure that similar cyber-attacks or failures will not occur in the future. System failures, accidents or security breaches can cause interruptions in our operations, and can result in a material disruption of our commercialization activities, drug development programs and our business operations. The loss of clinical trial data from completed or future clinical trials could result in delays in our regulatory approval and post-market study compliance efforts and significantly increase our costs to recover or reproduce the data. Similarly, we rely on a large number of third parties to supply components for and manufacture our product candidates and conduct clinical trials, and similar events relating to their computer systems could also have a material adverse effect on our business. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability and the development of our product candidates could be delayed or otherwise adversely affected.

Cyber-attacks or other failures in telecommunications or information technology systems could result in information theft, data corruption and significant disruption of our business operations.

We use information technology, computer systems and networks to process, transmit and store electronic information in connection with our business activities. Cyber incidents, including deliberate attacks and attempts to gain unauthorized access to computer systems and networks, have increased in frequency, scope and sophistication in every industry. These threats pose a risk to the security of our systems and networks and the confidentiality, availability and integrity of our data, and may cause a disruption in our operations, harm our reputation and increase our stock trading risk. There can be no assurance that we will be

successful in preventing cyber-attacks or successfully mitigating their effects. Similarly, there can be no assurance that our third-party collaborators, distributors and other contractors and consultants will be successful in protecting our data that is stored on their systems. A cyber-attack or destruction or loss of data could have a material adverse effect on our business and prospects. In addition, we may suffer reputational harm or face litigation or adverse regulatory action as a result of cyber-attacks or other data security breaches and may incur significant additional expense to implement further data protection measures.

Fluctuations in the value of the Euro or UK pound sterling could negatively impact our results of operations and increase our costs.

We conduct research and development activities in the UK and other European countries and some of the payments for these activities are denominated in Euros and UK pounds sterling. As a result, we are exposed to foreign exchange risk, and our results of operations may be impacted by fluctuations in the exchange rate between the U.S. dollar and the Euro or UK pound sterling, such as the decline in value of the UK pound sterling following the results of the UK's referendum on withdrawal from the EU. A significant appreciation in the Euro or UK pound sterling relative to the U.S. dollar will result in higher expenses and cause increases in our net losses. Likewise, to the extent that we generate any revenues denominated in foreign currencies, or become required to make payments in other foreign currencies, fluctuations in the exchange rate between the U.S. dollar and those foreign currencies could also negatively impact our results of operations. We currently have not entered into any foreign currency hedging contracts to reduce the effect of changes in foreign currency exchange rates, and foreign currency hedging is inherently risky and may result in unanticipated losses.

If we are unable to achieve and maintain adequate levels of coverage and reimbursement for any of our other product candidates for which we may receive regulatory approval on reasonable pricing terms, their commercial success may be severely hindered.

Successful sales of any product candidates for which we may receive regulatory approval will depend on the availability of adequate coverage and reimbursement from third-party payors. Patients who are prescribed medicine 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. Adequate coverage and reimbursement from governmental healthcare programs, such as Medicare and Medicaid, and commercial payors are critical to new product acceptance. Coverage decisions may depend upon clinical and economic standards that disfavor new drug products when more established or lower cost therapeutic alternatives are already available or subsequently become available. Assuming coverage is approved, the resulting reimbursement payment rates might not be adequate or may require co-payments that patients find unacceptably high. Patients are unlikely to use our products unless coverage is provided and reimbursement is adequate to cover a significant portion of the cost of our products.

In addition, the market for our products will depend significantly on access to third-party payors' drug formularies, or lists of medications for which third-party payors provide coverage and reimbursement. The industry competition to be included in such formularies often leads to downward pricing pressures on pharmaceutical companies. Also, third-party payors may refuse to include a particular branded drug in their formularies or otherwise restrict patient access to a branded drug when a less costly generic equivalent or other alternative is available.

In addition, regional healthcare authorities and individual hospitals are increasingly using competitive bidding procedures to determine what pharmaceutical products and which suppliers will be included in their prescription drug and other healthcare programs. This can reduce demand for our products or put pressure on our product pricing, which could negatively affect our business, results of operations, financial condition and prospects.

Third-party payors, whether foreign or domestic, or governmental or commercial, are developing increasingly sophisticated methods of controlling healthcare costs. In addition, in the United States, no uniform policy of coverage and reimbursement for drug products exists among third-party payors. Therefore, coverage and reimbursement for drug products can differ significantly from payor to payor.

Further, we believe that future coverage and reimbursement will likely be subject to increased restrictions both in the United States and in international markets. Third-party coverage and reimbursement for any of our product candidates for which we may receive regulatory approval may not be available or adequate in either the United States or international markets, which could have a material adverse effect on our business, results of operations, financial condition and prospects.

We face potential product liability exposure, and if successful claims are brought against us, we may incur substantial liability if our insurance coverage for those claims is inadequate.

The commercial use of our products and clinical use of our products and product candidates expose us to the risk of product liability claims. This risk exists even if a product or product candidate is approved for commercial sale by the FDA and manufactured in facilities regulated by the FDA such as the case with Zohydro ER, or an applicable foreign regulatory authority. Our products and product candidates are designed to affect important bodily functions and processes. Any side effects, manufacturing defects, misuse or abuse associated with Zohydro ER or our product candidates could result in injury to a patient or even death. For example, Zohydro ER is an opioid pain reliever that contains hydrocodone, which is a regulated "controlled substance" under the Controlled Substances Act of 1970 (CSA) and could result in harm to patients relating to its potential for abuse. Although we no longer sell Zohydro ER following the sale of the Zohydro ER business in April 2015, we retain all liabilities associated with the Zohydro ER business arising prior to such sale, including possible product liability exposure in connection with sales of Zohydro ER made prior to the sale of the Zohydro ER business. In addition, a liability claim may be brought against us even if our products or product candidates merely appear to have caused an injury.

Product liability claims may be brought against us by consumers, health care providers, pharmaceutical companies or others selling or otherwise coming into contact with our products or product candidates, if approved, among others. If we cannot successfully defend ourselves against product liability claims, we will incur substantial liabilities. In addition, regardless of merit or eventual outcome, product liability claims may result in:

- the inability to commercialize our product candidates;
- decreased demand for our product candidates, if approved;
- impairment of our business reputation;
- product recall or withdrawal from the market;
- withdrawal of clinical trial participants;
- costs of related litigation;
- distraction of management's attention from our primary business;
- substantial monetary awards to patients or other claimants; or
- loss of revenues.

We have obtained product liability insurance coverage for commercial product sales and clinical trials with a $20 million per occurrence and annual aggregate coverage limit. Our insurance coverage may not be sufficient to cover all of our product liability related expenses or losses and may not cover us for any expenses or losses we may suffer. Moreover, insurance coverage is becoming increasingly expensive, and, in the future, we may not be able to maintain insurance coverage at a reasonable cost, in sufficient amounts or upon adequate terms to protect us against losses due to product liability. If we determine that it is prudent to increase our product liability coverage based on approval of Fintepla, or otherwise, we may be unable to obtain this increased product liability insurance on commercially reasonable terms or at all. Large judgments have been awarded in class action or individual lawsuits based on drugs that had unanticipated side effects, including side effects that are less severe than those of Zohydro ER and our product candidates. A successful product liability claim or series of claims brought against us could cause our stock price to decline and, if judgments exceed our insurance coverage, could decrease our cash and have a material adverse effect on our business, results of operations, financial condition and prospects.

We may never receive regulatory approval or commercialize our product candidate outside of the United States.

We intend to market Fintepla and MT1621 outside of the United States, if approved. For example, Fintepla has received orphan drug designation in the EU and MT1621 has access to the PRIME scheme in the EU. In addition, we completed a Phase 3 clinical trial, which included sites in Europe and Australia, in 2017, and submitted an MAA to the EMA for Fintepla for the treatment of seizures associated with Dravet syndrome in February 2019. The EMA has accepted the MAA and initiated its review. In order to market our products outside of the United States, we, or any potential partner, must obtain separate regulatory approvals and comply with numerous and varying regulatory requirements of other countries regarding safety and efficacy and governing, among other things, clinical trials and commercial sales, pricing and distribution of our products. The time required to obtain approval in other countries might differ from and be longer than that required to obtain FDA approval. The regulatory approval process in other countries may include all of the risks detailed in these "Risk Factors" and those disclosed in Part I, Item 1A of our 2018 Annual Report on Form 10-K regarding FDA approval in the United States, as well as other risks.

For example, in the European Economic Area (EEA), which comprised of 28 EU member states plus Iceland, Liechtenstein, and Norway, medicinal products can only be commercialized after obtaining a MA. There are two types of MAs:

- The Community MA, which is issued by the European Commission through the Centralized Procedure, based on the opinion of the Committee for Medicinal Products for Human Use (CHMP) of the EMA and which is valid throughout the entire territory of the EEA. The Centralized Procedure is mandatory for certain types of products, such as biotechnology medicinal products, orphan medicinal products, and medicines that contain a new active substance indicated for the treatment of AIDS, cancer, neurodegenerative disorders, diabetes, auto-immune and viral diseases. The Centralized Procedure is optional for products containing a new active substance not yet authorized in the EEA, or for products that constitute a significant therapeutic, scientific or technical innovation or which are in the interest of public health in the EU. Under the Centralized Procedure the maximum timeframe for the evaluation of an MAA is 210 days (excluding clock stops, when additional written or oral information is to be provided by the applicant in response to questions asked by the CHMP). Accelerated evaluation might be granted by the CHMP in exceptional cases, when the authorization of a medicinal product is of major interest from the point of view of public health and in particular from the viewpoint of therapeutic innovation. Under the accelerated procedure the standard 210-day review period is reduced to 150 days.
- National MAs, which are issued by the competent authorities of the member states of the EEA and only cover their respective territory, are available for products not falling within the mandatory scope of the Centralized Procedure. Where a product has already been authorized for marketing in a member state of the EEA, this National MA can be recognized in other member states through the Mutual Recognition Procedure. If the product has not received a National MA in any member state at the time of application, it can be approved simultaneously in various Member States through the Decentralized Procedure.

In the EEA, upon receiving marketing authorization, new chemical entities generally receive eight years of data exclusivity and an additional two years of market exclusivity. If granted, data exclusivity prevents regulatory authorities in the EU from referencing the innovator's data to assess a generic application. During the additional two-year period of market exclusivity, a generic marketing authorization can be submitted, and the innovator's data may be referenced, but no generic product can be marketed until the expiration of the market exclusivity. However, there is no guarantee that a product will be considered by the EU's regulatory authorities to be a new chemical entity and qualify for data exclusivity.

In the EEA, we have taken advantage of the hybrid application pathway of the EU Centralized Procedure, which is similar to the FDA's 505(b)(2) pathway. Hybrid applications may rely in part on the results of pre-clinical tests and clinical trials contained in the authorization dossier of the reference product, but must be supplemented with additional data. In territories where data is not freely available, we or our partners may not have the ability to commercialize our products without negotiating rights from third parties to refer to their clinical data in our regulatory applications, which could require the expenditure of significant additional funds. We, or any potential partner, may be unable to obtain rights to the necessary clinical data and may be required to develop our own proprietary safety effectiveness dossiers. Regulatory approval in one country does not ensure regulatory approval in another, but a failure or delay in obtaining regulatory approval in one country may have a negative effect on the regulatory process in others.

Inability to obtain regulatory approval in other countries or any delay or setback in obtaining such approval could have the same adverse effects detailed in these "Risk Factors" regarding FDA approval in the United States. As described above, such effects include the risks that our product candidates may not be approved at all or for all requested indications, which could limit the uses of our product candidates and have an adverse effect on their commercial potential or require costly, post-marketing studies. In addition, we, or any potential partner, may be subject to fines, suspension or withdrawal of regulatory approvals, product recalls, seizure of products, operating restrictions and criminal prosecution if we are unable to comply with applicable foreign regulatory requirements.

Our business involves the use of hazardous materials and we and our third-party manufacturers and suppliers must comply with environmental laws and regulations, which can be expensive and restrict how we do business.

Our research and development activities and our third-party manufacturers' and suppliers' activities involve the controlled storage, use and disposal of hazardous materials owned by us, including the components of our product candidates and other hazardous compounds. We and our manufacturers and suppliers are subject to laws and regulations governing the use, manufacture, storage, handling and disposal of these hazardous materials. In some cases, these hazardous materials and various wastes resulting from their use are stored at our and our manufacturers' facilities pending use and disposal. We cannot completely eliminate the risk of contamination, which could cause an interruption of our research and development efforts and business operations, injury to our employees and others, environmental damage resulting in costly clean-up and liabilities under

applicable laws and regulations governing the use, storage, handling and disposal of these materials and specified waste products. Although we believe that the safety procedures utilized by our third-party manufacturers for handling and disposing of these materials generally comply with the standards prescribed by these laws and regulations, we cannot guarantee that this is the case or eliminate the risk of accidental contamination or injury from these materials. In such an event, we may be held liable for any resulting damages and such liability could exceed our resources. We do not currently carry biological or hazardous waste insurance coverage.

In connection with the reporting of our financial condition and results of operations, we are required to make estimates and judgments which involve uncertainties, and any significant differences between our estimates and actual results could have an adverse impact on our financial position, results of operations and cash flows.

Our discussion and analysis of our financial condition and results of operations are based on our consolidated financial statements, which have been prepared in accordance with generally accepted accounting principles in the United States (GAAP). The preparation of these consolidated financial statements requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, revenues and expenses and related disclosure of contingent assets and liabilities. Any significant differences between our actual results and our estimates and assumptions could negatively impact our financial position, results of operations and cash flows.

The UK's withdrawal from the EU may have a negative effect on global economic conditions, financial markets and our business.

Following a national referendum and enactment of legislation by the government of the UK, the UK formally withdrew from the EU on January 31, 2020 and entered into a transition period during which it will continue its ongoing and complex negotiations with the EU relating to the future trading relationship between the parties. Significant political and economic uncertainty remains about whether the terms of the relationship will differ materially from the terms before withdrawal, as well as about the possibility that a so-called "no deal" separation will occur if negotiations are not completed by the end of the transition period.

These developments, or the perception that any of them could occur, 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, restrict the ability of key market participants to operate in certain financial markets or restrict our access to capital. In addition, a significant proportion of the regulatory framework in the UK is derived from EU directives and regulations. The UK's withdrawal from the EU could materially impact the regulatory regime with respect to the approval of product candidates, disrupt the importation and export of active substances and other components of drug formulations, and disrupt the supply chain for clinical trial product and final authorized formulations. Any delay in obtaining, or an inability to obtain, any marketing approvals or otherwise, would prevent us from commercializing our product candidates in the UK and/or the EU. Any of these factors could have a material adverse effect on our business, financial condition and results of operations and reduce the price of our common stock.

Changes in accounting standards and their interpretations could adversely affect our operating results.

Generally accepted accounting principles in the United States are subject to interpretation by the Financial Accounting Standards Board, the American Institute of Certified Public Accountants, the SEC, and various other bodies that promulgate and interpret appropriate accounting principles. These principles and related implementation guidelines and interpretations can be highly complex and involve subjective judgments. A change in these principles or interpretations could have a significant effect on our reported financial results, and could affect the reporting of transactions completed before the announcement of a change.

Risks Related to Our Financial Position and Capital Requirements

We have never generated net income from operations or positive cash flow from operations and are dependent upon external sources of financing to fund our business and development.

We launched our first approved product, Sumavel DosePro, in January 2010 and subsequently sold the business in April 2014. We launched our approved product, Zohydro ER, in March 2014 and subsequently sold the business in April 2015. Our contract manufacturing agreement to manufacture and supply Sumavel DosePro to Endo International plc (Endo) was terminated in September 2017. We currently have limited collaboration revenue under an arrangement with Nippon Shinyaku Co., Ltd. We have financed our operations primarily through the proceeds from the issuance of equity securities, the sale of the Sumavel DosePro and Zohydro ER businesses, and debt, and have incurred negative cash flow from operations in each year

since our inception. For the years ended December 31, 2019, 2018 and 2017, we incurred net losses of $419.5 million, $123.9 million and $126.8 million, respectively, and our cash used in operating activities was $111.5 million, $111.7 million, and $75.9 million, respectively. As of December 31, 2019, we had an accumulated deficit of $1.1 billion. The losses and negative cash flow from operations have had a material adverse effect on our stockholders' equity and working capital.

We expect to continue to incur net losses and negative cash flow from operating activities for at least the next year to conduct clinical trials to support regulatory approval of our product candidates. As a result, we will remain dependent upon external sources of financing to fund our business and the development and commercialization of any approved products and product candidates. To the extent we need to raise additional capital in the future, we cannot ensure that debt or equity financing will be available to us in amounts, at times or on terms that will be acceptable to us, or at all. Any shortfall in our cash resources could require that we delay or abandon certain development and commercialization activities and could otherwise have a material adverse effect on our business, results of operations, financial condition and prospects.

We will require additional funding in the future to carry out our plan of operations and if we are unable to raise capital when needed, we may be forced to delay, reduce or eliminate our product development programs or future commercialization efforts.

Our operations have consumed substantial amounts of cash since inception. We will require additional capital in the future to fund our operations, including:

- further development of our product candidates to support potential regulatory approval; and
- commercialize any of our product candidates, or any products or product candidates that we may develop, in-license or otherwise acquire, if any such product candidates receive regulatory approval.

In addition, our estimates of the amount of cash necessary to fund our business and development activities may prove to be wrong, and we could spend our available financial resources much faster than we currently expect. Our future funding requirements will depend on many factors, including, but not limited to:

- the rate of progress and cost of our clinical trials and other product development programs for our product candidates and any future product candidates that we may develop, in-license or acquire;
- the timing of regulatory approval for any of our product candidates and the commercial success of any approved products;
- the costs of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights associated with our product candidates;
- the costs of establishing or outsourcing sales, marketing and distribution capabilities, should we elect to do so;
- the costs, terms and timing of completion of outsourced commercial manufacturing supply arrangements for any product candidate;
- the effect of competing technological and market developments; and
- the terms and timing of any additional collaborative, licensing, co-promotion or other arrangements that we may establish, including our ability to secure a global strategic development and commercialization partner for Fintepla.

Until we can generate a sufficient amount of product revenue and cash flow from operations and achieve profitability, we expect to finance future cash needs through public or private equity offerings, debt financings, receivables financings or corporate collaboration and licensing arrangements. We cannot be certain that additional funding will be available on acceptable terms, or at all. If we are unsuccessful in raising additional funds when needed, we may be required to significantly delay, reduce the scope of or eliminate one or more of our development programs or our commercialization efforts, or cease operating as a going concern. We also may be required to relinquish, license or otherwise dispose of rights to product candidates or products that we would otherwise seek to develop or commercialize ourselves on terms that are less favorable than might otherwise be available. If we raise additional funds by issuing equity securities, substantial dilution to existing stockholders would likely result. If we raise additional funds by incurring debt financing, the terms of the debt may involve significant cash payment obligations as well as covenants and specific financial ratios that may restrict our ability to operate our business. If we are unable to maintain sufficient financial resources, including by raising additional funds when needed, our business, financial condition and results of operations will be materially and adversely affected and we may be unable to continue as a going concern.

Our results of operations and liquidity needs could be materially negatively affected by market fluctuations and economic downturn.

Our results of operations and liquidity could be materially negatively affected by economic conditions generally, both in the United States and elsewhere around the world. Concerns over inflation, energy costs, geopolitical issues, public health emergencies, the availability and cost of credit, and the U.S. financial markets have in the past contributed to, and may continue in the future to contribute to, increased volatility and diminished expectations for the economy and the markets. For example, in December 2019, a novel strain of coronavirus was reported to have surfaced in Wuhan, China. The coronavirus has impacted the global economy, including limiting travel to China, and may impact our operations including potential interruption of our clinical operations and supply chain. The extent to which the coronavirus will impact our results of operations will depend on future developments, which are highly uncertain and cannot be predicted, including new information which may emerge concerning the severity of the coronavirus and the actions to contain the coronavirus or treat its impact, among others. In addition, domestic and international equity and debt markets have experienced and may continue to experience heightened volatility and turmoil based on domestic and international economic conditions and concerns. In the event these economic conditions and concerns continue or worsen and the markets continue to remain volatile, our results of operations and liquidity could be adversely affected by those factors in many ways, including making it more difficult for us to raise funds if necessary, and our stock price may decline. In addition, we maintain significant amounts of cash and cash equivalents at one or more financial institutions that are not federally insured. If economic instability continues, we cannot provide assurance that we will not experience losses on these investments.

Raising additional funds by issuing securities may cause dilution to existing stockholders and raising funds through lending and licensing arrangements may restrict our operations or require us to relinquish proprietary rights.

We may need to raise additional funds through public or private equity offerings, debt financings, receivables or royalty financings or corporate collaboration and licensing arrangements. For example, in May 2016, we entered into an at-the-market sales agreement (the ATM Sales Agreement), with Cantor Fitzgerald & Co. (Cantor), pursuant to which Cantor agreed to act as a sales agent in connection with sale of our common stock from time to time pursuant to an effective registration statement. In December 2017, we filed a prospectus supplement (the 2017 ATM Prospectus), to our automatic “shelf” registration statement on Form S-3 registering the offering, issuance and sale of up to $75.0 million in gross aggregate proceeds of common stock pursuant to the 2016 Sales Agreement. As of December 31, 2019, there were no amounts remaining for future sales under the 2017 ATM Prospectus. To the extent that we raise additional capital by issuing equity securities or convertible debt, your ownership interest in us will be diluted. Debt financing typically contains covenants that restrict operating activities.

If we raise additional funds through collaboration, licensing or other similar arrangements, it may be necessary to relinquish potentially valuable rights to our current product or product candidates or proprietary technologies, or grant licenses on terms that are not favorable to us. If adequate funds are not available, our ability to achieve profitability or to respond to competitive pressures would be significantly limited and we may be required to delay, significantly curtail or eliminate the commercialization and development of our product or product candidates.

We may be unable to benefit from favorable U.K. tax legislation.

As a company that carries out extensive research and development activities, we benefit from the U.K.’s small and medium-sized enterprises (SMEs) R&D tax relief scheme. For each discrete tax year, we have an option to receive an enhanced U.K. tax deduction on our eligible R&D activities or, when we are in a net operating loss position for that year, we can elect to surrender net operating losses that arose from our eligible R&D activities in exchange for a cash payment from the U.K. tax authorities for amounts up to 33.35% of qualifying expenditures. Qualifying expenditures largely comprise employment costs for research staff, consumables and certain internal overhead costs incurred as part of research projects. The majority of our R&D activities consist of qualifying expenditures under the U.K.’s SME R&D tax relief scheme. To date, aggregate cash payments received under this tax relief scheme were approximately $10.1 million. We may not be able to continue to benefit from the U.K.’s SME R&D tax relief scheme in the future as we increase our personnel and expand our business because we may no longer qualify as an SME. In order to qualify as an SME for R&D tax credits, we must continue to be a company with fewer than 500 employees and also have either an annual turnover not exceeding €100 million or a balance sheet not exceeding €86 million. We may also benefit in the future from U.K.’s R&D Expenditure Credit scheme, or the RDEC scheme, available to larger companies. However, the RDEC scheme has a significantly lower credit than the SME scheme. In addition, changes in U.K. tax legislation may reduce or limit any future claims. For example, a policy paper was published on October 29, 2018 setting out HMRC’s intention from April 2020 to cap the amount of cash rebate that a qualifying loss-making business can receive in any one year under the research and development tax credit regime for SMEs at three times the company’s total liability for National Insurance contributions and income tax under the Pay As You Earn system.

Our ability to utilize our net operating loss and research and development income tax credit carryforwards may be limited.

Under Section 382 of the Internal Revenue Code of 1986, as amended (IRC), substantial changes in our ownership may limit the amount of net operating loss and research and development income tax credit carryforwards, and certain other attributes (such as any future carryovers resulting from any business interest deductions that are disallowed under the recently-enacted U.S. tax legislation) (collectively, tax attributes) that could be utilized annually in the future to offset taxable income, if any. Specifically, this limitation may arise in the event of a cumulative change in ownership of our company of more than 50% within a three-year period as determined under the Code, which we refer to as an ownership change. Any such annual limitation may significantly reduce the utilization of these tax attributes before they expire. Prior to our initial public offering in November 2010, we performed an IRC Section 382 and 383 analysis and determined that we had one ownership change, which occurred in August 2006 upon the issuance of convertible preferred stock. We performed an additional IRC Section 382 and 383 analysis upon the issuance of common stock in our follow-on public offering in September 2011, and together with the issuance of common stock in our initial public offering and certain other transactions involving our common stock, resulted in an additional ownership change. We had a third ownership change as defined by IRC Sections 382 and 383, which occurred in January 2014. There was no forfeiture in federal and California net operating loss carryforwards or research and development income tax credits as a result of the third ownership change. We recently completed an evaluation of the potential effect of Section 382 on our ability to utilize our net operating losses, including those acquired from our acquisition of Modis. However, we do not anticipate these limitations will significantly impact our ability to utilize our net operating losses and tax credit carryforwards. Any future equity financing transactions, private placements and other transactions that occur within the specified three-year period may trigger additional ownership changes, which could further limit our use of such tax attributes. Any such limitations, whether as the result of prior or future offerings of our common stock or sales of common stock by our existing stockholders, could have an adverse effect on our consolidated results of operations in future years. In addition, pursuant to the Tax Cuts and Jobs Act of 2017 (Tax Act), we may not use net operating loss carry-forwards arising in taxable years beginning after December 31, 2017 to reduce our taxable income in any year by more than 80% and we may not carry back any net operating losses arising in taxable years ending after December 31, 2017 to prior years. These new rules apply regardless of the occurrence of an ownership change. This change may require us to pay federal income taxes in future years despite generating a loss for federal income tax purposes in prior years.

Changes in U.S. tax law may materially adversely affect our financial condition, results of operations and cash flows.

The Tax Act has significantly changed the U.S. federal income taxation of U.S. corporations The Tax Act remains unclear in many respects and has been, and may continue to be, the subject of amendments and technical corrections, as well as interpretations and implementing regulations by the Treasury and Internal Revenue Service (IRS), which have lessened or increased certain adverse impacts of the Tax Act and may do so in the future.. In addition, it is unclear how these U.S. federal income tax changes will affect state and local taxation, which often uses federal taxable income as a starting point for computing state and local tax liabilities. We continue to work with our tax advisors and auditors to determine the full impact the Tax Act will have on us. We urge our investors to consult with their legal and tax advisors with respect to the Tax Act.

We are exposed to fluctuations in the market values of our investments.

As of December 31, 2019, our cash, cash equivalents and marketable securities totaled $251.2 million. Our cash equivalents and marketable securities include money market funds and certificate of deposits, securities issued by the U.S. government and its agencies, corporate debt securities and commercial paper meeting the criteria of our investment policy, which prioritizes the preservation of capital. These investments are subject to general credit, liquidity, market and interest rate risks, instability in the global financial markets, or other factors. As a result, the value or liquidity of our investments could decline and result in a material impairment, which could have a material adverse effect on our financial results and the availability of cash to fund our operations.

Risks Related to Government Regulation

Fintepla, MT1621 and any of our future product candidates are subject to extensive regulation, and we cannot give any assurance that it will receive regulatory approval or be successfully commercialized.

We currently are developing Fintepla for the treatment of seizures associated with Dravet syndrome and LGS and MT1621 for the treatment of TK2d. The research, testing, manufacturing, labeling, approval, sale, marketing, distribution and promotion of drug products, among other things, are subject to extensive regulation by the FDA and other regulatory authorities in the United States. We are not permitted to market Fintepla or any of our product candidates in the United States unless and

until we receive regulatory approval from the FDA. We cannot provide any assurance that we will obtain regulatory approval for any of our product candidates, or that any such product candidates will be successfully commercialized.

Under PDUFA, the FDA has agreed to certain performance goals to complete the review of NDA submissions through a two-tiered classification system: standard review and priority review. For drugs that do not contain a new molecular entity, such as Fintepla, the FDA has a goal to complete a standard review of the NDA and respond to the applicant within ten months from the date of the FDA's receipt of the NDA. A priority review is given to drugs that are intended to treat a serious disease or condition and, if approved, would provide a significant improvement in safety or effectiveness. On November 25, 2019, we announced that the FDA accepted for filing our NDA for Fintepla for the treatment of Dravet syndrome, and granted priority review of the application, with a target action date of March 25, 2020. As part of their review, the FDA requested additional information. We provided the FDA with additional data to conduct additional efficacy analyses from our two pivotal studies in Dravet syndrome. On February 27, 2020, we announced that the FDA extended the PDUFA target action date to June 25, 2020, which provides the FDA additional time to review. Although we do not believe the approvability of the NDA is affected by these analyses, we cannot be certain the FDA will concur with our analyses or otherwise approve the NDA by the revised PDUFA target action date or at all. The FDA's review goals are subject to change, and the duration of the FDA's review may depend on the number and type of other NDAs that are submitted to the FDA around the same time period.

The FDA may also refer applications for novel products or products which present difficult questions of safety or efficacy to an advisory committee, typically a panel that includes clinicians and other experts, for review, evaluation and a recommendation as to whether the application should be approved. Although the FDA is not bound by the recommendation of an advisory committee, the matters discussed at the advisory committee meeting, and in particular any concerns regarding safety, could limit our ability to successfully commercialize our product candidates subject to advisory committee review.

As part of its review of an NDA, the FDA may inspect the facility or facilities where the drug is manufactured. If the FDA's evaluations of the NDA and the clinical and manufacturing procedures and facilities are favorable, the FDA will issue an action letter, which will be either an approval letter, authorizing commercial marketing of the drug for a specified indication, or a Complete Response letter containing the conditions that must be met in order to secure approval of the NDA. These conditions may include deficiencies identified in connection with the FDA's evaluation of the NDA submission or the clinical and manufacturing procedures and facilities. Until any such conditions or deficiencies have been resolved, the FDA may refuse to approve the NDA. If and when those conditions have been met to the FDA's satisfaction, the FDA will issue an approval letter. The FDA has substantial discretion in the drug approval process, including the ability to delay, limit or deny approval of a product candidate for many reasons. For example:

- the FDA may not deem a product candidate safe and effective for its proposed indication;
- the FDA may not find the data from pre-clinical studies and clinical trials sufficient to support approval;
- the FDA may require additional pre-clinical studies or clinical trials;
- the FDA may not approve of our third-party manufacturers' processes and facilities; or
- the FDA may change its approval policies or adopt new regulations.

Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses and many companies that believed their product candidates performed satisfactorily in preclinical studies and clinical trials nonetheless failed to obtain FDA approval. We cannot guarantee that the FDA will interpret trial results as we do, and more trials could be required before we are able to submit applications seeking approval of our product candidates. To the extent that the results of the trials are not satisfactory to the FDA or foreign regulatory authorities for support of a marketing application, we may be required to expend significant resources, which may not be available to us, to conduct additional trials in support of potential approval of our product candidates. Of the large number of drugs in development, only a small percentage successfully complete the regulatory approval processes and are commercialized. This lengthy approval process, as well as the unpredictability of future clinical trial results, may result in our failing to obtain regulatory approval to market Fintepla, MT1621 or any other product candidate, which would significantly harm our business, results of operations and prospects.

In addition, the FDA may approve a product candidate for a more limited indication or patient population than we originally requested, and the FDA may approve a product candidate with a REMS or a label that does not include the labeling claims necessary or desirable for the successful commercialization of that product candidate. The FDA may also grant approval contingent on the performance of costly post-marketing clinical trials. Any of the foregoing scenarios could materially harm the commercial prospects for our product candidates.

We may not be able to maintain orphan drug designation or obtain or maintain orphan drug exclusivity for Fintepla or MT1621.

We have obtained orphan drug designation for Fintepla in the United States and Europe for both the treatment of Dravet syndrome and LGS. We have also received orphan drug designation for MT1621 for the treatment of TK2d. In the United States, under the Orphan Drug Act, the FDA may designate a product as an orphan drug if it is intended to treat a rare disease or condition affecting fewer than 200,000 individuals in the United States or, if it affects more than 200,000 people, there is no reasonable expectation that costs of research and development of the drug for the indication can be recovered by sales in the United States. In the EU, a drug may receive orphan designation if the prevalence of the condition in the EU is of no more than five in 10,000 or it if is unlikely that marketing of the medicine would generate sufficient returns to justify the investment needed for its development. Orphan drug designation in the United States confers certain benefits, including tax incentives and waiver of the applicable application fee upon submission of the product for approval in the rare disease or condition. In the EU, sponsors who obtain orphan designation benefit from a number of incentives, including protocol assistance and fee reductions.

If a product with an orphan drug designation subsequently receives the first marketing approval for the indication for which it has such designation, the product is eligible for a period of marketing exclusivity, which precludes the FDA or EMA from approving another marketing application for the same drug to treat the same rare disease or condition for that time period, except in limited circumstances. The applicable period is seven years in the United States and ten years in Europe. Also, we are only able to attain orphan drug status in Europe if we are able to demonstrate to EMA that Fintepla or MT1621 has incremental benefit over any other approved product for that orphan disorder. In July 2018, we reported positive top-line results from Study 1504 and in February 2019, we submitted an MAA to the EMA for Fintepla for the treatment of seizures associated with Dravet syndrome. The EMA has accepted the MAA and initiated its review. Currently in Europe, only stiripentol has orphan drug status, which has been approved for treatment of seizures in Dravet syndrome, but others could be approved.

The European exclusivity period can be reduced to six years if a drug no longer meets the criteria for orphan drug designation or if the drug is sufficiently profitable so that market exclusivity is no longer justified. Orphan drug exclusivity may be lost if the FDA or EMA determines that the request for designation was materially defective or if the manufacturer is unable to assure sufficient quantity of the drug to meet the needs of patients with the rare disease or condition.

Orphan drug exclusivity may not effectively protect the product from competition in the United States because different drugs can be approved for the same condition. Even after an orphan drug is approved and granted exclusivity, the FDA and EMA can subsequently approve the same or a similar drug for the same condition during the exclusivity period if the FDA or the EMA concludes that the later drug is clinically superior in that it is shown to be safer, more effective or makes a major contribution to patient care. Orphan drug designation neither shortens the development time or regulatory review time of a drug nor gives the drug any advantage in the regulatory review or approval process.

Use of our product candidates could be associated with side effects, adverse events or other properties or safety risks, which could delay or preclude approval, cause us to suspend or discontinue clinical trials, abandon a product candidate, limit the commercial profile of the label for an approved product candidate, or result in other significant negative consequences that could severely harm our business, prospects, operating results and financial condition.

Results of our clinical trials could reveal a high and unacceptable severity and prevalence, or unexpected characteristics of side effects. Undesirable side effects caused by our product candidates could cause us or regulatory authorities to interrupt, delay or halt clinical trials, result in a more restrictive label for the product candidate, or delay or cause the denial of regulatory approval of the product candidate by the FDA or comparable foreign regulatory authorities. The drug-related side effects could also affect patient recruitment for our clinical trials, or the ability of enrolled patients to complete the trials, or result in potential product liability claims. Any of these occurrences may harm our business, financial condition and prospects significantly.

Moreover, if our product candidates are associated with undesirable side effects in clinical trials or have characteristics that are unexpected, we may elect to abandon their development or limit their development to more narrow uses or subpopulations in which the undesirable side effects or other characteristics are less prevalent, less severe or more acceptable from a risk-benefit perspective, which may limit the commercial prospects for the product candidate if approved. We may also be required to modify our plans for future studies based on findings in our ongoing clinical trials. Many compounds that initially showed promise in early-stage testing have later been found to cause side effects that prevented further development of the compound. In addition, regulatory authorities may draw different conclusions or require additional testing to confirm these determinations.

Additionally, if one or more of our product candidates receives marketing approval, and we or others identify undesirable side effects, or other previously unknown problems, caused by Fintepla, MT1621 or any of our future product candidates, a number of potentially significant negative consequences could result, including:

- regulatory authorities may not approve, or may withdraw their approval of the product;
- regulatory authorities may add new limitations for distribution and marketing of the product;
- regulatory authorities may require the addition of warnings in the product label or narrowing of the indication in the product label;
- we may be required to implement a REMS or create a Medication Guide outlining the risks of such side effects for distribution to patients;
- we may be required to change the way the product is administered or modify the product in some other way;
- we may be required to implement a REMS program;
- the FDA may require us to conduct additional clinical trials or costly post-marketing testing and surveillance to monitor the safety or efficacy of the product;
- we could be sued and held liable for harm caused to patients; and
- our reputation may suffer.

Any of the above events resulting from undesirable side effects or other previously unknown problems could prevent us from achieving or maintaining market acceptance of the affected product, if approved, and could substantially increase the costs of commercializing our product candidates.

Even if we receive regulatory approval for Fintepla, MT1621, or any other product candidate, we will be subject to ongoing regulatory obligations and continued regulatory review, which may result in significant additional expense. Additionally, our product candidates, if approved, could be subject to labeling and other restrictions on marketing or withdrawal from the market, and we may be subject to penalties if we fail to comply with regulatory requirements or if we experience unanticipated problems with our product candidates, when and if any of them are approved.

Following potential approval of any of our product candidates, the FDA may impose significant restrictions on a product's indicated uses or marketing or impose ongoing requirements for potentially costly and time-consuming post-approval studies, post-market surveillance or clinical trials to monitor the safety and efficacy of the product. The FDA may also require a REMS as a condition of approval of our product candidates, which could include requirements for a medication guide, physician communication plans or additional elements to ensure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. In addition, if the FDA or a comparable foreign regulatory authority approves our product candidates, the manufacturing processes, labeling, packaging, distribution, adverse event reporting, storage, advertising, promotion, import, export and recordkeeping for our products will be subject to extensive and ongoing regulatory requirements. These requirements include submissions of safety and other post-marketing information and reports, registration, as well as continued compliance with cGMPs and GCP requirements for any clinical trials that we conduct post-approval. Later discovery of previously unknown problems with our products, including adverse events of unanticipated type, severity or frequency, or with our third-party manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may result in, among other things:

- restrictions on the marketing or manufacturing of our products, withdrawal of the product from the market or voluntary or mandatory product recalls;
- restrictions on product distribution or use, or requirements to conduct post-marketing studies or clinical trials;
- fines, restitutions, disgorgement of profits or revenues, warning letters, untitled letters or holds on clinical trials;
- refusal by the FDA to approve pending applications or supplements to approved applications we filed or suspension or revocation of approvals;
- product seizure or detention, or refusal to permit the import or export of our products; and
- injunctions or the imposition of civil or criminal penalties.

The occurrence of any event or penalty described above may inhibit our ability to commercialize our product candidates and generate revenue and could require us to expend significant time and resources in response and could generate negative publicity.

In addition, if any of our product candidates are approved, our product labeling, advertising and promotion will be subject to regulatory requirements and continuing regulatory review. The FDA strictly regulates the promotional claims that may be made about drug products. In particular, a product may not be promoted for uses that are not approved by the FDA as reflected in the product's approved labeling. If we receive marketing approval for a product candidate, physicians may nevertheless prescribe it to their patients in a manner that is inconsistent with the approved label. If we are found to have promoted such off-label uses, we may become subject to significant liability. The FDA and other agencies actively enforce the laws and regulations prohibiting the promotion of off-label uses, and a company that is found to have improperly promoted off-label uses may be subject to significant sanctions. The federal government has levied large civil and criminal fines against companies for alleged improper promotion and has enjoined several companies from engaging in off-label promotion. The FDA has also requested that companies enter into consent decrees or permanent injunctions under which specified promotional conduct is changed or curtailed.

The FDA and other regulatory authorities' policies may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our product candidates. If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained and we may not achieve or sustain profitability.

We also cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative or executive action, either in the United States or abroad. For example, certain policies of the current U.S. administration may impact our business and industry. Namely, the current U.S. administration has taken several executive actions, including the issuance of a number of Executive Orders, that could impose significant burdens on, or otherwise materially delay, the FDA's ability to engage in routine regulatory and oversight activities such as implementing statutes through rulemaking, issuance of guidance, and review and approval of marketing applications. It is difficult to predict how these executive actions, including any Executive Orders, will be implemented, and the extent to which they will impact the FDA's ability to exercise its regulatory authority. If these executive actions impose constraints on the FDA's ability to engage in oversight and implementation activities in the normal course, our business may be negatively impacted.

If we are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or if we are not able to maintain regulatory compliance, we may lose any marketing approval that we may have obtained and we may not achieve or sustain profitability, which would adversely affect our business, prospects, financial condition and results of operations.

Changes in funding for the FDA and other government agencies could hinder their ability to hire and retain key leadership and other personnel, or otherwise prevent new products and services from being developed or commercialized in a timely manner, which could negatively impact our business.

The ability of the FDA and other regulatory agencies to review and approve new products can be affected by a variety of factors, including government budget and funding levels, ability to hire and retain key personnel and accept the payment of user fees, and statutory, regulatory, and policy changes. Average review times at the agency have fluctuated in recent years as a result. In addition, government funding of other government agencies that fund research and development activities is subject to the political process, which is inherently fluid and unpredictable.

Disruptions at the FDA and other agencies may also slow the time necessary for new drugs and biologics to be reviewed and/or approved by necessary government agencies, which would adversely affect our business. For example, over the last several years, including for 35 days beginning on December 22, 2018, the U.S. government has shut down several times and certain regulatory agencies, such as the FDA, have had to furlough critical FDA employees and stop critical activities. If a prolonged government shutdown occurs, it could significantly impact the ability of the FDA to timely review and process our regulatory submissions, which could have a material adverse effect on our business.

The successful commercialization of our product candidates will depend in part on the extent to which third-party payors, including governmental authorities and private health insurers, provide funding, establish favorable coverage and pricing policies, and set adequate reimbursement levels. Failure to obtain or maintain coverage and adequate reimbursement for our product candidates, if approved, could limit our ability to market those products and decrease our ability to generate revenue.

Our ability to commercialize any of our product candidates successfully, particularly in orphan or rare disease indications, will depend in part on the availability of favorable coverage and the adequacy of reimbursement for the product candidate and alternative treatments from third-party payors (e.g., governmental authorities, private health insurers and other organizations). Obtaining coverage and adequate reimbursement is contingent on our ability to:

- obtain clinical data that supports payor value/benefit assessments;
- execute formal payor value/benefit assessment processes;
- obtain coverage that enables use in populations reflected in any product candidate's approved product label; and
- effectively negotiate favorable pricing and reimbursement terms.

While in some markets, there is a single payor, in other markets there are multiple payors that can have different ways of assessing prescription drugs. To commercialize our product candidates successfully, we will be required to have sufficient expertise and resources to execute on the respective product candidate's coverage and reimbursement strategy, which we cannot be certain we will be able to do.

Governmental authorities, private health insurers and other third-party payors have attempted to control costs by delaying the time to reimbursement, and by restricting the breadth of patient-coverage and limiting the amount of reimbursement for particular products in terms of lower pricing and increasing the proportion of the cost for which the patient is responsible. There may be significant delays in obtaining reimbursement for newly approved products or product indications, coverage may be more limited than the purposes for which the product is approved by the FDA or similar regulatory authorities outside the United States, and reimbursement rates may vary according to the use of the product and the clinical setting in which it is used. Coverage and reimbursement barriers by payors may materially impact the demand for, or the price of, any product candidate for which we obtain marketing approval. If coverage and reimbursement are not available, or available only at limited levels, or if such coverage will require patient out-of-pocket costs that are unacceptably high, we may not be able to successfully commercialize any product candidate for which we obtain marketing approval. Moreover, any coverage or reimbursement that may be obtained may be decreased or eliminated in the future.

Third-party payors continue to introduce new tactics to contain costs, including more rigorous value/benefit assessment processes and criteria. It is possible that third-party payors will change the clinical comparators that serve as benchmarks for determining relative value. The result of such a change would be a more challenging value/benefit assessment caused by a more challenging basis for comparison and the potential for a worse relative outcome. Third-party payors may determine that we have failed to generate sufficient evidence to support a value/benefit assessment and refuse to provide coverage and reimbursement, thereby impacting or preventing the progression to a price negotiation. The potential of third-party payors to introduce more rigorous value/benefit assessment processes and criteria could have a negative impact on our ability to commercialize our product candidates successfully.

Third-party payors are also introducing more challenging price negotiation tactics, including in re-visiting established coverage and reimbursement in cases when new competitors, including brands, generics and biosimilars enter the market. It is possible that a third-party payor may consider our product candidates as substitutable and only offer to cover the cost of the alternative product. Even if we show improved efficacy or improved convenience of administration with our product candidates, pricing of competitive products may limit the amount we will be able to charge for our product candidates. Third-party payors may deny or revoke the reimbursement status of a given product or establish prices for new or existing marketed products at levels that are too low to enable us to realize an appropriate return on our investment in our product candidates. In some cases, when new competitor generic and biosimilar products enter the market, there are mandatory price reductions for the innovator compound, in other cases, payors employ "therapeutic category" price referencing and seek to lower the reimbursement levels for all treatment in the respective therapeutic category. In other cases, new competitor brand drugs can trigger therapeutic category reviews in the interest of modifying coverage and or reimbursement levels. The potential of third-party payors to introduce more challenging price negotiation tactics could have a negative impact on our ability to commercialize our product candidates successfully.

Evolving health policy and associated legislative changes related to coverage and reimbursement aimed at lowering healthcare expenditure could impact the commercialization of our product candidates. Pharmaceutical pricing has been, and likely will continue to be, a central component of these efforts.

The regulations that govern regulatory approvals, pricing and reimbursement for new pharmaceutical products vary widely from country to country. In markets of some countries we may pursue outside of the United States for any of our product candidates, the products may be subject to extensive governmental price control or other price regulations. Some

countries require approval of the sale price of a drug before it can be marketed. In many countries, the pricing review period begins after marketing approval is granted. In some markets, prescription pharmaceutical pricing remains subject to continuing governmental control even after initial approval is granted. As a result, we might obtain marketing approval for a product candidate in a particular country, but then be subject to price negotiations that delay our commercial launch of the product candidate, possibly for lengthy time periods, which may negatively impact the revenues we are able to generate from the sale of the product candidate in that country. Adverse pricing and reimbursement limitations may hinder our ability to recoup our investment in one or more product candidates, even if our product candidates obtain marketing approval.

Net prices for products may be reduced by mandatory discounts or legislated rebates that must be paid in order to participate in government healthcare programs or paid to other third-party payors. Mandatory discounts can be legislated at any time in any market. Similarly, some markets currently have pricing legislation that sets the price of a pharmaceutical product in their market by referencing the price of that product in other markets, known as international reference pricing. International reference pricing has the potential to impact price cuts in individual countries and the countries that reference the pricing of certain other individual countries. Expansion of mandatory discounts and international reference pricing, including into the United States, presents a material risk to our ability to achieve favorable pricing and adequate reimbursement.

Drug importation and cross-border trade, both sanctioned and unsanctioned, occurs when a pharmaceutical product from a market where the official price is set lower is shipped and made commercially available in a market where the official price is set higher. Any future relaxation of laws that presently restrict or limit drug importation or cross-border trade, including in the United States, could have a material negative impact on our ability to commercialize our product candidates, if approved.

We expect to experience pricing pressures in connection with the sale of our product candidates due to the trend toward managed healthcare, the increasing influence of health maintenance organizations and additional legislative changes. The downward pressure on healthcare costs in general, particularly prescription drugs and biologics and surgical procedures and other treatments, has become intense. As a result, we may not be able to achieve or sustain favorable pricing for our product candidates and adequate reimbursement.

Healthcare reform measures and changes in policies, funding, staffing and leadership at the FDA and other agencies could hinder or prevent the commercial success of any of our product candidates that may be approved by the FDA.

In the United States, there have been a number of legislative and regulatory changes to the healthcare system in ways that could affect our future results of operations and the future results of operations of our customers. There have been and continue to be a number of initiatives at the federal and state levels that seek to reduce healthcare costs. In March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, or collectively the ACA, was signed into law, which includes measures to significantly change the way health care is financed by both governmental and private insurers. Among the provisions of the ACA of greatest importance to the pharmaceutical industry are the following:

- an annual, nondeductible fee on any entity that manufactures or imports certain branded prescription drugs and biologic agents, apportioned among these entities according to their market share in certain government healthcare programs;
- an increase in the statutory minimum rebates a manufacturer must pay under the Medicaid Drug Rebate Program to 23% and 13% of the average manufacturer price for most branded and generic drugs, respectively;
- a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted or injected;
- a new Medicare Part D coverage gap discount program, in which manufacturers must now agree to offer point-of-sale discounts of 70% 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;
- extension of manufacturers’ Medicaid rebate liability to covered drugs dispensed to individuals who are enrolled in Medicaid managed care organizations;
- expansion of eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to additional individuals and by adding new mandatory eligibility categories for certain individuals with income at or below 133% of the Federal Poverty Level, thereby potentially increasing both the volume of sales and manufacturers’ Medicaid rebate liability;
- expansion of the entities eligible for discounts under the Public Health Service pharmaceutical pricing program;

- a new requirement to annually report drug samples that manufacturers and distributors provide to physicians;
- a licensure framework for follow-on biologic products;
- a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research; and
- establishment of a Center for Medicare Innovation at CMS to test innovative payment and service delivery models to lower Medicare and Medicaid spending.

Since its enactment, there have been judicial and Congressional challenges to certain aspects of the ACA, and we expect there will be additional challenges and amendments to the ACA in the future. By way of example, the Tax Act was enacted, which, among other things, removes penalties for not complying with the ACA's individual mandate to carry health insurance. On December 14, 2018, a U.S. District Court Judge in the Northern District of Texas, ruled that the individual mandate is a critical and inseverable feature of the ACA, and therefore, because it was repealed as part of the Tax Act, the remaining provisions of the ACA are invalid as well. On December 18, 2019, the U.S. Court of Appeals for the 5th Circuit upheld the District Court's decision that the individual mandate was unconstitutional but remanded the case back to the District Court to determine whether the remaining provisions of the ACA are invalid as well. It is unclear how these decisions, subsequent appeals, if any, or other efforts to challenge, repeal or replace the ACA will impact the law or our business.

Other legislative changes have also been proposed and adopted in the United States since the ACA was enacted. For example, in August 2011, the Budget Control Act of 2011, among other things included aggregate reductions to Medicare payments to providers of 2% per fiscal year, which went into effect on April 1, 2013, and, due to subsequent legislative amendments to the statute, will remain in effect through 2029 unless additional Congressional action is taken. In January 2013, the American Taxpayer Relief Act of 2012, among other things, further reduced Medicare payments to several providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years.

Recently, there has been heightened governmental scrutiny over the manner in which drug manufacturers set prices for their marketed products, which has resulted in several Congressional inquiries and proposed and enacted legislation designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drug products. 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 to encourage importation from other countries and bulk purchasing. These new laws may result in additional reductions in Medicare and other health care funding, which could have a material adverse effect on our customers and accordingly, our financial operations.

Furthermore, regulatory authorities' assessment of the data and results required to demonstrate safety and efficacy can change over time and can be affected by many factors, such as the emergence of new information, including on other products, changing policies and agency funding, staffing and leadership. We cannot be sure whether future changes to the regulatory environment will be favorable or unfavorable to our business prospects. For example, average review times at the FDA for marketing approval applications have fluctuated over the last ten years, and we cannot predict the review time for any of our submissions with any regulatory authorities. In addition, review times can be affected by a variety of factors, including budget and funding levels and statutory, regulatory and policy changes.

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

We may incur liability if our continuing medical or health education programs and/or product promotions are determined, or are perceived, to be inconsistent with regulatory guidelines.

The FDA provides guidelines with respect to appropriate promotion and continuing medical and health education activities. Although we endeavor to follow these guidelines, the FDA or the Office of the Inspector General U.S. Department of Health and Human Services may disagree, and we may be subject to significant liability, including civil and administrative remedies as well as criminal sanctions. In addition, management's attention could be diverted and our reputation could be damaged.

If we do not comply with federal and state healthcare laws, including fraud and abuse and health information privacy and security laws, we could face substantial penalties and our business, results of operations, financial condition and prospects could be adversely affected.

As a pharmaceutical company, certain federal and state healthcare laws and regulations pertaining to fraud and abuse and patients' rights are applicable to our business. We could be subject to healthcare fraud and abuse and patient privacy regulation by both the federal government and the states in which we conduct our business. The laws that may affect our ability to operate include:

- the federal Anti-Kickback Statute, which constrains our marketing practices, educational programs, pricing policies, and relationships with healthcare providers or other entities, by prohibiting, among other things, soliciting, receiving, offering or paying remuneration, directly or indirectly, in cash or in kind, to induce, or in return for, the purchase or recommendation of an item or service reimbursable under a federal healthcare program, such as the Medicare and Medicaid programs. A person or entity no longer needs to have actual knowledge of the statute or specific intent to violate it in order to have committed a violation;
- federal civil and criminal false claims laws, including the False Claims Act, which prohibit, among other things, individuals or entities from knowingly presenting, or causing to be presented, claims for payment from Medicare, Medicaid, or other third-party payors that are false or fraudulent. In addition, the government may assert that a claim including items or services resulting from a violation of the federal anti-kickback statute constitutes a false or fraudulent claim for purposes of the False Claims Act;
- federal civil monetary penalties laws, which impose civil fines for, among other things, the offering or transfer of remuneration to a Medicare or state healthcare program beneficiary if the person knows or should know it is likely to influence the beneficiary's selection of a particular provider, practitioner, or supplier of services reimbursable by Medicare or a state healthcare program, unless an exception applies;
- federal consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers;
- HIPAA which created new federal criminal statutes that prohibit executing a scheme to defraud any healthcare benefit program or making false statements relating to healthcare matters. Similar to the federal Anti-Kickback Statute, a person or entity no longer needs 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, and its implementing regulations, which impose certain requirements relating to the privacy, security and transmission of individually identifiable health information;
- federal "sunshine" requirements that require drug manufacturers to report and disclose any "transfer of value" made or distributed to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors), certain other health care professionals beginning in 2022, and teaching hospitals, and any investment or ownership interests held by such physicians and their immediate family members. Manufacturers are required to report data to the government by the 90th day of each calendar year;
- federal price reporting laws, which require us 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 our commercial products;
- state law equivalents of each of the above federal laws, such as anti-kickback and false claims laws which may apply to items or services reimbursed by any third-party payor, including commercial insurers, 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. By way of example,

the California Consumer Privacy Act (CCPA) effective January 1, 2020, gives California residents expanded rights to access and delete their personal information, opt out of certain personal information sharing, and receive detailed information about how their personal information is used. The CCPA provides for civil penalties for violations, as well as a private right of action for data breaches that is expected to increase data breach litigation. The CCPA may increase our compliance costs and potential liability; and

- similar healthcare laws and regulations in the EU and other jurisdictions, including reporting requirements detailing interactions with and payments to healthcare providers and requirements regarding the collection, distribution, use, security, and storage of personally identifiable information and other data relating to individuals (including the EU enacted Regulation (EU) 2016/679 (GDPR)).

In addition, there has been a recent trend of increased state regulations that require drug manufacturers to file reports with states regarding pricing and marketing information, and require the tracking and reporting of gifts, compensation and other remuneration to physicians. Certain states mandate implementation of commercial compliance programs to ensure compliance with these laws and impose restrictions on drug manufacturer marketing practices and tracking and reporting of gifts, compensation and other remuneration to physicians. The shifting commercial compliance environment and the need to build and maintain robust and expandable systems to comply with multiple jurisdictions with different compliance and/or reporting requirements increases the possibility that a healthcare company may be found out of compliance of one or more of the requirements.

Because of the breadth of these laws and the narrowness of the statutory exceptions and safe harbors available, it is possible that some of our business activities could be subject to challenge under one or more of such laws. To the extent that any product we make is sold in a foreign country, we may be subject to similar foreign laws and regulations. If we or our operations are found to be in violation of any of the laws described above or any other governmental regulations that apply to us, we may be subject to penalties, including civil and criminal penalties, damages, fines, exclusion from participation in governmental health care programs, additional reporting obligations and oversight if we become subject to a corporate integrity agreement or other agreement to resolve allegations of non-compliance with these laws, imprisonment, and the curtailment or restructuring of our operations. Any penalties, damages, fines, curtailment or restructuring of our operations could materially adversely affect our ability to operate our business and our financial results. Although compliance programs can mitigate the risk of investigation and prosecution for violations of these laws, the risks cannot be entirely eliminated. Any action against us for violation of these laws, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business. Moreover, achieving and sustaining compliance with applicable federal and state privacy, security and fraud laws may prove costly.

Risks Related to Intellectual Property

Our success depends in part on our ability to protect our intellectual property. It is difficult and costly to protect our proprietary rights and technology, and we may not be able to ensure their protection.

Our commercial success depends in large part on obtaining and maintaining patent, trademark and trade secret protection of our product candidates, their respective components, formulations, methods used to manufacture them and methods of treatment, as well as successfully defending these patents against third-party challenges. Our ability to stop unauthorized third parties from making, using, selling, offering to sell or importing our product candidates is dependent upon the extent to which we have rights under valid and enforceable patents or trade secrets that cover these activities.

We in-licensed certain data from a continuing, long-term, open-label study in 15 Dravet syndrome patients, as well as certain intellectual property related to fenfluramine for the treatment of Dravet syndrome from the Universities of Antwerp and Leuven in Belgium (the Universities).

Prior to receiving rights to four U.S. patents in 2017, we did not own or control any issued patents covering Fintepla or its use. There is no guarantee that any of our pending applications will issue as patents. The composition of matter patents covering the API in Fintepla have expired and therefore it is not subject to patent protection. With respect to our MT1621 product candidate, we have certain patent rights that we obtained through our acquisition of Modis. In September 2016, Modis entered into a license agreement (the Columbia Agreement), with Columbia, under which Modis was granted an exclusive worldwide license and sublicense to certain intellectual property rights owned or controlled by Columbia to develop and commercialize MT1621 and certain backup compounds for any application or purpose. These licensed patent rights include patents owned by Columbia and patents jointly owned by Columbia and Vall d'Hebron Research Institute (VHIR). VHIR delegated to Columbia the rights to enter into the Columbia Agreement on VHIR's behalf. The patent family jointly owned by Columbia and VHIR is directed to the use of MT1621 to treat TK2d and includes a granted U.S. patent and a granted European

patent application, pending applications in Australia, Brazil, Canada, China, Hong Kong, Israel, India, Japan, Korea, Mexico and Russia, as well as continuing applications in the United States and Europe. There are no patents covering the API in MT1621.

The initial applications covering MT1621 or the methods of treatment using Fintepla were licensed by us and not written by our attorneys. Neither we nor our licensors had control over the drafting and initial prosecution of these applications. Further, the counsel previously handling the Fintepla and MT1621 matters might not have given the same attention to the drafting and prosecution to these applications as we would have if we had been the owners and originators of the applications and had control over the drafting and prosecution. In addition, the former counsel handling these matters may not have been completely familiar with U.S. patent law or the patent law in various countries, possibly resulting in inadequate disclosure, improperly claiming inventions and/or filing of applications at times which do not meet appropriate priority requirements. The named inventors on the pending applications and others involved in the protection of the intellectual property related to Fintepla and MT1621 did not and may still not have sufficient knowledge relating to preferred procedures and the legal requirements related to the protection of intellectual property. They published papers which adversely affected our licensed rights, particularly in jurisdictions without a grace period for inventors' own disclosures. Although they have been advised with respect to procedures going forward, we cannot directly control their actions. All of these factors and others could result in the inability to obtain the issuance of additional applications in the United States or elsewhere in the world. Even if additional patents issue, such issued patents may later be found invalid or unenforceable or may be modified or revoked in proceedings instituted by third parties before various patent offices or in courts.

The patent positions of pharmaceutical, biopharmaceutical and medical device companies can be highly uncertain and involve complex legal and factual questions for which important legal principles remain unresolved. No consistent policy regarding the breadth of claims allowed in patents in these fields has emerged to date in the United States. There have been recent changes regarding how patent laws are interpreted, and both the U.S. Patent and Trademark Office (USPTO), and Congress have recently made significant changes to the patent system. There have been three U.S. Supreme Court decisions that now show a trend of the Supreme Court which is distinctly negative on patents. The trend of these decisions along with resulting changes in patentability requirements being implemented by the USPTO could make it increasingly difficult for us to obtain and maintain patents on our products. We cannot accurately predict future changes in the interpretation of patent laws or changes to patent laws which might be enacted into law. Those changes may materially affect our patents, our ability to obtain patents and/or the patents and applications of our collaborators and licensors. The patent situation in these fields outside the United States is even more uncertain. Changes in either the patent laws or in interpretations of patent laws in the United States and other countries may diminish the value of our intellectual property or narrow the scope of our patent protection. Accordingly, we cannot predict the breadth of claims that may be allowed or enforced in the patents we own or to which we have a license or third-party patents.

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

- others may be able to make or use compounds that are the same or similar to the pharmaceutical compounds used in our product candidates but that are not covered by the claims of our patents or our in-licensed patents;
- the APIs in Fintepla may soon become, commercially available in generic drug products, and no patent protection will be available without regard to formulation or method of use;
- the APIs in MT1621 are well-known and available commercially from many sources, and no patent protection claiming the APIs as a composition of matter will be available;
- we or our licensors, as the case may be, may not be able to detect infringement against our patents or in-licensed patents, which may be especially difficult for manufacturing processes or formulation patents;
- we or our licensors, as the case may be, might not have been the first to make the inventions covered by our owned or in-licensed issued patents or pending patent applications;
- we or our licensors, as the case may be, might not have been the first to file patent applications for these inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technologies;
- it is possible that our pending patent applications will not result in issued patents;
- it is possible that our owned or in-licensed U.S. patents are not Orange-Book eligible;
- it is possible that there are dominating patents to Fintepla and MT1621 of which we are not aware;

- it is possible that there are prior public disclosures that could invalidate our or our licensors' patents, as the case may be, or parts of our or their patents;
- it is possible that others may circumvent our owned or in-licensed patents;
- it is possible that there are unpublished applications or patent applications maintained in secrecy that may later issue with claims covering our products or technology similar to ours;
- the claims of our owned or in-licensed issued patents or patent applications, if and when issued, may not cover our system or products or our system of product candidates;
- our owned or in-licensed issued patents may not provide us with any competitive advantages, or may be narrowed in scope, be held invalid or unenforceable as a result of legal administrative challenges by third parties;
- we may not develop additional proprietary technologies for which we can obtain patent protection; or
- the patents of others may have an adverse effect on our business.

We also may rely on trade secrets to protect our technology, especially where we do not believe patent protection is appropriate or obtainable. However, trade secrets are difficult to protect, and we have limited control over the protection of trade secrets used by our licensors, collaborators and suppliers. Although we use reasonable efforts to protect our trade secrets, our employees, consultants, contractors, outside scientific collaborators and other advisors may unintentionally or willfully disclose our information to competitors. Enforcing a claim that a third party illegally obtained and is using any of our trade secrets is expensive and time consuming, and the outcome is unpredictable. In addition, state laws in the Unites States vary, and their courts as well as courts outside the United States are sometimes less willing to protect trade secrets. Moreover, our competitors may independently develop equivalent knowledge, methods and know-how. If our confidential or proprietary information is divulged to or acquired by third parties, including our competitors, our competitive position in the marketplace will be harmed and our ability to successfully penetrate our target markets could be severely compromised.

If any of our owned or in-licensed patents are found to be invalid or unenforceable, or if we are otherwise unable to adequately protect our rights, it could have a material adverse impact on our business and our ability to commercialize or license our technology and products.

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

Our existing license with the Universities and Columbia impose various diligence, milestone payment, royalty, insurance and other obligations on us. If we fail to comply with these obligations, our licensors may have the right to terminate the license, in which event we would not be able to develop or market the affected products. If we lose such license rights, our business, results of operations, financial condition and prospects may be materially adversely affected. We may enter into additional licenses in the future and if we fail to comply with obligations under those agreements, we could suffer similar consequences.

We may incur substantial costs as a result of litigation or other proceedings relating to patent and other intellectual property rights, and we may be unable to protect our rights to our products and technology.

If we or our collaborators or licensors choose to go to court to stop a third party from using the inventions claimed in our owned or in-licensed patents, that third party may ask the court to rule that the patents are not infringed, invalid and/or should not be enforced against that third party. These lawsuits are expensive and would consume time and other resources even if we or they, as the case may be, were successful in stopping the infringement of these patents. In addition, there is a risk that the court will decide that these patents are not valid and that we or they, as the case may be, do not have the right to stop others from using the inventions.

There is also the risk that, even if the validity of these patents is upheld, the court will refuse to stop the third party on the ground that such third-party's activities do not infringe our owned or in-licensed patents. In addition, the U.S. Supreme Court has recently changed some tests regarding granting patents and assessing the validity of patents. As a consequence, issued patents may be found to contain invalid claims according to the newly revised standards. Some of our own or in-licensed patents may be subject to challenge and subsequent invalidation or significant narrowing of claim scope in a reexamination or other post-grant proceeding before the USPTO, or during litigation, under the revised criteria which make it more difficult to obtain patents.

We may also not be able to detect infringement of our own or in-licensed patents, which may be especially difficult for methods of manufacturing or formulation products. While we intend to take actions reasonably necessary to enforce our patent rights, we depend, in part, on our licensors and collaborators to protect a substantial portion of our proprietary rights.

If we are sued for infringing intellectual property rights of third parties, it will be costly and time consuming, and an unfavorable outcome in that litigation would have a material adverse effect on our business.

Our commercial success depends upon our ability and the ability of our collaborators to develop, manufacture, market and sell our product candidate and use our proprietary technologies without infringing the proprietary rights of third parties. Numerous U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in the fields relating to Fintepla and MT1621. As the medical device, biotechnology and pharmaceutical industries expand and more patents are issued, the risk increases that others may assert that our products or product candidates infringe the patent rights of others. Moreover, it is not always clear to industry participants, including us, which patents cover various types of medical devices, drugs, products or their methods of use. Thus, because of the large number of patents issued and patent applications filed in our fields, there may be a risk that third parties may allege they have patent rights encompassing our products, product candidates, technology or methods.

In addition, there may be issued patents of third parties of which we are currently unaware, that are infringed or are alleged to be infringed by our product candidate or proprietary technologies. Because (i) patent applications filed only in the United States may be maintained in secrecy until the patents are issued, (ii) other United States patent applications and patent applications filed in many foreign jurisdictions are typically not published until eighteen months after their filing date, (iii) publications in the scientific literature often lag behind actual discoveries, we cannot be certain that others have not filed patent applications for technology covered by our owned and in-licensed issued patents or our pending applications, or that we or, if applicable, a licensor were the first to invent the technology. Our competitors may have filed, and may in the future file, patent applications covering our product candidates or technology similar to ours. Any such patent application may have priority over our owned and in-licensed patent applications or patents, which could further require us to obtain rights to issued patents covering such technologies. If another party filed a U.S. patent application prior to March 16, 2013 on inventions similar to those owned or in-licensed to us, we or, in the case of in-licensed technology, the licensor may have to participate in an interference proceeding declared by the USPTO to determine priority of invention in the United States. The costs of these proceedings could be substantial, and it is possible that such proceedings may be decided against us if the other party had independently arrived at the same or similar invention prior to our own or, if applicable, our licensor's invention, resulting in a loss of our U.S. patent position with respect to such inventions. In addition, if another party has reason to assert a substantial new question of patentability against any of our claims in our owned and in-licensed U.S. patents, the third party can request that the USPTO reexamine the patent claims, which may result in a loss of scope of some claims or a loss of the entire patent. In addition to potential infringement claims, interference and post grant review proceedings, we may become a party to patent opposition proceedings in the European Patent Office, Australian Patent Office or other jurisdictions where either our patents are challenged, or we are challenging the patents of others. The costs of these proceedings could be substantial, and it is possible that our efforts would be unsuccessful. We may be exposed to, or threatened with, future litigation by third parties having patent or other intellectual property rights alleging that our product candidates and/or proprietary technologies infringe their intellectual property rights. These lawsuits are costly and could adversely affect our results of operations and divert the attention of managerial and technical personnel. There is a risk that a court would decide that we or our commercialization partners are infringing the third party's patents and would order us or our partners to stop the activities covered by the patents. In addition, there is a risk that a court will order us or our partners to pay the other party damages for having violated the other party's patents.

If a third-party's patent was found to cover our product candidate, proprietary technologies or their uses, we or our collaborators could be enjoined by a court and required to pay damages and could be unable to commercialize our product candidates or use our proprietary technologies unless we or they obtained a license to the patent. A license may not be available to us or our collaborators on acceptable terms, if at all. In addition, during litigation, the patent holder could obtain a preliminary injunction or other equitable relief which could prohibit us from making, using or selling our products, technologies or methods pending a trial on the merits, which could be years away.

There is a substantial amount of litigation involving patent and other intellectual property rights in the device, biotechnology and pharmaceutical industries generally. If a third party claims that we or our collaborators infringe its intellectual property rights, we may face a number of issues, including, but not limited to:

- infringement and other intellectual property claims which, regardless of merit, may be expensive and time-consuming to litigate and may divert our management's attention from our core business;

- substantial damages for infringement, which we may have to pay if a court decides that the product at issue infringes on or violates the third party's rights, and if the court finds that the infringement was willful, we could be ordered to pay treble damages and the patent owner's attorneys' fees;
- a court order prohibiting us from selling or licensing the product unless the third party licenses its patent rights to us, which it is not required to do;
- if a license is available from a third party, we may have to pay substantial royalties, upfront fees and/or grant cross-licenses to intellectual property rights for our products; and
- redesigning our products or processes so they do not infringe, which may not be possible or may require substantial monetary expenditures and time.

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. In addition, any uncertainties resulting from the initiation and continuation of any litigation could have a material adverse effect on our ability to raise the funds necessary to continue our operations or otherwise have a material adverse effect on our business, results of operations, financial condition and prospects.

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

Periodic maintenance fees on our owned and in-licensed patents are due to be paid to the USPTO in several stages over the lifetime of the patents. Future maintenance fees will also need to be paid on other patents which may be issued to us or our licensors. We have systems in place to remind us to pay these fees, and we employ outside firms to remind us or our in-licensor to pay annuity fees due to foreign patent agencies on our pending foreign patent applications. The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process. In many cases, an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with the applicable rules. However, there are situations in which noncompliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, our competitors might be able to enter the market and this circumstance would have a material adverse effect on our business.

We also may rely on trade secrets and confidentiality agreements to protect our technology and know-how, especially where we do not believe patent protection is appropriate or obtainable. However, trade secrets are difficult to protect, and we have limited control over the protection of trade secrets used by our licensors, collaborators and suppliers. Although we use reasonable efforts to protect our trade secrets, our employees, consultants, contractors, outside scientific collaborators and other advisors may unintentionally or willfully disclose our information to competitors. Enforcing a claim that a third party illegally obtained and is using any of our trade secrets is expensive and time consuming, and the outcome is unpredictable. In addition, courts outside the United States are sometimes less willing to protect trade secrets. Moreover, our competitors may independently develop equivalent knowledge, methods and know-how. If our confidential or proprietary information is divulged to or acquired by third parties, including our competitors, our competitive position in the marketplace will be harmed and our ability to successfully generate revenues from our product candidates, if approved by the FDA or other regulatory authorities, could be adversely affected.

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

As is common in the device, biotechnology and pharmaceutical industries, we employ individuals who were previously employed at other device, biotechnology or pharmaceutical companies, including our competitors or potential competitors.

Risks Relating to the Securities Markets and an Investment in Our Stock

The market price of our common stock has fluctuated and is likely to continue to fluctuate substantially.

The market prices for securities of biotechnology and pharmaceutical companies have historically been highly volatile, and the market has recently experienced significant price and volume fluctuations that are unrelated to the operating performance of particular companies. Since the commencement of trading in connection with our initial public offering in November 2010, the publicly traded shares of our common stock have themselves experienced significant price and volume

fluctuations. During the year ended December 31, 2019, the price per share for our common stock on The Nasdaq Global Market has ranged from a low sale price of $36.17 to a high sale price of $55.01. This market volatility is likely to continue. These and other factors could reduce the market price of our common stock, regardless of our operating performance. In addition, the trading price of our common stock could change significantly, both over short periods of time and the longer term, due to many factors, including those described elsewhere in this "Risk Factors" section and the following:

- FDA or international regulatory actions and whether and when we receive regulatory approval for Fintepla or MT1621;
- the development status of Fintepla or MT1621, including the results from our clinical trials;
- variations in the level of expenses related to Fintepla or MT1621 clinical development programs, including relating to the timing of invoices from, and other billing practices of, our CROs and clinical trial sites;
- changes in operating performance and stock market valuations of other pharmaceutical companies and price and volume fluctuations in the overall stock market;
- deviations from securities analysts' estimates or the impact of other analyst comments;
- ratings downgrades by any securities analysts who follow our common stock;
- additions or departures of key personnel;
- third-party payor coverage and reimbursement policies;
- developments concerning current or future strategic collaborations, and the timing of payments we may make or receive under these arrangements;
- developments affecting our contract manufacturers, component fabricators and service providers;
- the development and sustainability of an active trading market for our common stock;
- future sales of our common stock by our officers, directors and significant stockholders;
- other events or factors, including those resulting from war, incidents of terrorism, natural disasters, security breaches, system failures or responses to these events;
- changes in accounting principles; and
- discussion of us or our stock price by the financial and scientific press and in online investor communities.

In addition, the stock markets, and in particular the Nasdaq Global Market, have experienced extreme price and volume fluctuations that have affected and continue to affect the market prices of equity securities of many pharmaceutical companies. Stock prices of many pharmaceutical companies have fluctuated in a manner unrelated or disproportionate to the operating performance of those companies. The realization of any of the above risks or any of a broad range of other risks, including the risk factors described in this section of this Annual Report on Form 10-K, could have a dramatic and material adverse impact on the market price of our common stock.

Our quarterly operating results may fluctuate significantly.

Our quarterly operating results are difficult to predict and may fluctuate significantly from period to period, particularly because the success and costs of our Fintepla and MT1621 development programs are uncertain and therefore our future prospects are uncertain. Our net loss and other operating results will be affected by numerous factors, including:

- variations in the level of development and/or regulatory expenses related to Fintepla and MT1621 development programs;
- results of clinical trials for Fintepla or MT1621;
- any intellectual property infringement lawsuit in which we may become involved;
- the level of underlying demand for any of our product candidates that may receive regulatory approval;
- our ability to control production spending and underutilization of production capacity;
- those of our competitors; and

- our execution of any collaborative, licensing or similar arrangements, and the timing of payments we may make or receive under these arrangements.

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.

Our operating results may fluctuate significantly, which makes our future operating results difficult to predict.

Our quarterly and annual operating results may fluctuate significantly in the future, which makes it difficult for us to predict our future operating results. From time to time, in addition to the existing Shinyaku Agreement, we may enter into collaborative arrangements with other companies that include development funding and significant upfront and milestone payments and/or royalties, which may become an important source of our revenue. Accordingly, our revenue may depend on development funding and the achievement of development and clinical milestones under current and any potential future collaborative arrangements and sales of our products, if approved. Furthermore, revenues may consist of the recognition of deferred revenue from upfront, nonrefundable payments that we received from Shinyaku or payments we may receive under future collaboration agreements and the timing of recognizing deferred revenue is subject to significant management judgments, including estimating total costs at completion. These upfront and milestone payments may vary significantly from period to period and any such variance could cause a significant fluctuation in our operating results from one period to the next. As a result, any period-to-period comparisons of our operating results may not be meaningful. Accordingly, the results of any one period should not be relied upon as an indication of future performance.

We are involved in securities class action litigation and may become involved in future securities class action litigation that could divert management's attention and adversely affect our business and could subject us to significant liabilities.

The stock markets have experienced significant price and volume fluctuations that have affected the market prices for the common stock of pharmaceutical companies. These broad market fluctuations as well a broad range of other factors, including the realization of any of the risks described in these "Risk Factors," may cause the market price of our common stock to decline. In the past, securities class action litigation has often been brought against a company following a decline in the market price of its securities. This risk is especially relevant for us because biotechnology and pharmaceutical companies generally experience significant stock price volatility. On April 12, 2019, a plaintiff stockholder filed a class action lawsuit against us and certain of our executive officers alleging violations of Sections 10(b) and 20(a) of the Securities Exchange Act in the United States District Court for the Northern District of California captioned *Lake v. Zogenix*, Case No. 3:19-cv-01975-RS. On October 4, 2019, we filed a motion to dismiss the complaint in the action. On January 27, 2020, the court entered an order dismissing the complaint without prejudice. Rather than amend the complaint, the plaintiffs opted to voluntary dismiss their claims. A final judgment in favor of Zogenix and our executive officers was filed on February 13, 2020. On January 17, 2020, a plaintiff stockholder filed a shareholder derivative lawsuit against our directors and officers alleging violations of Sections 10(b) and 20(a) of the Securities Exchange Act, breach of fiduciary duties, unjust enrichment, and waste of corporate assets, in the United States District Court for the Northern District of California captioned *Lui v. Farr*, Case No. 3:20-cv-00390. The plaintiff alleges that certain statements regarding the prospects for our NDA for FINTEPLA were false or misleading, and that we failed to maintain adequate internal controls in connection with its FDA submission process. We believe the allegations lack merit and intend to defend the claims vigorously. We may become involved in additional securities class action litigation in the future. Litigation often is expensive and diverts management's attention and resources, which could adversely affect our business. Any adverse determination in any such litigation or any amounts paid to settle any such actual or threatened litigation could require that we make significant payments.

If securities or industry analysts do not publish research or publish inaccurate or unfavorable research about our business, our stock price and trading volume could decline.

The trading market for our common stock will depend in part on the research and reports that securities or industry analysts publish about us or our business. As of December 31, 2019, we had research coverage by only 12 securities analysts. If these securities analysts cease coverage of our company, the trading price for our stock would be negatively impacted. If one or more of the analysts who covers us downgrades our stock or publishes inaccurate or unfavorable research about our business, our stock price would likely decline. If one or more of these analysts ceases coverage of us or fails to publish reports on us regularly, demand for our stock could decrease, which could cause our stock price and trading volume to decline.

Future sales of our common stock or securities convertible or exchangeable for our common stock may depress our stock price.

Persons who were our stockholders prior to the sale of shares in our initial public offering in November 2010 continue to hold a substantial number of shares of our common stock that they are able to sell in the public market, subject in some cases to certain legal restrictions. Significant portions of these shares are held by a small number of stockholders. If these stockholders sell, or indicate an intention to sell, substantial amounts of our common stock in the public market, the trading price of our common stock could decline. The perception in the market that these sales may occur could also cause the trading price of our common stock to decline. As of December 31, 2019, we had 45,272,088 shares of common stock outstanding. The majority of these shares are freely tradeable, without restriction, in the public market.

In addition, shares of common stock that are either subject to outstanding options or reserved for future issuance under our employee benefit plans are eligible for sale in the public market to the extent permitted by the provisions of various vesting schedules and Rule 144 and Rule 701 under the Securities Act of 1933, as amended, or the Securities Act, and, in any event, we have filed a registration statement permitting shares of common stock issued on exercise of options to be freely sold in the public market. If these additional shares of common stock are sold, or if it is perceived that they will be sold, in the public market, the trading price of our common stock could decline.

Certain of our directors and executive officers have established, or may establish programmed selling plans under Rule 10b5-1 of the Securities Exchange Act of 1934, as amended, or the Exchange Act, for the purpose of effecting sales of our common stock. Any sales of securities by these stockholders, warrantholders or executive officers and directors, or the perception that those sales may occur, could have a material adverse effect on the trading price of our common stock.

Anti-takeover provisions under our charter documents and Delaware law could delay or prevent a change of control which could limit the market price of our common stock and may prevent or frustrate attempts by our stockholders to replace or remove our current management.

Our amended and restated certificate of incorporation and amended and restated bylaws contain provisions that could delay or prevent a change of control of our company or changes in our board of directors that our stockholders might consider favorable. Some of these provisions include:

- a board of directors divided into three classes serving staggered three-year terms, such that not all members of the board will be elected at one time;
- a prohibition on stockholder action through written consent, which requires that all stockholder actions be taken at a meeting of our stockholders;
- a requirement that special meetings of stockholders be called only by the chairman of the board of directors, the chief executive officer, the president or by a majority of the total number of authorized directors;
- advance notice requirements for stockholder proposals and nominations for election to our board of directors;
- a requirement that no member of our board of directors may be removed from office by our stockholders except for cause and, in addition to any other vote required by law, upon the approval of not less than 66 2/3% of all outstanding shares of our voting stock then entitled to vote in the election of directors;
- a requirement of approval of not less than 66 2/3% of all outstanding shares of our voting stock to amend any bylaws by stockholder action or to amend specific provisions of our certificate of incorporation; and
- the authority of the board of directors to issue preferred stock on terms determined by the board of directors without stockholder approval and which preferred stock may include rights superior to the rights of the holders of common stock.

In addition, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporate Law, which may prohibit certain business combinations with stockholders owning 15% or more of our outstanding voting stock. These anti-takeover provisions and other provisions in our amended and restated certificate of incorporation and amended and restated bylaws could make it more difficult for stockholders or potential acquirers to obtain control of our board of directors or initiate actions that are opposed by the then- current board of directors and could also delay or impede a merger, tender offer or proxy contest involving our company. These provisions could also discourage proxy contests and make it more difficult for you and other stockholders to elect directors of your choosing or cause us to take other corporate actions you desire. Any delay or prevention of a change of control transaction or changes in our board of directors could cause the market price of our common stock to decline.

We have never paid dividends on our capital stock, and we do not anticipate paying any cash dividends in the foreseeable future.

The continued operation and expansion of our business will require substantial funding. Investors seeking cash dividends in the foreseeable future should not purchase our common stock. We have paid no cash dividends on any of our classes of capital stock to date and we currently intend to retain our available cash to fund the development and growth of our business. Any determination to pay dividends in the future will be at the discretion of our board of directors and will depend upon results of operations, financial condition, contractual restrictions, restrictions imposed by applicable law and other factors our board of directors deems relevant. We do not anticipate paying any cash dividends on our common stock in the foreseeable future. Any return to stockholders will therefore be limited to the appreciation in the market price of their stock, which may never occur.

We have incurred and will continue to incur significant increased costs as a result of operating as a public company, and our management is required to devote substantial time to meet compliance obligations.

As a public company, we have incurred and will continue to incur significant legal, accounting and other expenses. We are subject to the reporting requirements of the Exchange Act, the Sarbanes-Oxley Act, as well as rules subsequently implemented by the SEC and the Nasdaq Stock Market LLC that impose significant requirements on public companies, including requiring establishment and maintenance of effective disclosure and financial controls and changes in corporate governance practices. The Exchange Act requires, among other things, that we file annual, quarterly and current reports with respect to our business and financial condition. In addition, on July 21, 2010, the Dodd-Frank Wall Street Reform and Protection Act, or the Dodd-Frank Act, was enacted. There are significant corporate governance and executive compensation-related provisions in the Dodd-Frank Act that require the SEC to adopt additional rules and regulations in these areas. The requirements of these rules and regulations have increased and will continue to increase our legal and financial compliance costs, make some activities more difficult, time-consuming or costly and may also place considerable strain on our personnel, systems and resources. Our management and other personnel have devoted and will continue to devote a substantial amount of time to these new compliance initiatives. In addition, we expect these rules and regulations to make it more difficult and more expensive for us to obtain director and officer liability insurance, and we may be required to accept reduced policy limits and coverage or incur substantially higher costs to obtain the same or similar coverage. As a result, it may be more difficult for us to attract and retain qualified people to serve on our board of directors, our board committees or as executive officers.

The Sarbanes-Oxley Act requires, among other things, that we maintain effective internal controls for financial reporting and disclosure controls and procedures. Ensuring that we have adequate internal financial and accounting controls and procedures in place is a costly and time-consuming effort that needs to be re-evaluated frequently. In particular, commencing in fiscal 2011, we performed system and process evaluation and testing of our internal controls over financial reporting which allowed management to report on the effectiveness of our internal controls over financial reporting, as required by Section 404 of the Sarbanes-Oxley Act, or Section 404. Our future testing may reveal deficiencies in our internal controls over financial reporting that are deemed to be material weaknesses or that may require prospective or retroactive changes to our consolidated financial statements or identify other areas for further attention or improvement. We expect to incur significant expense and devote substantial management effort toward ensuring compliance with Section 404. Pursuant to Section 404(c) of the Sarbanes-Oxley Act, our independent registered public accounting firm is required to deliver an attestation report on the effectiveness of our internal control over financial reporting. We currently do not have an internal audit function, and we may need to hire additional accounting and financial staff with appropriate public company experience and technical accounting knowledge. Implementing any appropriate changes to our internal controls may require specific compliance training for our directors, officers and employees, entail substantial costs to modify our existing accounting systems, and take a significant period of time to complete. Such changes may not, however, be effective in maintaining the adequacy of our internal controls, and any failure to maintain that adequacy, or consequent inability to produce accurate consolidated financial statements or other reports on a timely basis, could increase our operating costs and could materially impair our ability to operate our business. Moreover, effective internal controls are necessary for us to produce reliable financial reports and are important to help prevent fraud. If we are not able to comply with the requirements of Section 404 in a timely manner, or if we or our independent registered public accounting firm identifies deficiencies in our internal controls that are deemed to be material weaknesses, the market price of our stock could decline and we could be subject to sanctions or investigations by Nasdaq, the SEC or other regulatory authorities, which would entail expenditure of additional financial and management resources.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

As of December 31, 2019, our corporate headquarters, which includes executive offices and research and development and business operations, consist of approximately 37,307 square feet of leased office and laboratory space in Emeryville, California. We also lease office space in Oakland, California and Maidenhead, United Kingdom.

We believe that our facilities are adequate to meet our needs for the immediate future, and that, should it be needed, suitable additional space will be available to accommodate expansion of our operations.

Item 3. Legal Proceedings

See “Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note 9, Commitments and Contingencies.”

Item 4. Mine Safety Disclosures

Not Applicable.

PART II

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

Market Information

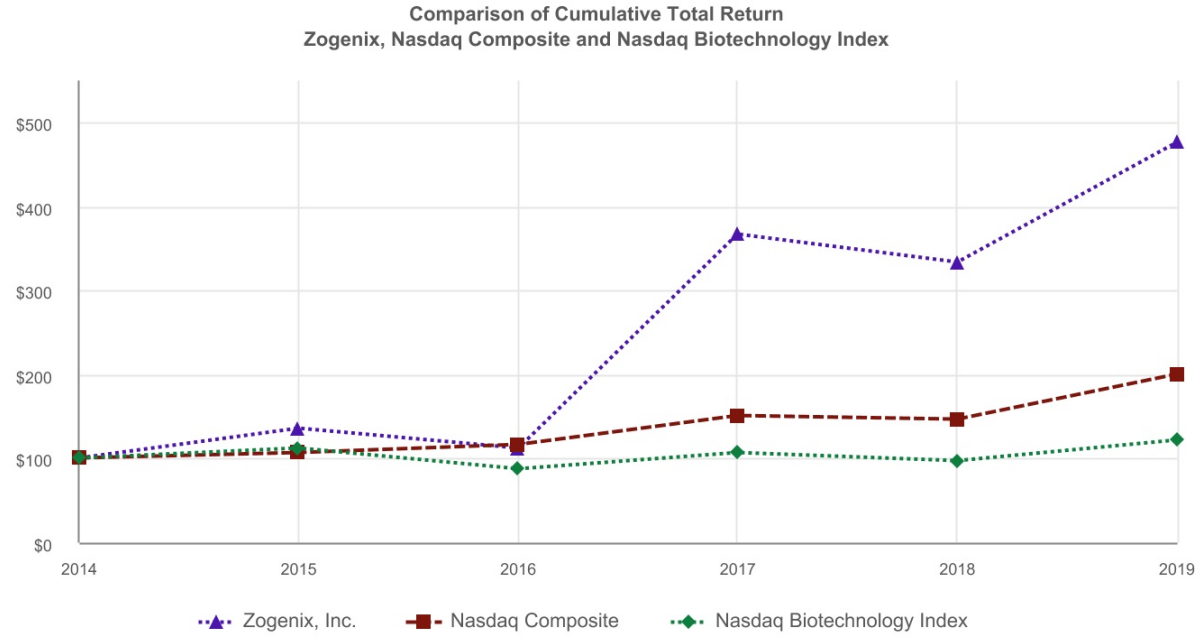
Zogenix common stock is listed on The Nasdaq Global Market under the symbol ZGNX.

Holders of Common Stock

According to the records of our transfer agent, there were 9 holders of record of our common stock on February 28, 2020. Because many of such shares are held by brokers and other institutions on behalf of stockholders, we are unable to estimate the total number of stockholders represented by these record holders.

Performance Graph

The following stock performance graph illustrates a comparison of the total cumulative stockholder return on our common stock over the five-year period ended December 31, 2019 to the Nasdaq Composite Index and the Nasdaq Biotechnology Index. The graph assumes an initial investment of $100 on December 31, 2014, and that all dividends were reinvested. The comparisons in the graph are required by the SEC and are not intended to forecast or be indicative of possible future performance of our common stock.



Dividend Policy

We have never declared or paid any cash dividends on our capital stock and do not anticipate paying any cash dividends in the foreseeable future. We expect to retain available cash to finance ongoing operations and the potential growth of our business. Any future determination to pay dividends on our common stock will be at the discretion of our board of directors and will depend upon, among other factors, our results of operations, financial condition, capital requirements, contractual restrictions, business prospects and other factors our board of directors may deem relevant.

Equity Compensation Plan Information

See Part III, Item 12, "Security Ownership of Certain Beneficial Owners and Management and related Stockholder Matters" for information regarding securities authorized for issuance under equity compensation plans.

Recent Sales of Unregistered Securities

None.

Issuer Repurchases of Equity Securities

None.

Item 6. Selected Financial Data

The following table summarizes certain of our selected financial data. The selected statement of operations data for the years ended December 31, 2019, 2018 and 2017 and the consolidated balance sheet data as of December 31, 2019 and 2018 should be read in conjunction with the audited financial statements and related notes, Management's Discussion and Analysis of Financial Condition and Results of Operations and other financial information presented elsewhere in this Form 10-K. The selected statements of operations data for the years ended December 31, 2016 and 2015 and the consolidated balance sheet data as of December 31, 2017, 2016 and 2015 have been derived from audited financial statements not included herein.

Our historical results for any prior period do not necessarily indicate our results to be expected for any future period.

	Year Ended December 31,				
	2019	2018	2017	2016	2015
	(In Thousands, Except Per Share Amounts)				
Statement of Operations Data					
Revenue:					
Collaboration revenue	$ 3,648	$ —	$ —	$ —	$ —
Contract manufacturing revenue [1]	—	—	9,821	28,525	24,369
Service and other product revenue	—	—	—	325	2,813
Total revenue	3,648	—	9,821	28,850	27,182
Operating expenses:					
Cost of contract manufacturing [1]	—	—	10,729	22,173	22,356
Royalty expense	—	—	—	295	345
Research and development	115,639	100,925	67,449	41,840	27,860
Selling, general and administrative	60,792	38,950	25,885	26,996	26,347
Acquired in-process research and development and related costs	251,438	—	—	—	—
Loss on contract termination	—	—	478	—	—
Change in fair value of contingent consideration [2]	5,600	1,300	24,100	1,800	(2,000)
Asset impairment charges [3]	—	—	1,116	8,431	—
Total operating expenses	433,469	141,175	129,757	101,535	74,908
Loss from operations	(429,821)	(141,175)	(119,936)	(72,685)	(47,726)
Other income (expense):					
Interest income (expense), net	9,802	7,164	(1,554)	(2,382)	(2,959)
Loss on sale of marketable securities [4]	—	—	—	—	(5,746)
Loss on extinguishment of debt[5]	—	—	(4,876)	—	—
Change in fair value of common stock warrant liabilities	145	169	297	5,387	(1,103)
Other income (expense)[6]	371	10,126	47	46	(71)
Total other income (expense)	10,318	17,459	(6,086)	3,051	(9,879)
Loss from continuing operations before income taxes	(419,503)	(123,716)	(126,022)	(69,634)	(57,605)
Income tax benefit[7]	—	—	—	948	15,901
Net loss from continuing operations	$ (419,503)	(123,716)	(126,022)	(68,686)	(41,704)
Net (loss) income from discontinued operations	—	(198)	(795)	(1,021)	67,848
Net (loss) income	$ (419,503)	(123,914)	(126,817)	(69,707)	26,144
Net loss per share from continuing operations, basic and diluted	$ (9.74)	$ (3.27)	$ (4.62)	$ (2.77)	$ (1.94)

(1) Amounts relate to supplying Sumavel DosePro under a long-term supply agreement, which was terminated in 2017.

(2) Reflects changes in the estimated fair value of the contingent consideration liability related to potential regulatory and sales-based milestone payments. See Notes 2 and 7 to our consolidated financial statements included in this Form 10-K.

(3) Includes the impairment of long-lived assets used in the production of Sumavel DosePro in 2016 and 2017.

(4) Represents loss on sale of marketable securities, which was included as part of the sales consideration received from divesting our Zohydro ER business.

(5) Reflects loss on extinguishment of our working capital advance note payable to our customer related to supplying Sumavel DosePro under a long-term supply agreement, which terminated in 2017.

(6) Includes income recognized for qualifying research and development expenditures under U.K.'s SME R&D tax relief scheme. See Notes 2 and 15 to our consolidated financial statements included in this Form 10-K.

(7) Tax benefit in 2015 was attributable to the sale of Zohydro ER.

	As of December 31,				
	2019	2018	2017	2016	2015
	(In Thousands)				
Balance Sheet Data:					
Cash, cash equivalents and marketable securities	$ 251,155	$ 514,187	$ 293,503	$ 91,551	$ 155,349
Working capital[(1)]	191,850	474,355	283,720	99,604	154,517
Total assets	414,250	648,331	417,613	231,505	305,822
Long-term debt, less current portion	—	—	—	18,824	15,899
Accumulated deficit	(1,115,457)	(695,954)	(572,040)	(445,223)	(375,516)
Total stockholders' equity	245,059	552,801	301,521	120,756	182,760

(1) Subsequent to the adoption of ASC 842 on January 1, 2019, working capital balances will decrease by operating lease liabilities (current portion), which is included in current liabilities.

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

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with "Selected Financial Data" and our consolidated financial statements and related notes appearing elsewhere in this Annual Report on Form 10-K. In addition to historical information, this discussion and analysis contains forward-looking statements that involve risks, uncertainties and assumptions. Our actual results may differ materially from those anticipated in these forward-looking statements as a result of certain factors, including, but not limited, to those set forth under "Item 1A — Risk Factors" and elsewhere in this Annual Report on Form 10-K.

This section of this Form 10-K generally discusses 2019 and 2018 items and year-to-year comparisons between 2019 and 2018. Discussions of 2017 items and year-to-year comparisons between 2018 and 2017 that are not included in this Form 10-K can be found in "Management's Discussion and Analysis of Financial Condition and Results of Operations" in Part II, Item 7 of our Annual Report on Form 10-K for the year ended December 31, 2018, filed with the SEC on February 28, 2019.

Overview

We are a global pharmaceutical company committed to developing and commercializing transformative therapies to improve the lives of patients and their families living with rare diseases. We are primarily focused on developing and commercializing two therapeutic product candidates: Fintepla, a low-dose fenfluramine, for two pediatric epilepsy disorders and MT1621 for a mitochondrial depletion disorder.

We own and control worldwide development and commercialization rights to Fintepla, our lead product candidate, for which we have filed a new drug application (NDA) with the United States Food and Drug Administration (FDA) seeking approval to market and sell the product in the treatment of Dravet syndrome, a rare and devastating pediatric epilepsy disorder. In March 2019, we entered into an exclusive distribution agreement with Nippon Shinyaku Co., Ltd. to support the sales and distribution of the product in Japan, if approved. Fintepla is also under late-stage development for the treatment of seizures associated with Lennox- Gastaut syndrome (LGS), another rare and devastating form of childhood-onset epilepsy. Additionally, we are evaluating Fintepla in other rare epileptic syndromes and diseases in preclinical studies.

In September 2019, we acquired all the outstanding equity interests of Modis Therapeutics, Inc. (Modis), a privately-held biopharmaceutical company based in Oakland, California. Modis holds an exclusive worldwide license from Columbia University in New York City (Columbia) to certain intellectual property rights owned or controlled by Columbia to develop and commercialize MT1621. MT1621 is an investigational deoxynucleoside-combination substrate enhancement therapy in development for the treatment of thymidine kinase 2 deficiency (TK2d), an inherited mitochondrial DNA depletion disorder that predominantly affects children and is often fatal. For the acquisition of Modis, we transferred aggregate upfront transaction consideration of approximately $246.5 million, which consisted of cash payments of $175.5 million and common stock with a fair value of $68.1 million. Also included in the aggregate upfront consideration were $3.5 million of transaction costs incurred, reduced by a net working capital adjustment receivable of $0.6 million.

Fintepla for Patients with Dravet Syndrome

Dravet syndrome is a rare form of pediatric-onset epilepsy with life threatening consequences for patients and for which current treatment options are very limited. Fintepla has received orphan drug designation in the United States and the European Union (EU) for the treatment of Dravet syndrome. In addition, Fintepla for the treatment of Dravet syndrome received Fast Track designation from the FDA in January 2016.

We have completed multiple clinical trials of Fintepla for the treatment of Dravet syndrome, including Study 1, a double-blind placebo-controlled studies of Fintepla as adjunctive therapy for patients with uncontrolled seizures who have Dravet syndrome, Study 1504, which investigated the pharmacokinetic profile and safety of Fintepla when co-administered with the stiripentol regimen and Study 1503, our ongoing open-label extension (OLE) trial to study the long-term safety and effectiveness of Fintepla, which is available to eligible patients who have completed our Phase 3 trials.

In February 2019, we completed our rolling submission of a NDA with the FDA and submitted a Marketing Authorization Application (MAA) to the European Medicines Agency (EMA) for Fintepla for the treatment of seizures associated with Dravet syndrome. The EMA has accepted the MAA and initiated its review.

In April 2019, we received a Refusal to File (RTF) letter from the FDA regarding our NDA for Fintepla for the treatment of seizures associated with Dravet syndrome. Upon its preliminary review, the FDA determined that the NDA submitted in February 2019 was not sufficiently complete to permit a substantive review. In the RTF letter, the FDA cited two reasons for

the RTF decision: first, certain non-clinical studies were not submitted to allow assessment of the chronic administration of fenfluramine; and, second, the application contained an incorrect version of a clinical dataset, which prevented the completion of the review process that is necessary to support the filing of the NDA.

We held a Type A meeting with the FDA in May 2019 to review the two issues identified in the RTF letter. Based on the final meeting minutes received, the FDA agreed with our plan to resubmit the NDA for Fintepla without the inclusion of the new chronic toxicity studies requested in the RTF letter. With regards to the second issue, we conducted and discussed with the FDA a root cause analysis identifying the issue with the incorrect clinical dataset submitted in the original NDA, and the FDA requested that we include certain findings from our analysis in the resubmitted NDA. In September 2019, we resubmitted the NDA for Fintepla for the treatment of seizures associated with Dravet syndrome to the FDA, and in November 2019, the FDA accepted the NDA for filing. The FDA granted priority review for the NDA for Fintepla, which provides for a six-month review from the date of receipt and assigned a Prescription Drug User Fee Act target action date of March 25, 2020. As part of their review, the FDA requested additional information. We provided the FDA with additional data to conduct additional efficacy analyses from our two pivotal studies in Dravet syndrome. On February 27, 2020, we announced that the FDA extended the PDUFA target action date to June 25, 2020, which provides the FDA additional time to review.

Fintepla for Patients with LGS

LGS is another rare, refractory, debilitating pediatric-onset epilepsy with life threatening consequences for patients and for which current treatment options are limited and suboptimal. In November 2017, we announced the initiation of our multicenter global Phase 3 clinical trial of Fintepla as an adjunctive treatment for seizures in patients with LGS (Study 1601). Study 1601 has two parts: Part 1 was a double-blind, placebo-controlled study to assess the safety, tolerability and efficacy of Fintepla when added to a patient's current anti-epileptic regimen. In July 2019, we completed enrollment for Study 1601 with a total of 263 patients randomized into three treatment groups. Part 2 of the clinical trial will be a 12-month open-label extension to evaluate the long-term safety, tolerability and effectiveness of Fintepla.

In February 2020, we reported positive top-line results from Study 1601. The trial met its primary objective of demonstrating that Fintepla at a dose of 0.7 mg/kg/day was superior to placebo in reducing the frequency of drop seizures and demonstrated statistically significant improvements versus placebo in key secondary efficacy measures, including the proportion of patients with a clinically meaningful reduction in drop seizure frequency. No cases of valvular heart disease or pulmonary hypertension have been observed in Study 1601, including both Part 1 and Part 2. A total of 247 (93.9%) patients entered the open-label extension phase. We plan to work with regulatory agencies to seek regulatory approval of Fintepla for the treatment of LGS.

Fintepla for Other Potential Indications

In addition to Dravet syndrome and LGS, we have initiated an exploratory Phase 2 study to understand the characteristics of additional rare epilepsy disorders in separate cohorts and evaluate whether Fintepla is safe and effective versus placebo in these patient populations. The study protocol has been finalized and we are currently seeking IRB approvals and proceeding with opening study sites in the U.S. We expect to enroll the first patient in this Phase 2 "basket study" in the second quarter of 2020.

MT1621 for Patients with TK2d

TK2d is a rare, debilitating, and often fatal genetic disorder that primarily affects infants and children and for which there are currently no approved therapies. As of September 6, 2019, the date we acquired Modis, Modis had completed a pivotal Phase 2 retrospective treatment study (the RETRO study), of MT1621 in patients with TK2d and commenced a Phase 2 prospective, OLE study of patients with TK2d, Study MT-1621-101. MT1621 has received Breakthrough Therapy designation from the FDA and access to the PRIME scheme by the EMA and is therefore eligible for an accelerated regulatory review path in both the United States and Europe.

RETRO is a global retrospective study of MT1621, a fixed combination treatment of two pyrimidine nucleosides deoxycytidine and deoxythymidine (dC/dT), in 38 pediatric and adult patients with TK2 deficiency (median age of disease onset, 2.5 years) treated at eight clinical sites in the United States, Spain and Israel.

Subjects received MT1621 for a median of 71 weeks (range 92 days – 7 years). Each subject was scored across motor, respiratory, and feeding domains according to pre-defined response criteria and was compared to pre-treatment status to assess whether responses improved, remained stable, or worsened. Parallel to RETRO, we compiled a comprehensive, global TK2d Natural History dataset from published studies and individual case reports to document untreated patients' disease course. From

this natural history dataset, 68 patients reflecting the range of disease severity, age, and age of disease onset, were selected as a control group for treated patients in the RETRO study.

In October 2019, we announced positive top-line results from the pivotal Phase 2 RETRO study at the World Muscle Society congress in Copenhagen. 94.7% of treated patients had either improved (68%) or stabilized (26%) overall responses in major functional domains. A survival analysis using a time-dependent Cox regression model showed that the difference in probability of survival between treated patients and untreated natural history control patients was statistically significant ($p<0.0006$). Among clinical responders, a subset demonstrated profound responses, in some cases re-acquiring previously lost motor milestones such as ambulation, respiratory function and feeding. Safety data from RETRO indicated that MT1621 was generally well-tolerated. Most reported adverse events were considered not related to study drug (199 of 292), with mild or moderate diarrhea being the most common treatment-related adverse event (AE), occurring in 63% of patients. Serious AEs (SAEs) were reported in 14 subjects (37%). The majority of SAEs were deemed related to TK2d; two patients experienced three events related to study drug alone (kidney stone, kidney stone removal, diarrhea). Two adult-onset patients stopped treatment due to asymptomatic increases in aminotransferase liver enzymes (no increase in bilirubin levels), which resolved upon discontinuation of treatment. We plan to work with regulatory authorities during the second quarter of 2020 to determine the path forward to a potential submission of an NDA.

See the above “Business” section for a more complete discussion of our product candidates and clinical trials.

Collaborative Arrangement with Nippon Shinyaku

In March 2019, we entered into an agreement (Shinyaku Agreement) with Nippon Shinyaku Co., Ltd. (Shinyaku) for the exclusive distribution of Fintepla in Japan for the treatment of Dravet syndrome and LGS. As part of the Shinyaku Agreement, we are responsible for completing the global clinical development and all regulatory approval activities for Fintepla to support the submission of new drug applications in Japan for Dravet syndrome and LGS. Shinyaku will be responsible for the commercialization activities including the promotion, marketing, sale and distribution of Fintepla in Japan. Upon regulatory approval of Fintepla in Japan, Shinyaku will also act as our exclusive distributor for commercial shipment and distribution of Fintepla in Japan. If we pursue global development of Fintepla for indications other than Dravet syndrome or LGS, Shinyaku has the option to participate in the development for such indications in Japan, subject to cost sharing requirements pursuant to the agreement. Activities under the Shinyaku Agreement will be governed by a joint steering committee (JSC) consisting of three representatives from each party to the agreement. All decisions of the JSC are to be made by a unanimous vote with tie-breaking rights provided to each party for certain matters related to development, regulatory approval and commercialization.

Shinyaku has agreed to support development and regulatory approval of Fintepla in Japan by actively participating in the design of non-clinical, clinical and manufacturing requirements needed for regulatory submission, actively planning and participating in product labeling decisions and discussions with the Japanese Ministry of Health, Labor and Welfare (MHLW) and obtained distribution exclusivity through the payment of $20.0 million, of which $15.5 million was received shortly after the execution of the agreement with the remainder payable over the next two years. We will be actively running the clinical trials, performing manufacturing validation activities, preparing regulatory filings and holding discussions with MHLW, and negotiating pricing. We and Shinyaku have agreed to proportionally share the Japan specific development costs that may arise outside of the initial development plan and any post-approval clinical study costs in Japan. In addition, we can earn up to $66.0 million from Shinyaku for the achievement of certain regulatory milestones related to the treatment of Dravet syndrome and the treatment of LGS.

After regulatory approval of Fintepla in Japan has been obtained, we have agreed to supply Shinyaku with Fintepla upon receipt of purchase orders at our actual manufacturing cost plus a fixed transfer price mark-up, a fixed percentage of Shinyaku's net sales of Fintepla in Japan for such fiscal year, and a net price mark-up based on a percent of the applicable aggregate sales of Fintepla by Shinyaku for such fiscal year. The net price mark-up percentage increases with Shinyaku’s sales of Fintepla annual net sales in Japan and ranges between mid-twenties and is capped at a low thirties of the aggregate annual net sales for an applicable fiscal year.

In addition, we can earn up to an additional $42.5 million tied to the achievement of certain net sales milestones by Shinyaku through the term of the agreement.

The Shinyaku Agreement expires in September of 2045, unless earlier terminated by either party for a change in control, a material breach, bankruptcy, dissolution, or winding up of such other party. The Shinyaku Agreement may be also terminated by either party: (1) with one year prior written notice to the other party on or after the date of the first commercial sale of a competing generic version of the Fintepla in Japan, (2) if, prior to the launch of the Fintepla in Japan, a party has a good faith

concern, based on credible evidence, that such launch is not likely to be possible with commercially reasonable efforts, or (3) if a party believes Fintepla poses a substantial safety concern. We may also terminate the agreement following the second anniversary of the first commercial sale of the Fintepla in Japan if Shinyaku has failed to achieve or maintain certain diligence obligations under the Shinyaku Agreement. Shinyaku may also terminate the agreement if, prior to the launch of the Fintepla in Japan, Shinyaku has a good faith concern that Fintepla will not be commercially viable in Japan.

Critical Accounting Policies and Estimates

Our management's discussion and analysis of our financial condition and results of operations is based on our consolidated financial statements, which have been prepared in conformity with generally accepted accounting principles in the United States (GAAP). The preparation of these consolidated financial statements requires management to make judgments, assumptions, and estimates that affect the amounts reported in our consolidated financial statements and accompanying notes. We evaluate our estimates and assumptions on an ongoing basis. Our estimates are based on historical experience and various other assumptions that we believe to be reasonable under the circumstances.

Note 2 to our consolidated financial statements included in this Form 10-K describes the significant accounting policies and methods used in the preparation of the consolidated financial statements. The accounting policies described below are significantly affected by critical accounting estimates. Such accounting policies require significant judgments, assumptions, and estimates used in the preparation of the consolidated financial statements and actual results could differ from these estimates under different assumptions or conditions.

Revenue Recognition

We analyze our collaboration arrangements to assess whether such arrangements, or transactions between arrangement participants, involve joint operating activities performed by parties that are both active participants in the activities and exposed to significant risks and rewards dependent on the commercial success of such activities or are more akin to a vendor-customer relationship. In making this evaluation, we consider whether the activities of the collaboration are considered to be distinct and deemed to be within the scope of the collaborative arrangement guidance and those that are more reflective of a vendor-customer relationship and, therefore, within the scope of the revenue with contracts with customers guidance. This assessment is performed throughout the life of the arrangement based on changes in the responsibilities of all parties in the arrangement.

For elements of collaboration arrangements that are not accounted for pursuant to the revenue from contracts with customers guidance, an appropriate recognition method is determined and applied consistently, generally by analogy to the revenue from contracts with customers guidance. Amounts related to transactions with a counterparty in a collaborative arrangement that is not a customer are presented as collaboration revenue and on a separate line item from revenue recognized from contracts with customers, if any, in our consolidated statements of operations.

Amounts received prior to satisfying the revenue recognition criteria are recorded as deferred revenue in the consolidated balance sheets. If the related efforts underlying the deferred revenue is expected to be satisfied within the next twelve months this will be classified in current liabilities. Unconditional rights to receive consideration in advance of performance are recorded as receivables and deferred revenue in the consolidated balance sheets when we have a contractual right to bill and receive the payment, performance is expected to commence shortly and there is less than a year between billing and performance. Amounts recognized for satisfied performance obligations prior to the right to payment becoming unconditional are recorded as contract assets in the consolidated balance sheets. If we expect to have an unconditional right to receive consideration in the next twelve months, this will be classified in current assets. A net contract asset or liability is presented for each contract with a customer.

For arrangements or transactions between arrangement participants determined to be within the scope of the contracts with customers guidance, we perform the following steps to determine the appropriate amount of revenue to be recognized as we fulfill our obligations: (i) identification of the promised goods or services in the contract; (ii) determination of whether the promised goods or services are performance obligations including whether they are distinct in the context of the contract; (iii) measurement of the transaction price, including the constraint on variable consideration; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) we satisfy each performance obligation.

At contract inception, we assess the goods or services promised in a contract with a customer and identify those distinct goods and services that represent a performance obligation. A promised good or service may not be identified as a performance obligation if it is immaterial in the context of the contract with the customer, if it is not separately identifiable from other promises in the contract (either because it is not capable of being separated or because it is not separable in the context of the contract), or if the performance obligation does not provide the customer with a material right.

We consider the terms of the contract and our customary business practices to determine the transaction price. The transaction price is the amount of consideration to which we expect to be entitled in exchange for transferring promised goods or services to a customer. The consideration promised in a contract with a customer may include fixed amounts, variable amounts, or both. Variable consideration will only be included in the transaction price when it is not considered constrained, which is when it is probable that a significant reversal in the amount of cumulative revenue recognized will not occur.

If it is determined that multiple performance obligations exist, the transaction price is allocated at the inception of the agreement to all identified performance obligations based on the relative stand-alone selling prices unless the transaction price is variable and meets the criteria to be allocated entirely to one or more, but not all, performance obligations in the contract. The relative selling price for each performance obligation is based on observable prices if it is available. If observable prices are not available, we estimate stand-alone selling price for the performance obligation utilizing the estimated cost of the performance obligation with an estimated assumed margin. Once the transaction price has been allocated to a performance obligation using the applicable methodology, it is not subject to reassessment for subsequent changes in stand-alone selling prices.

Revenue is recognized when, or as, we satisfy a performance obligation by transferring a promised good or service to a customer. An asset is transferred when, or as, the customer obtains control of that asset. For performance obligations that are satisfied over time, we recognize revenue using an input or output measure of progress that best depicts our satisfaction of the relevant performance obligation. Revenues from performance obligations associated with a purchase order of Fintepla will be recognized when the customer obtains control of our product, which will occur at a point in time which may be upon shipment or delivery to the customer.

After contract inception, the transaction price is reassessed at every period end and updated for changes such as resolution of uncertain events. Any change in the overall transaction price is allocated to the performance obligations on the same methodology as at contract inception.

Management may be required to exercise judgment in estimating revenue to be recognized. Judgment is required in identifying performance obligations, estimating the transaction price, estimating the stand-alone selling prices of identified performance obligations, which may include forecasted revenue, development timelines, reimbursement rates for personnel costs, discount rates and probabilities of technical and regulatory success, and estimating the progress towards satisfaction of performance obligations.

Acquisitions

We evaluate acquisitions of assets and other similar transactions to assess whether or not the transaction should be accounted for as a business combination or asset acquisition by first applying a screen test to determine if substantially all of the fair value of the gross assets acquired is concentrated in a single identifiable asset or group of similar identifiable assets. If the screen is met, the transaction is accounted for as an asset acquisition. If the screen is not met, further determination is required as to whether or not we have acquired inputs and processes that have the ability to create outputs which would meet the definition of a business. Significant judgment is required in the application of the screen test to determine whether an acquisition is a business combination or an acquisition of assets.

For asset acquisitions, a cost accumulation model is used to determine the cost of an asset acquisition. Common stock issued as consideration in an asset acquisition is generally measured based on the acquisition date fair value of the equity interests issued. Direct transaction costs are recognized as part of the cost of an asset acquisition. We also evaluate which elements of a transaction should be accounted for as a part of an asset acquisition and which should be accounted for separately. Consideration deposited into escrow accounts are evaluated to determine whether it should be included as part of the cost of an asset acquisition or accounted for as contingent consideration. Amounts held in escrow where we have legal title to such balances but where such accounts are not held in our name, are recorded on a gross basis as an asset with a corresponding liability in our consolidated balance sheet.

The cost of an asset acquisition, including transaction costs, are allocated to identifiable assets acquired and liabilities assumed based on a relative fair value basis. Goodwill is not recognized in an asset acquisition. Any difference between the cost of an asset acquisition and the fair value of the net assets acquired is allocated to the non-monetary identifiable assets based on their relative fair values. Assets acquired as part of an asset acquisition that are considered to be in-process research and development (IPR&D) are immediately expensed unless there is an alternative future use in other research and development projects.

In addition to upfront consideration, our asset acquisitions may also include contingent consideration payments to be made for future milestone events or royalties on net sales of future products. We assess whether such contingent consideration

meets the definition of a derivative. Contingent consideration payments in an asset acquisition not required to be accounted for as derivatives are recognized when the contingency is resolved, and the consideration is paid or becomes payable. Contingent consideration payments required to be accounted for as derivatives are recorded at fair value on the date of the acquisition and are subsequently remeasured to fair value at each reporting date. Contingent consideration payments made prior to regulatory approval are expensed as incurred. Contingent consideration payments made subsequent to regulatory approval are capitalized as intangible assets and amortized, subject to impairment assessments.

Leases

In February 2016, the FASB issued ASU No. 2016-02, *Leases* (Topic 842). Topic 842 establishes a right-of-use asset model that requires all lessees to recognize ROU assets and liabilities for leases with a duration greater than one year on the balance sheet as well as provide disclosures with respect to certain qualitative and quantitative information regarding the amount, timing and uncertainty of cash flows arising from leases.

We adopted Topic 842 effective January 1, 2019 using the modified retrospective approach and elected the package of practical expedients permitted under transition guidance. Consequently, prior period financial information and related disclosures have not been adjusted and will continue to be presented in accordance with the previous lease standard. In addition, we elected the package of transition provisions available for existing contracts, which allowed us to carryforward our historical assessments of (1) whether contracts are or contain leases, (2) lease classification and (3) initial direct lease costs for existing leases. We did not elect the practical expedient allowing the use-of-hindsight which would require us to reassess the lease term of our leases based on all facts and circumstances through the effective date and did not elect the practical expedient pertaining to land easements as this is not applicable to the current contract portfolio.

The adoption of Topic 842 did not have a material impact on our consolidated statements of operations and cash flows. The impact on the accompanying consolidated balance sheet as of January 1, 2019 was as follows (in thousands):

	December 31, 2018	Adjustments Due to the Adoption of Topic 842	January 1, 2019
Assets			
Operating lease right-of-use assets	$ —	$ 8,641	$ 8,641
Liabilities			
Other accrued liabilities	$ 1,845	$ (363)	$ 1,482
Current portion of operating lease liabilities	—	1,058	1,058
Operating lease liabilities, net of current portion	—	11,776	11,776
Other long-term liabilities	3,830	(3,830)	—
Total	$ 5,675	$ 8,641	$ 14,316

Upon adoption on January 1, 2019, we recorded operating lease ROU assets and lease liabilities of $8.6 million and $12.8 million, respectively, with the difference between ROU assets and lease liabilities attributed to the reclassifications of deferred rent and lease incentive obligations, a cease-use liability and initial direct leasing costs as a component of ROU assets.

Prior to January 1, 2019, we recognized related rent expense on a straight-line basis over the term of the lease. Incentives granted under our operating lease, including allowances for leasehold improvements and rent holidays, were recognized as reductions to rent expense on a straight-line basis over the term of the lease. Deferred rent consisted of the difference between rent expense recognized on a straight-line basis and cash rent payments. Subsequent to the adoption of Accounting Standards Update (ASU) 2016-02 and related amendments (collectively, Topic 842) on January 1, 2019, we determine whether the arrangement is or contains a lease at the inception of the arrangement and if such a lease is classified as a financing lease or operating lease at lease commencement. All of our leases are classified as operating leases. Leases with a term greater than one year are included in operating lease right-of-use assets (ROU asset), current portion of lease liabilities, and lease liabilities, net of current portion in our consolidated balance sheet at September 30, 2019. If a lease contains an option to renew, the renewal option is included in the calculation of lease liabilities if we are reasonably certain at lease commencement the renewal option will be exercised. Lease liabilities and their corresponding ROU assets are measured at the present value of the remaining lease payments, discounted at an appropriate incremental borrowing rate at lease commencement, or as of January 1, 2019, for our existing leases. Management uses judgment to estimate the appropriate incremental borrowing rate, which is the rate incurred to borrow on a collateralized basis over a similar term an amount equal to the lease payments in a similar economic environment.

Certain adjustments to the ROU asset may be required for items such as initial direct lease costs, lease incentives, scheduled rent escalations and impairment charges if we determine the ROU asset is impaired. Operating lease expense is recognized on a straight-line basis over the lease term.

We elected the post-transition practical expedient to not separate lease components from non-lease components for all existing lease classes. We also elected a policy of not recording leases on our consolidated balance sheets when a lease has a term of one year or less.

Fair Value Measurement of Contingent Consideration Liability

In conjunction with our business combination we have recorded contingent consideration liabilities payable upon the achievement of specified development, regulatory approval or sales-based milestone events. The contingent consideration liabilities are measured at their respective fair values as of the acquisition date. The models used in valuing the contingent consideration liabilities are based on significant unobservable inputs, including but not limited to:

- estimates of revenues related to the products or product candidates;
- the probability of success for unapproved product candidates considering their stages of development;
- the time to complete the development and approval of product candidates;
- the life of the potential commercialized products and associated risks, including the inherent difficulties and uncertainties in developing a product candidate such as obtaining FDA and other regulatory approvals;
- risks related to the viability of and potential alternative treatments in any future target markets; and
- risk adjusted discount rates.

We revalue contingent consideration liabilities at each reporting period following the acquisition and record increases or decreases in fair value in our consolidated statements of operations under the caption “Change in Fair Value of Contingent Consideration”.

Increases or decreases in the fair value of our contingent consideration liabilities can result from updates to assumptions such as the expected timing or probability of achieving the specified milestones, changes in projected revenues, changes in time periods to attain events or revenue targets, or changes in discount rates. Significant judgment is used in determining these assumptions as of the acquisition date and at each subsequent reporting period. Updates to assumptions could have a significant impact on our results of operations in any given period.

Impairment Assessments related to Indefinite-Lived Intangible Assets

Indefinite-lived intangible assets are reviewed for impairment at least annually in the fourth quarter, and more frequently if events or other changes in circumstances indicate that the carrying amount of the assets may not be recoverable. Impairment of indefinite-lived intangibles is determined to exist when the fair value is less than the carrying value of the net assets being tested.

Our indefinite-lived intangible asset consists of in-process research and development (IPR&D) acquired in a business combination that are used in research and development activities but have not yet reached technological feasibility, regardless of whether they have alternative future use. The primary basis for determining the technological feasibility of these projects at the time of acquisition is obtaining regulatory approval to market the underlying products in an applicable geographic region. We classify in-process research and development acquired in a business combination as an indefinite-lived intangible asset until the completion or abandonment of the associated research and development efforts. Upon completion of the associated research and development efforts, we perform a final test for impairment and will determine the useful life of the technology and begin amortizing the assets to reflect their use over their remaining lives. Upon permanent abandonment, we would write-off the remaining carrying amount of the associated in-process research and development intangible asset.

In performing each annual impairment assessment and any interim impairment assessment, the accounting guidance allows an entity the option to first assess qualitative factors to determine whether it is necessary to perform a quantitative test. If we believe, as a result of our qualitative assessment, that it is more-likely-than-not that the fair value of our IPR&D asset is less than its carrying amount, a quantitative impairment test must be performed. Otherwise, no further testing is required.

When performing a qualitative test, we consider the results of our most recent quantitative impairment test and identify the most relevant divers of the fair value for the IPR&D asset. The most relevant drivers of fair value we have identified are

consistent with the assumptions used in the quantitative estimate of the IPR&D asset discussed below. Using these drivers of fair value, we identify events and circumstances that may have an effect on the fair value of the IPR&D asset since the last time the IPR&D's fair value was quantitatively determined. We then weigh these factors to determine and conclude if it is not more likely than not that the IPR&D asset is impaired. If it is more-likely-than-not that the IPR&D asset is impaired, we will proceed with quantitatively determining the fair value of the IPR&D asset.

Under a quantitative test, we use an income approach to determine the fair value of our IPR&D asset. This approach calculates fair value by estimating the after-tax cash flows attributable to an in-process project over its useful life and then discounting these after-tax cash flows back to a present value. This estimate includes judgmental assumptions regarding the estimates that market participants would make in evaluating the IPR&D asset, including the probability of successfully completing clinical trials and obtaining regulatory approval to market the IPR&D asset, the timing of and the expected costs to complete IPR&D projects, future net cash flows from potential drug sales, which are based on estimates of the sales price of the drug, the number of patients who will be diagnosed and treated and our competitive position in the marketplace, and appropriate discount and tax rates. If the fair value is less than the carrying amount based on our test, any impairment loss is recognized in our consolidated statements of operations by adjusting the carrying value of the IPR&D asset on our consolidated balance sheet to its fair value.

For 2019, we performed a qualitative test and concluded that it is more-likely-than-not that the fair value of our IPR&D asset exceeded its carrying value and no further testing was required. We did not recognize any IPR&D impairment charges for all periods presented.

For asset purchases outside of business combinations, we expense any purchased research and development assets as of the acquisition date if they have no alternative future uses.

Research and Development Expense and Accruals

Research and development costs are expensed as incurred unless there is an alternative future use in other research and development projects. Research and development costs include personnel-related costs, outside contracted services including clinical trial costs, facilities costs, fees paid to consultants, milestone payments prior to FDA approval, license fees prior to FDA approval, professional services, travel costs, dues and subscriptions, depreciation, materials used in clinical trials and research and development and costs incurred related to our agreement with Nippon Shinyaku Co., Ltd. We expense costs relating to the purchase and production of pre-approval inventories as research and development expense in the period incurred until FDA approval is received. Payments made prior to the receipt of goods or services to be used in research and development are recorded as prepaid assets on our consolidated balance sheets until the goods or services are realized or consumed. We classify such prepaid assets as current or non-current assets based on our estimates of the timing of when the goods or services will be realized or consumed.

Our expense accruals for clinical trials are based on estimates of the services received from clinical trial investigational sites, contract research organizations (CROs), contract manufacturing organizations (CMOs) and other third-party vendors that support us in our research and development efforts. Payments under some of our contracts with these service providers depend on factors such as the achievement of clinical milestones such as the successful enrollment of certain numbers of patients, site initiation, reservation of manufacturing capacity, or completion of a clinical trial. In accruing for these services at each reporting date, we estimate the time period over which services will be performed and the level of effort to be expended in each period. If available, we obtain information regarding unbilled services directly from these service providers. However, we may be required to estimate our accrual based only on information available to us. Once established, accruals are adjusted from time to time, as appropriate, in light of additional information. Amounts ultimately incurred in relation to amounts accrued for these services at a reporting date may be substantially higher or lower than our estimates.

Results of Operations

Comparison of Years Ended December 31, 2019 and 2018

Collaboration and Contract Manufacturing Revenue

(Dollars in thousands)	Year Ended December 31, 2019	2018	2017	$ Change 2019 vs 2018	2018 vs 2017
Collaboration revenue	$ 3,648	$ —	$ —	$ 3,648	$ —
Contract manufacturing revenue	—	—	9,821	—	(9,821)
Total collaboration and contract manufacturing revenue	$ 3,648	$ —	$ 9,821	$ 3,648	$ (9,821)

We currently do not have an approved product for sale. We recognize collaboration revenue from a collaborative arrangement entered into in March 2019 with Shinyaku. We may also be entitled to receive additional milestone payments pursuant to the Shinyaku Agreement upon the achievement of specified milestones. As the recognition of this collaboration revenue is based on costs incurred to date relative to total estimated costs at completion when measuring progress and the uncertainty of when the events underlying various milestones are resolved, we expect our collaboration revenue will fluctuate from period to period.

Research and Development Expenses

For each of our research and development programs, we incur both external and internal costs. External costs include clinical and non-clinical activities performed by CROs, lab services, purchases of product candidate materials and manufacturing development costs. We track external research and development expenses for each of our key development programs. We have not tracked internal costs on a program-by-program basis because our research and development employees and infrastructure resources are utilized across our product candidate development programs.

The table below sets forth components of our research and development expenses for the periods presented.

(Dollars in thousands)	Year Ended December 31, 2019	2018	2017	$ Change 2019 vs 2018	2018 vs 2017
External costs:					
Fintepla for Dravet syndrome	$ 39,679	$ 52,765	44,181	$ (13,086)	$ 8,584
Fintepla for LGS	30,320	15,295	3,638	15,025	11,657
MT1621[1]	3,243	—	—	3,243	—
Other[2]	1,986	4,885	40	(2,899)	4,845
Total external costs	75,228	72,945	47,859	2,283	25,086
Internal Costs	40,411	27,980	19,590	12,431	8,390
Total research and development	$ 115,639	$ 100,925	$ 67,449	$ 14,714	$ 33,476

(1) Only includes external costs incurred subsequent to our acquisition of Modis in September 2019.
(2) Other external costs include early-phase exploratory research programs.

In October 2014, we acquired worldwide development and commercialization rights to Fintepla through a business acquisition and have since incurred significant expenditures related to conducting clinical trials of Fintepla. Research and development expenses related to Fintepla for Dravet syndrome decreased by $13.1 million in 2019 compared to 2018 primarily due to wind-down of clinical activities related to our Phase 3 trials Study 1501 and Study 1504, partially offset by costs incurred related to regulatory resubmission of the NDA for Fintepla for Dravet syndrome to the FDA. The NDA was accepted for filing by the FDA in November 2019. In addition, the FDA granted priority review for the NDA, which provides for a six-month review from the date of receipt and assigned a Prescription Drug User Fee Act target action date of March 25, 2020. As part of their review, the FDA requested additional information. We provided the FDA with additional data to conduct additional efficacy analyses from our two pivotal studies in Dravet syndrome. On February 27, 2020, we announced that the FDA extended the PDUFA target action date to June 25, 2020, which provides the FDA additional time to review. Research and development spend related to Fintepla for LGS increased by $15.0 million in the same year-over-year periods, reflecting the

progression and expansion of our clinical trial activities within Study 1601. In February 2020, we reported positive top-line results from Study 1601. Research and development expenses from internal costs increased by $12.4 million in 2019 compared to the same period in 2018 and was primarily attributable to personnel-related costs from headcount additions, including employees from our acquisition of Modis.

Selling, General and Administrative Expenses

Selling expense consists primarily of salaries and benefits of marketing and commercial personnel, marketing and advertising costs, service fees under our co-promotion agreement and product sample costs.

General and administrative expenses consist primarily of salaries and related costs for personnel in executive, finance, accounting, business development and internal support functions. In addition, general and administrative expenses include professional fees for legal, public relations, patent protection, tax and accounting services.

	Year Ended December 31,			$ Change	
(Dollars in thousands)	**2019**	**2018**	**2017**	**2019 vs 2018**	**2018 vs 2017**
Selling	$ 27,167	$ 13,816	$ 4,762	$ 13,351	$ 9,054
General and administrative	33,625	25,134	21,123	8,491	4,011
Total selling, general and administrative	60,792	38,950	25,885	$ 21,842	$ 13,065

Selling expense increased by $13.4 million in 2019 as compared to 2018 due primarily to an increase in marketing and commercial headcount and commercial expenses including marketing and pricing studies to prepare for a potential commercial launch of Fintepla for the treatment of Dravet syndrome.

General and administrative expense increased by $8.5 million in 2019 as compared to 2018 due primarily to increased general and administrative headcount as we build our infrastructure to support the expansion of our operations.

Acquired In-Process Research and Development and Related Costs

Acquired IPR&D consists of existing research and development projects at the time of the acquisition. Projects that qualify as IPR&D assets represent those that have not yet reached technological feasibility and have no alternative future use.

Our asset acquisition of Modis in September 2019 included one IPR&D project, MT1621. We allocated $244.5 million of the cost of the acquisition to MT1621. As MT1621 has not reached technological feasibility and had no alternative future use, the amount allocated to MT1621 was charged to expense at the acquisition date. In addition, the terms of the purchase agreement provided for the conversion of certain outstanding, unvested stock-based compensation awards held by employees of Modis into rights to receive a pro-rata share of the purchase consideration at the date of acquisition, with no future service requirement. As a result, we incurred compensation expense related to the acquired IPR&D of $4.9 million.

In December 2019, we paid a total of $2.0 million to acquire an option to license rights for a preclinical development program for orphan central nervous system disorders in an asset acquisition. The project had not yet reached technological feasibility and had no alternative future use which resulted in a write-off of IPR&D to acquired in-process research and development and related costs in our consolidated statement of operations.

Change in Fair Value of Contingent Consideration

	Year Ended December 31,			$ Change	
(Dollars in thousands)	**2019**	**2018**	**2017**	**2019 vs 2018**	**2018 vs 2017**
Change in fair value of contingent consideration	$ 5,600	$ 1,300	$ 24,100	$ 4,300	$ (22,800)

The contingent consideration liability relates to milestone payments under an existing agreement in connection with our prior acquisition of Fintepla. At each reporting period, the estimated fair value of the liability is determined by applying the income approach which utilizes variable inputs, such as the probability of success for achieving regulatory/commercial milestones, anticipated future cash flows, risk-free adjusted discount rates, and nonperformance risk. Any change in the fair value is recorded as contingent consideration (income) expense.

The estimated fair value of our contingent consideration liabilities increased by $4.3 million in 2019 compared to 2018 primarily due to the inclusion of sales in Japan in our forecast associated with the execution of the Shinyaku Agreement, which

accelerated the estimated timing of when certain sales milestones will be reached, a higher estimated probability of success of Fintepla for the treatment of Dravet syndrome and a market driven decrease in the discount rate.

Other Income (Expense)

	Year Ended December 31,			$ Change	
(Dollars in thousands)	2019	2018	2017	2019 vs 2018	2018 vs 2017
Other income (expense)	$ 10,318	$ 17,459	$ (6,086)	$ (7,141)	$ 23,545

For the year ended December 31, 2019, other income of $10.3 million primarily consisted of interest earned on our investments in marketable securities. For the year ended December 31, 2018, other income included $7.2 million of interest earned on our investments and marketable securities and income of $10.1 million related to claims under U.K.'s small and medium sized enterprises (SME) research and development (R&D) tax relief scheme for qualifying expenditures incurred in the 2015 and 2016 U.K. tax years. As of December 31, 2019, we have made similar elections and submitted two individual claims for refundable cash credits related to our 2017 and 2018 U.K. tax years. Amounts submitted for reimbursement for qualifying expenditures incurred in 2017 and 2018 are higher than claims received for prior tax years due to increases in qualifying expenditures incurred in those periods. We have not recorded a receivable for these refundable cash credits at December 31, 2019 as collectability was not probable or reasonably assured. For our 2019 U.K. tax year, we have not yet decided whether to seek tax relief by surrendering some of our losses for refundable cash credits or electing to receive enhanced U.K. tax deductions on our eligible R&D activities. Under U.K's tax legislation, there is a two-year window after the end of a tax year to seek relief under this scheme. See Notes 2 and 15 to our consolidated financial statements in this Form 10-K for additional information.

LIQUIDITY AND CAPITAL RESOURCES

Since we commenced operations in 2006, our operations have been financed primarily through equity and debt financings and proceeds from two business divestitures—Sumavel DosePro and Zohydro ER. Excluding gains from business divestitures, we have incurred significant net losses from operations and negative cash flows from operating activities since inception. As of December 31, 2019, we have an accumulated deficit of $1.1 billion. We currently do not have an approved product for sale and have limited collaboration revenue from our collaborative arrangement with Nippon Shinyaku Co., Ltd. We expect to continue to incur significant operating losses and negative cash flows from operations to advance our product candidates through development and commercialization. We do not know when, or if, we will generate any revenue from product sales and do not expect to generate significant revenue from product sales unless and until we obtain regulatory approval of, and commercialize Fintepla. To date, we have relied primarily on the proceeds from equity offerings to finance our operations. Our recent equity offerings include the following transactions.

At-the-Market Offerings

In May 2016, we entered into an at-the-market sales agreement (the ATM Sales Agreement) with Cantor Fitzgerald & Co. (Cantor) pursuant to which Cantor agreed to act as a sales agent in connection with sales of our common stock from time to time pursuant to an effective registration statement. In May 2016, we filed a registration on Form S-3, which was declared effective by the SEC on May 24, 2016, which included a prospectus covering the offering, issuance and sale of up to $25.0 million in gross aggregate proceeds of common stock from time to time, through Cantor as our sales agent. In the third quarter of 2017, we sold 1,550,880 shares of our common stock resulting in net proceeds of approximately $19.4 million, after deducting commissions and other offering expenses.

In December 2017, we filed a prospectus supplement (the 2017 ATM Prospectus), to our automatic "shelf" registration statement on Form S-3 registering the offering, issuance and sale of up to $75.0 million in gross aggregate proceeds of common stock pursuant to the ATM Sales Agreement. During the years ended December 31, 2019 and 2018, we sold 903,573 and 740,417 shares of common stock, respectively, resulting in net proceeds of approximately $42.6 million and $30.3 million, respectively, after deducting commissions and other offering costs. As of December 31, 2019, there were no amounts remaining for future sales under the 2017 ATM Prospectus.

Underwritten Public Offerings

In October 2017, we completed an underwritten public offering for the sale of 7,700,000 shares of our common stock. The shares were sold at an offering price of $37.50 per share. Net proceeds raised from the offering amounted to approximately $271.3 million, after deducting underwriting discounts and commissions and other offering expenses.

In August 2018, we completed an underwritten public offering for the sale of 6,000,000 shares of our common stock. The shares were sold at an offering price of $52.00 per share. Net proceeds raised from the offering amounted to approximately $292.9 million, after deducting underwriting discounts and commissions and other offering expenses.

The following table summarizes our cash, cash equivalents and marketable securities as of December 31, 2019 and 2018:

	December 31,		
	2019	2018	$ Change
	(In Thousands)		
Cash and cash equivalents	$ 62,070	$ 68,454	$ (6,384)
Marketable securities	189,085	445,733	(256,648)
Total	$ 251,155	$ 514,187	$ (263,032)

As of December 31, 2019, we had $251.2 million in cash, cash equivalents and marketable securities and no debt. We believe our existing cash and investment balances will be sufficient to fund our operations in the normal course of business and allow us to meet our liquidity needs for at least the next twelve months from the date hereof.

During 2019, the decrease of $263.0 million in our cash, cash equivalents and marketable securities balances from $514.2 million as of December 31, 2018 to $251.2 million as of December 31, 2019 was primarily due to cash used in operations and our acquisition of Modis in September 2019.

A summary of our cash flows for the periods presented was as follows:

	Year Ended December 31,		
	2019	2018	2017
	(In Thousands)		
Operating activities	$ (111,519)	$ (111,658)	$ (75,874)
Investing activities	73,121	(444,750)	(76)
Financing activities	32,014	331,359	277,902

Operating Activities

Net cash used in operating activities of $111.5 million in 2019 was primarily attributable to research and development spend related to clinical trials and manufacturing process development for Fintepla and general and administrative costs to support our research and development activities, offset by upfront payments received of $17.0 million in connection with the Shinyaku Agreement entered into in March 2019, cash received of $7.1 million from a claim submitted under U.K.'s R&D Tax Relief Scheme for qualifying R&D expenditures incurred in our 2016 U.K. tax year and the receipt of $3.1 million in tenant improvement allowance related to our new headquarters.

Net cash used in operating activities of $111.7 million in 2018 was primarily attributable to a net loss of $123.9 million, offset by noncash charges of $14.8 million including $15.5 million of stock-based compensation, and a net cash inflow from changes in operating assets and liabilities of $2.5 million. The change in our net operating assets and liabilities was primarily due to increases in accrued expenses related to an increase in our research and development activities and timing of prepayments for CRO clinical costs.

Investing Activities

Net cash provided by investing activities in 2019 of $73.1 million included net sales/maturities of our available-for-sale marketable securities of $262.2 million, of which approximately $179.6 million was used to fund the cash portion of the upfront payment for the asset acquisition of Modis. In addition, we incurred capital expenditures of $9.5 million primarily related to the build-out of our new headquarters, which we began to occupy in early March 2019.

Net cash used in investing activities in 2018 of $444.8 million included cash outflows of $569.5 million from the purchase of available-for-sale securities and $1.0 million for construction of tenant improvements at our new corporate headquarters. Cash outflows were partially offset by cash inflows of $125.8 million from maturities of available-for-sale securities.

Financing Activities

Net cash provided by financing activities of $32.0 million in 2019 consisted of net proceeds of $42.6 million from the sale of common stock pursuant to the 2017 Sales Agreement and $10.2 million from issuance of common stock under equity incentive plans, offset by $20.0 million in contingent consideration payments and $0.7 million for payment of employee withholding taxes related to net share settlement of equity awards.

Net cash provided by financing activities of $331.4 million in 2018 consisted of net proceeds of $292.9 million from a follow-on offering of common stock, $30.2 million from the sale of common stock pursuant to the 2017 Sales Agreement and $9.7 million from issuance of common stock under equity incentive plans, offset by $1.4 million for payment of employee withholding taxes related to net share settlement of equity awards.

Future Funding Requirements

Our principal uses of cash are research and development expenses, selling, general and administrative expenses and other working capital requirements. Our future funding requirements will depend on many factors, including, but not limited to:

- the rate of progress and cost of our clinical trials and other product development programs for our product candidates and any future product candidates that we may develop, in-license or acquire;
- the timing of regulatory approval for any of our product candidates and the commercial success of any approved products;
- the costs of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights associated with our product candidates;
- the costs of establishing or outsourcing sales, marketing and distribution capabilities, should we elect to do so;
- the costs, terms and timing of completion of outsourced commercial manufacturing supply arrangements for any product candidate;
- the effect of competing technological and market developments; and
- the terms and timing of any additional collaborative, licensing, co-promotion or other arrangements that we may establish, including our ability to secure a global strategic development and commercialization partner for Fintepla.

Until we can generate a sufficient amount of product revenue and cash flow from operations and achieve profitability, we expect to finance future cash needs through public or private equity offerings, debt financings, receivables financings or corporate collaboration and licensing arrangements. We cannot be certain that additional funding will be available on acceptable terms, or at all. If we are unsuccessful in raising additional funds when needed, we may be required to significantly delay, reduce the scope of or eliminate one or more of our development programs or our commercialization efforts, or cease operating as a going concern. We also may be required to relinquish, license or otherwise dispose of rights to product candidates or products that we would otherwise seek to develop or commercialize ourselves on terms that are less favorable than might otherwise be available. If we raise additional funds by issuing equity securities, substantial dilution to existing stockholders would likely result. If we raise additional funds by incurring debt financing, the terms of the debt may involve significant cash payment obligations as well as covenants and specific financial ratios that may restrict our ability to operate our business. If we are unable to maintain sufficient financial resources, including by raising additional funds when needed, our business, financial condition and results of operations will be materially and adversely affected and we may be unable to continue as a going concern.

Contractual Obligations and Commitments

The following table describes our contractual cash obligations and commitments as of December 31, 2019:

	Payments due by period				
	Total	Less than 1 year	1-3 years	4-5 years	More than 5 years
	(In Thousands)				
Operating lease obligations (1)	$ 14,899	$ 1,986	$ 3,851	$ 3,961	$ 5,101

(1) Amounts presented are gross lease payments and excludes contractual sublease income of $0.1 million in 2020.

We enter into contracts in the normal course of business with CROs for clinical trials and clinical supply manufacturing and with vendors for preclinical research studies and other services and products for operating purposes, which generally provide for termination within 30 days of notice, and therefore are cancelable contracts and not included in the table above.

In connection with our acquisition of Fintepla and Modis, we may be required to make certain regulatory and sales-based milestone payments. We cannot, at this time, determine when or if the related milestones will be achieved or whether the events triggering the commencement of payment obligations will occur. Therefore, such payments were not included in the table above. See Notes 3, 5 and 7 to our consolidated financial statements in this Form 10-K for additional details of our potential milestone payment obligations.

Recent Accounting Pronouncements

For the summary of recent accounting pronouncements applicable to our consolidated financial statements, see Note 2, Summary of Significant Accounting Policies, in Part IV, Item 15, Notes to Consolidated Financial Statements, which is incorporated herein by reference.

Off-Balance Sheet Arrangements

We have not engaged in any off-balance sheet arrangements, as defined in Item 303(a)(4)(ii) of Regulation S-K.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

As part of our investment portfolio, we own financial instruments that are sensitive to market risks. The primary objective of our investment activities is to preserve our capital until it is required to fund operations, including our research and development activities.

Interest Rate Risk

As of December 31, 2019, we had cash, cash equivalents and marketable securities of $251.2 million. We invest our excess cash primarily in money market funds and certificates of deposit, securities issued by the U.S. government and its agencies, corporate debt securities and commercial paper. These investments are denominated in U.S. Dollars. We place our investments with high quality credit issuers and, by policy, limit the amount of credit exposure to any one issuer. A portion of our investments consisting of interest-bearing securities are subject to interest rate risk and could decline in value if interest rates fluctuate. The portfolio includes cash equivalents and investments in marketable securities with active secondary or resale markets to ensure portfolio liquidity. Due to the conservative nature of these instruments, we do not believe that we have a material exposure to interest rate risk. A 100 basis points change in interest rates would not have a significant impact on the total value of our portfolio. We had no debt outstanding as of December 31, 2019.

Foreign Exchange Risk

As a result of our U.K. operations, we face exposure to movements in foreign currency exchange rates, primarily the British Pound Sterling and the Euro against the U.S. Dollar. The current exposures arise primarily from cash and payables and accruals denominated in the British Pound Sterling and the Euro. We have not hedged our foreign currency since the exposure has not been material to our historical operating results. Based on our foreign currency exchange rate exposures at December 31, 2019, a hypothetical 10% adverse fluctuation in the average exchange rate of the Euro or the British Pound Sterling would not have had a material impact on our consolidated financial statements. We will continue to monitor and evaluate our exposure to foreign exchange risk as a result of entering into transactions denominated in currencies other than the U.S. Dollar.

Item 8. Financial Statements and Supplementary Information

All financial statement schedules have been omitted, since the required information is not applicable or is not present in amounts sufficient to require submission of the schedule, or because the information required is included in the consolidated financial statements and accompanying notes.

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Zogenix, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Zogenix, Inc. ("the Company") as of December 31, 2019 and 2018, the related consolidated statements of operations, comprehensive loss, stockholders' equity, and cash flows for each of the three years in the period ended December 31, 2019, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2019, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the Company's internal control over financial reporting as of December 31, 2019, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 Framework) and our report dated March 2, 2020 expressed an unqualified opinion thereon.

Adoption of ASU No. 2016-02

As discussed in Note 2 to the consolidated financial statements, the Company changed its method of accounting for leases in 2019 due to the adoption of Accounting Standard Update ("ASU") No. 2016-02, Leases ("Topic 842"), effective January 1, 2019, using the modified retrospective approach.

Basis for Opinion

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

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

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Fair value of contingent consideration

Description of the Matter

As of December 31, 2019, the Company recorded $25.6 million and $38.2 million for the estimated fair value of its contingent consideration liabilities current and non-current, respectively, and during 2019, the Company recorded $5.6 million for the estimated change in fair value of contingent consideration liabilities related to the Company's 2014 acquisition of Brabant Pharma Limited ("Brabant"). As described in Note 7 to the consolidated financial statements, in connection with the acquisition of Brabant, the Company may be required to pay future consideration that is contingent upon the achievement of specified development, regulatory approval or sales-based milestone events. At each reporting period prior to meeting the milestone events, the Company estimates the current fair value of these contingent consideration liabilities and records an adjustment to the consolidated statement of operations to reflect any changes in the estimated fair value from the prior period.

Auditing the fair value of contingent consideration liabilities required the involvement of valuation specialists due to the complexity of the valuation model and was highly judgmental due to the significant estimation required in determining their fair value. In particular, the fair value estimate was sensitive to the significant assumptions such as the anticipated timelines, the probability of achieving development, regulatory approval or sales-based milestone events, projected revenues and discount rates.

How We Addressed the Matter in Our Audit

We obtained an understanding, evaluated the design and tested the operating effectiveness of controls over the Company's process for estimating the fair value of contingent consideration liabilities including controls over measuring the progress of clinical development and forecasting future revenues as well as controls over the completeness and accuracy of underlying data used in the estimate.

To test the estimated fair value of the contingent consideration liabilities, we performed audit procedures that included, among others, involving valuation specialists to assist in assessing fair value methodologies and testing the significant assumptions discussed above. We tested the underlying data used by the Company in its analysis and agreed the terms of the model back to the terms of the acquisition agreement. We obtained an understanding of the significant assumptions used by management and compared them to current industry and economic trends, evaluated changes to the Company's assumptions from prior periods and tested the consistency of the assumptions with data provided in support of other areas of the audit. We assessed management's ability to accurately forecast sales by testing the accuracy of historical management forecasts and performed sensitivity analyses of significant assumptions to evaluate changes in the fair value of the liabilities that would result from changes in assumptions.

Accrued clinical trial expenses

Description of the Matter

As of December 31, 2019, the Company recorded $18.7 million for accrued clinical trial expenses. As described in Note 2 to the consolidated financial statements, the Company's expense accruals for clinical trials are based on estimates of contracted services provided by third-party vendors not yet billed. When billing terms under such contracts do not coincide with the timing of when the work is performed, management is required to make estimates of outstanding obligations to those third parties as of period end. Accrual estimates are based on a number of factors, including management's knowledge of the research and development programs and clinical manufacturing activities, invoicing to date, and the provisions in the contract. If possible, the Company obtains information regarding unbilled services directly from these service providers and performs procedures to challenge these estimates based on their internal understanding of the services provided to date. However, the Company may also be required to estimate these services based on information available to its internal clinical or administrative staff if such information is not able to be obtained timely from its services providers.

Auditing accrued clinical trial expenses is complex because of the judgments applied by management to determine the commencement and completion date of vendor tasks and the cost and extent of work performed during the reporting period for services not yet billed by contracted third-party vendors. The testing of the Company's accrued clinical trial expense models also involves a high level of effort to test the high volume of data used to determine the estimated accrual.

How We Addressed the Matter in Our Audit

We obtained an understanding, evaluated the design and tested the operating effectiveness of controls over the Company's process for estimating the accrued clinical trial expenses including controls over management's assessment and measurement of clinical trial progress and related estimates of accrued clinical trial costs and the completeness and accuracy of underlying data used in the analysis.

To test the estimate of accrued clinical trial expenses, we performed audit procedures that included, among others, direct confirmation of contract terms and conditions with a sample of the Company's third-party vendors. We confirmed progress of contracted clinical activities with third-party vendors and compared such data to the Company's estimates of progress as reflected in their accrual models. We further tested the accuracy of the calculations, the data utilized, and the reasonableness of the assumptions used in management's accrual models by testing actual invoices paid to date, agreeing inputs back to contractual terms and holding discussions with clinical or administrative staff outside of the finance function. Procedures were performed to evaluate the reliability, completeness and relevance of management's data by testing actual invoices paid and holding discussions with clinical or administrative staff outside of the finance function to corroborate progress and estimated level of expended effort incurred by the Company's third-party vendors.

Application of collaborative arrangements guidance to the distribution agreement with Nippon Shinyaku, Ltd.

Description of the Matter

As of December 31, 2019, the Company recorded $5.9 million and $7.4 million for deferred revenue current and non-current, respectively, and during 2019, the Company recorded $3.6 million of collaboration revenue. As described in Note 2 and Note 4 to the consolidated financial statements, the Company early adopted ASU 2018-18, Collaborative Arrangements: Clarifying the Interaction between Topic 808 and Topic 606 ("ASU 2018-18") on January 1, 2019 and in March 2019, the Company entered into an agreement with Nippon Shinyaku, Ltd. ("Shinyaku") whereby Shinyaku will be the exclusive distributor of Fintepla in Japan ("the Shinyaku Agreement") for the treatment of Dravet syndrome and Lennox-Gastaut Syndrome ("LGS"). While no license to intellectual property was provided to Shinyaku, the Company received upfront and time delayed consideration for work to be performed on the development and regularly approval of Fintepla in Japan. The Company concluded that collaborative activities under the Shinyaku Agreement prior to Japanese regulatory approval are within the scope of the collaborative arrangements guidance as both parties are active participants and are exposed to significant risks and rewards dependent on the success of commercializing Fintepla in Japan.

Auditing management's application of the collaborative arrangements accounting guidance to the Shinyaku Agreement was determined to be especially challenging, complex and subject to auditor judgment due to the lack of the transfer of a license to Shinyaku, the early adoption and application of ASU 2018-18 to this agreement and characteristics of both collaborative activities and customer vendor relationships within this contract.

How We Addressed the Matter in Our Audit

We obtained an understanding, evaluated the design and tested the operating effectiveness of controls over management's review of the terms of the Shinyaku Agreement and the application of the accounting guidance.

To test the Company's application of the collaborative arrangements accounting guidance to the Shinyaku Agreement we performed audit procedures that included, among others, confirmation of the terms and conditions of the agreement with Shinyaku, assessed the completeness of management's application of U.S. generally accepted accounting principles applied in their accounting evaluation, considered the reasonableness of the accounting conclusions reached and evaluated alternative views and contrary and corroborative evidence associated with management's evaluation.

Acquisition of Modis Therapeutics, Inc.

Description of the Matter

During 2019, the Company completed its acquisition of Modis Therapeutics, Inc. ("Modis"), a privately-held biopharmaceutical company for total consideration of $246.5 million. As described in Note 3, the Company determined substantially all of the fair value of Modis was concentrated in a single in-process research and development ("IPR&D") asset group. Accordingly, the acquired set of assets and activities did not meet the definition of a business and the Company accounted for the transaction under the cost accumulation model of accounting for asset acquisitions. The consideration transferred associated with the acquisition was allocated to the identifiable intangible and tangible assets acquired and liabilities assumed based on their relative fair values resulting in $244.5 million being assigned to an IPR&D asset with no alternative future use and $2.8 million for assumed net liabilities.

We identified the acquisition of Modis as a critical audit matter because of the high degree of auditor judgment required when performing audit procedures to evaluate the reasonableness of management's conclusion that substantially all of the fair value of the gross assets acquired is concentrated in a single identifiable asset or group of similar identifiable assets and therefore the Modis acquisition should be accounted for as an asset acquisition.

How We Addressed the Matter in Our Audit

We obtained an understanding, evaluated the design and tested the operating effectiveness of management's controls over the identification and aggregation of the Modis assets acquired and the application of the qualitative and quantitative considerations in applying the accounting guidance.

To test the Modis asset acquisition conclusion, our audit procedures included, among others, reviewing the agreement between the Company and Modis and other information to determine the completeness of identified assets acquired. We assessed the reasonableness of the qualitative and quantitative considerations utilized when determining if substantially all of the fair value of the gross assets acquired is concentrated in a single identifiable asset or group of similar identifiable assets by comparing it to evidence obtained about Modis and its legacy operations. As part of our testing of the assessment made by management, we evaluated the reasonableness of the significant assumptions used in the Company's estimate of the gross fair value of the assets acquired by considering the sensitivity of these assumptions on the Company's asset acquisition conclusions.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2007.

Redwood City, California
March 2, 2020

Zogenix, Inc.

Consolidated Balance Sheets
(In thousands, except par value)

	December 31, 2019	December 31, 2018
Assets:		
Current assets:		
Cash and cash equivalents	$ 62,070	$ 68,454
Marketable securities	189,085	445,733
Prepaid expenses	8,593	6,718
Acquisition holdback amount placed in escrow	25,000	—
Other current assets	2,491	11,825
Total current assets	287,239	532,730
Property and equipment, net	9,424	2,870
Operating lease right-of-use assets	7,774	—
Indefinite-lived intangible asset	102,500	102,500
Goodwill	6,234	6,234
Other noncurrent assets	1,079	3,997
Total assets	$ 414,250	$ 648,331
Liabilities and stockholders' equity:		
Current liabilities:		
Accounts payable	$ 7,979	$ 7,989
Accrued clinical trial expenses	18,666	10,621
Other current liabilities	11,451	7,465
Acquisition holdback liability	24,444	—
Deferred revenue, current	5,927	—
Current portion of operating lease liabilities	1,322	—
Current portion of contingent consideration	25,600	32,300
Total current liabilities	95,389	58,375
Deferred revenue, noncurrent	7,425	—
Operating lease liabilities, net of current portion	10,752	—
Contingent consideration, net of current portion	38,200	45,900
Deferred tax liability	17,425	17,425
Deferred rent and lease incentive obligation	—	3,830
Total liabilities	169,191	125,530
Commitments and contingencies		
Stockholders' equity:		
Preferred stock, $.001 par value; 10,000 shares authorized, none issued and outstanding	—	—
Common stock, $.001 par value; 100,000 and 50,000 shares authorized and 45,272 and 42,078 shares issued and outstanding at December 31, 2019 and 2018, respectively	45	42
Additional paid-in capital	1,360,092	1,218,710
Accumulated other comprehensive income	379	3
Accumulated deficit	(1,115,457)	(695,954)
Total stockholders' equity	245,059	522,801
Total liabilities and stockholders' equity	$ 414,250	$ 648,331

See accompanying notes to the consolidated financial statements.

Zogenix, Inc.

Consolidated Statements of Operations
(In thousands, except per share amounts)

	Year Ended December 31,		
	2019	**2018**	**2017**
Collaboration and contract manufacturing revenue:			
Collaboration revenue	$ 3,648	$ —	$ —
Contract manufacturing revenue	—	—	9,821
Total collaboration and contract manufacturing revenue	3,648	—	9,821
Operating expenses:			
Cost of contract manufacturing	—	—	10,729
Research and development	115,639	100,925	67,449
Selling, general and administrative	60,792	38,950	25,885
Acquired in-process research and development and related costs	251,438	—	—
Loss on contract termination	—	—	478
Change in fair value of contingent consideration	5,600	1,300	24,100
Asset impairment charges	—	—	1,116
Total operating expenses	433,469	141,175	129,757
Loss from operations	(429,821)	(141,175)	(119,936)
Other income (expense):			
Interest income	9,804	7,170	1,090
Interest expense	(2)	(6)	(2,644)
Loss on extinguishment of debt	—	—	(4,876)
Change in fair value of common stock warrant liabilities	145	169	297
Other income (expense), net	371	10,126	47
Total other income (expense)	10,318	17,459	(6,086)
Loss from continuing operations	(419,503)	(123,716)	(126,022)
Loss from discontinued operations	—	(198)	(795)
Net loss	$ (419,503)	$ (123,914)	$ (126,817)
Net loss per share, basic and diluted:			
Continuing operations	$ (9.74)	$ (3.27)	$ (4.62)
Discontinued operations	$ —	$ —	$ (0.03)
Total	$ (9.74)	$ (3.27)	$ (4.65)
Weighted average common shares outstanding, basic and diluted	43,078	37,884	27,301

See accompanying notes to the consolidated financial statements.

Zogenix, Inc.

Consolidated Statements of Comprehensive Loss
(in thousands)

	Year Ended December 31,		
	2019	2018	2017
Net loss	$ (419,503)	$ (123,914)	$ (126,817)
Other comprehensive income:			
Net unrealized gains on marketable securities, net of tax	702	3	—
Reclassification adjustments for realization of gain on sale of marketable securities included in net loss, net of tax	(326)	—	—
Total other comprehensive income	376	3	—
Comprehensive loss	$ (419,127)	$ (123,911)	$ (126,817)

See accompanying notes to the consolidated financial statements.

Zogenix, Inc.

Consolidated Statements of Stockholders' Equity

(In thousands)	Common Stock Shares	Common Stock Amount	Additional Paid-in Capital	Accumulated Other Comprehensive Income	Accumulated Deficit	Total Stockholders' Equity
Balance at December 31, 2016	24,813	$ 25	$ 565,954	$ —	$ (445,223)	$ 120,756
Net loss	—	—	—	—	(126,817)	(126,817)
Issuance of common stock, net	9,256	9	290,582	—	—	290,591
Issuance of common stock upon net exercise of common stock warrants	26	—	—	—	—	—
Issuance of common stock under employee equity plans	713	1	10,835	—	—	10,836
Stock-based compensation	—	—	6,155	—	—	6,155
Balance at December 31, 2017	34,808	35	873,526	—	(572,040)	301,521
Net loss	—	—	—	—	(123,914)	(123,914)
Other comprehensive income, net of tax	—	—	—	3	—	3
Issuance of common stock, net	6,740	7	323,128	—	—	323,135
Issuance of common stock under employee equity plans	563	—	7,994	—	—	7,994
Shares repurchased for tax withholdings related to net share settlement of employee equity awards	(33)	—	(1,430)	—	—	(1,430)
Stock-based compensation	—	—	15,492	—	—	15,492
Balance at December 31, 2018	42,078	42	1,218,710	3	(695,954)	522,801
Net loss	—	—	—	—	(419,503)	(419,503)
Other comprehensive income, net of tax	—	—	—	376	—	376
Issuance of common stock, net	904	1	42,575	—	—	42,576
Issuance of common stock under employee equity plans	712	—	10,182	—	—	10,182
Shares repurchased for tax withholdings related to net share settlement of employee equity awards	(17)	—	(744)	—	—	(744)
Issuance of common stock as consideration for asset acquisition	1,595	2	68,122	—	—	68,124
Stock-based compensation	—	—	21,247	—	—	21,247
Balance at December 31, 2019	45,272	$ 45	$ 1,360,092	$ 379	$ (1,115,457)	$ 245,059

See accompanying notes to the consolidated financial statements.

Zogenix, Inc.

Consolidated Statements of Cash Flows
(in thousands)

	Year Ended December 31,		
	2019	**2018**	**2017**
Cash flows from operating activities:			
Net loss	$ (419,503)	$ (123,914)	$ (126,817)
Adjustments to reconcile net loss to net cash used in operating activities:			
Stock-based compensation	21,247	15,492	6,155
Depreciation	1,268	155	425
Amortization of debt issuance costs and debt discount	—	—	887
Net accretion and amortization of investments in marketable securities	(4,887)	(1,998)	—
Realized gain on sale of marketable securities	(326)	—	—
Change in fair value of common stock warrant liabilities	(145)	(169)	(297)
Acquired in-process research and development assets and related costs	251,437	—	—
Change in fair value of contingent consideration	5,600	1,300	24,100
Inventory write-down	—	—	2,232
Asset impairment charges	—	—	1,116
Loss on extinguishment of debt	—	—	4,876
Changes in operating assets and liabilities:			
Trade accounts receivable	—	—	9,356
Inventory	—	—	2,583
Prepaid expenses and other current assets	7,573	(9,335)	(801)
Other assets	(4,502)	266	(2,784)
Accounts payable, accrued and other liabilities	5,647	6,545	4,340
Operating lease liability	11,720	—	—
Deferred revenue	13,352	—	(1,245)
Net cash used in operating activities	(111,519)	(111,658)	(75,874)
Cash flows from investing activities:			
Cash paid for asset acquisitions, net of cash acquired	(179,624)	—	—
Purchases of marketable securities	(329,641)	(569,515)	—
Proceeds from maturities of marketable securities	415,020	125,783	—
Proceeds from sale of marketable securities	176,858	—	—
Purchases of property and equipment	(9,492)	(1,018)	(76)
Net cash provided by (used) in investing activities	73,121	(444,750)	(76)
Cash flows from financing activities:			
Payment of contingent consideration amounts previously established in purchase accounting	(20,000)	—	—
Principal repayments of long-term debt	—	—	(20,000)
Payment of fees to extinguish long-term debt	—	—	(1,865)
Proceeds from issuance of common stock under equity incentive plans	10,182	9,654	9,176
Taxes paid related to net share settlement of equity awards	(744)	(1,430)	—
Proceeds from issuance of common stock, net of issuance costs	42,576	323,135	290,591
Net cash provided by financing activities	$ 32,014	$ 331,359	$ 277,902
Net (decrease) increase in cash and cash equivalents	$ (6,384)	$ (225,049)	$ 201,952
Cash and cash equivalents at beginning of period	$ 68,454	$ 293,503	$ 91,551
Cash and cash equivalents at end of period	$ 62,070	$ 68,454	$ 293,503
Supplemental disclosure of cash flow information:			
Cash paid for interest	$ —	$ —	$ 1,475
Noncash investing and financing activities:			
Common stock issued as consideration for asset acquisition	$ 68,124	$ —	$ —
Net liabilities assumed in connection with asset acquisition	$ 3,688	$ —	$ —
Purchases of property and equipment in accounts payable and accrued liabilities	$ —	$ 1,762	$ —
Extinguishment of note payable advanced by a customer under a contract manufacturing supply agreement through net settlement of our receivables from the customer	$ —	$ —	$ 7,000

See accompanying notes to the consolidated financial statements.

Zogenix, Inc.

Notes to Consolidated Financial Statements

Note 1 — Organization and Description of Business

We are global pharmaceutical company committed to developing and commercializing transformative therapies to improve the lives of patients and their families living with rare diseases. We are currently focused on developing and commercializing therapies to address rare or orphan disorders. Our lead product candidate, Fintepla (ZX008, fenfluramine) is currently being developed for the treatment of seizures associated with Dravet syndrome and Lennox-Gastaut syndrome (LGS). In addition to Fintepla, we recently added MT1621 to our late-stage development pipeline.

In September 2019, we acquired all the outstanding equity interests in Modis Therapeutics, Inc. (Modis), a privately-held biopharmaceutical company focused on developing novel therapies for rare genetic diseases with high unmet medical need. Modis' lead product candidate, MT1621, is an investigational deoxynucleoside substrate enhancement therapy in development for the treatment of thymidine kinase 2 deficiency (TK2d), an inherited mitochondrial DNA depletion disorder that predominantly affects children and is often fatal. See Note 3 for additional information.

Zogenix, Inc., headquartered in Emeryville, California, was founded in May 2006 and was incorporated in the State of Delaware on May 11, 2006 as SJ2 Therapeutics, Inc. In August 2006, we changed our name to Zogenix, Inc. We currently do not generate any revenue from contracts with customers and we have no approved products for commercial marketing or sale. Previously, we performed contract manufacturing services for one customer under a long-term supply agreement, which was terminated in 2017.

Future Funding Requirements

Excluding gains from two discrete business divestitures, we have incurred significant net losses and negative cash flows from operating activities since inception resulting in an accumulated deficit of $1.1 billion as of December 31, 2019. We expect to continue to incur significant operating losses and negative cash flows from operations as we continue to advance our product candidates through development and commercialization. Additionally, pursuant to our acquisition of Brabant Pharma Limited (Brabant) in 2014 to obtain worldwide development and commercialization rights to Fintepla, we are required to make additional payments to the former shareholders of Brabant in the event we achieve certain regulatory and sales milestones with Fintepla (See Notes 5 and 8). In addition, our asset acquisition of Modis in September 2019 requires us to make additional payments to the former shareholders of Modis in the event we achieve certain regulatory milestones (See Note 3). Historically, we have relied primarily on the proceeds from equity offerings to finance our operations. Until such time, if ever, we can generate a sufficient amount of revenue to finance our cash requirements, we may need to continue to rely on additional financing to achieve our business objectives. However, if such financing is not available at adequate levels when needed, we may be required to significantly delay, scale back or discontinue one or more of our product development programs or commercialization efforts or other aspects of our business plans, and our operating results and financial condition would be adversely affected.

Note 2 — Summary of Significant Accounting Policies

Basis of Presentation

These consolidated financial statements have been prepared in accordance with accounting principles generally accepted in the United States (GAAP) and include the accounts of Zogenix and its wholly-owned subsidiaries. All intercompany transactions have been eliminated in consolidation.

Certain reclassifications have been made to the prior period amounts to conform to the current year presentation. More specifically, accrued compensation, other accrued liabilities and common stock warrant liabilities, which were previously presented separately on the consolidated balance sheet, have been reclassified into a single caption, other current liabilities. These reclassifications did not affect our financial position, net loss, comprehensive loss, or cash flows as of and for the periods presented.

Use of Estimates

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

Revenue Recognition

We analyze our collaboration arrangements to assess whether such arrangements, or transactions between arrangement participants, involve joint operating activities performed by parties that are both active participants in the activities and exposed to significant risks and rewards dependent on the commercial success of such activities or are more akin to a vendor-customer relationship. In making this evaluation, we consider whether the activities of the collaboration are considered to be distinct and deemed to be within the scope of the collaborative arrangement guidance and those that are more reflective of a vendor-customer relationship and, therefore, within the scope of the revenue with contracts with customers guidance. This assessment is performed throughout the life of the arrangement based on changes in the responsibilities of all parties in the arrangement.

For elements of collaboration arrangements that are not accounted for pursuant to the revenue from contracts with customers guidance, an appropriate recognition method is determined and applied consistently, generally by analogy to the revenue from contracts with customers guidance. Amounts related to transactions with a counterparty in a collaborative arrangement that is not a customer are presented as collaboration revenue and on a separate line item from revenue recognized from contracts with customers, if any, in our consolidated statements of operations.

Amounts received prior to satisfying the revenue recognition criteria are recorded as deferred revenue in the consolidated balance sheets. If the related efforts underlying the deferred revenue is expected to be satisfied within the next twelve months this will be classified in current liabilities. Unconditional rights to receive consideration in advance of performance are recorded as receivables and deferred revenue in the consolidated balance sheets when we have a contractual right to bill and receive the payment, performance is expected to commence shortly and there is less than a year between billing and performance. Amounts recognized for satisfied performance obligations prior to the right to payment becoming unconditional are recorded as contract assets in the consolidated balance sheets. If we expect to have an unconditional right to receive consideration in the next twelve months, this will be classified in current assets. A net contract asset or liability is presented for each contract with a customer.

For arrangements or transactions between arrangement participants determined to be within the scope of the contracts with customers guidance, we perform the following steps to determine the appropriate amount of revenue to be recognized as we fulfill our obligations: (i) identification of the promised goods or services in the contract; (ii) determination of whether the promised goods or services are performance obligations including whether they are distinct in the context of the contract; (iii) measurement of the transaction price, including the constraint on variable consideration; (iv) allocation of the transaction price to the performance obligations based on estimated selling prices; and (v) recognition of revenue when (or as) we satisfy each performance obligation.

At contract inception, we assess the goods or services promised in a contract with a customer and identify those distinct goods and services that represent a performance obligation. A promised good or service may not be identified as a performance obligation if it is immaterial in the context of the contract with the customer, if it is not separately identifiable from other promises in the contract (either because it is not capable of being separated or because it is not separable in the context of the contract), or if the performance obligation does not provide the customer with a material right.

We consider the terms of the contract and our customary business practices to determine the transaction price. The transaction price is the amount of consideration to which we expect to be entitled in exchange for transferring promised goods or services to a customer. The consideration promised in a contract with a customer may include fixed amounts, variable amounts, or both. Variable consideration will only be included in the transaction price when it is not considered constrained, which is when it is probable that a significant reversal in the amount of cumulative revenue recognized will not occur.

If it is determined that multiple performance obligations exist, the transaction price is allocated at the inception of the agreement to all identified performance obligations based on the relative stand-alone selling prices unless the transaction price is variable and meets the criteria to be allocated entirely to one or more, but not all, performance obligations in the contract. The relative selling price for each performance obligation is based on observable prices if it is available. If observable prices are not available, we estimate stand-alone selling price for the performance obligation utilizing the estimated cost of the performance obligation with an estimated assumed margin. Once the transaction price has been allocated to a performance obligation using the applicable methodology, it is not subject to reassessment for subsequent changes in stand-alone selling prices.

Revenue is recognized when, or as, we satisfy a performance obligation by transferring a promised good or service to a customer. An asset is transferred when, or as, the customer obtains control of that asset. For performance obligations that are satisfied over time, we recognize revenue using an input or output measure of progress that best depicts our satisfaction of the relevant performance obligation. Revenues from performance obligations associated with a purchase order of Fintepla will be recognized when the customer obtains control of our product, which will occur at a point in time which may be upon shipment or delivery to the customer.

After contract inception, the transaction price is reassessed at every period end and updated for changes such as resolution of uncertain events. Any change in the overall transaction price is allocated to the performance obligations on the same methodology as at contract inception.

Management may be required to exercise judgment in estimating revenue to be recognized. Judgment is required in identifying performance obligations, estimating the transaction price, estimating the stand-alone selling prices of identified performance obligations, which may include forecasted revenue, development timelines, reimbursement rates for personnel costs, discount rates and probabilities of technical and regulatory success, and estimating the progress towards satisfaction of performance obligations.

Revenue generated in 2017 consisted of contract manufacturing services provided for one customer under a long-term supply agreement, which was terminated in 2017. Contract manufacturing revenue was recognized under the legacy revenue recognition standard when all of the following criteria for revenue recognition have been met: (1) persuasive evidence of an arrangement existed (2) delivery has occurred or services have been rendered; (3) the fee was fixed or determinable; and (4) collectability was reasonably assured.

Acquisitions

We evaluate acquisitions of assets and other similar transactions to assess whether or not the transaction should be accounted for as a business combination or asset acquisition by first applying a screen test to determine if substantially all of the fair value of the gross assets acquired is concentrated in a single identifiable asset or group of similar identifiable assets. If the screen is met, the transaction is accounted for as an asset acquisition. If the screen is not met, further determination is required as to whether or not we have acquired inputs and processes that have the ability to create outputs which would meet the definition of a business. Significant judgment is required in the application of the screen test to determine whether an acquisition is a business combination or an acquisition of assets.

If the transaction is determined not to be a business combination, it is accounted for as an asset acquisition. For asset acquisitions, a cost accumulation model is used to determine the cost of an asset acquisition. Common stock issued as consideration in an asset acquisition is generally measured based on the acquisition date fair value of the equity interests issued. Direct transaction costs are recognized as part of the cost of an asset acquisition. We also evaluate which elements of a transaction should be accounted for as a part of an asset acquisition and which should be accounted for separately. Consideration deposited into escrow accounts are evaluated to determine whether it should be included as part of the cost of an asset acquisition or accounted for as contingent consideration. Amounts held in escrow where we have legal title to such balances but where such accounts are not held in our name, are recorded on a gross basis as an asset with a corresponding liability in our consolidated balance sheet.

The cost of an asset acquisition, including transaction costs, are allocated to identifiable assets acquired and liabilities assumed based on a relative fair value basis. Goodwill is not recognized in an asset acquisition. Any difference between the cost of an asset acquisition and the fair value of the net assets acquired is allocated to the non-monetary identifiable assets based on their relative fair values. Assets acquired as part of an asset acquisition that are considered to be in-process research and development (IPR&D) are immediately expensed unless there is an alternative future use in other research and development projects.

In addition to upfront consideration, our asset acquisitions may also include contingent consideration payments to be made for future milestone events or royalties on net sales of future products. We assess whether such contingent consideration meets the definition of a derivative. Contingent consideration payments in an asset acquisition not required to be accounted for as derivatives are recognized when the contingency is resolved, and the consideration is paid or becomes payable. Contingent consideration payments required to be accounted for as derivatives are recorded at fair value on the date of the acquisition and are subsequently remeasured to fair value at each reporting date. Contingent consideration payments made prior to regulatory approval are expensed as incurred. Contingent consideration payments made subsequent to regulatory approval are capitalized as intangible assets and amortized, subject to impairment assessments.

We classify cash payments related to purchased intangibles in an asset acquisition, including IPR&D assets, as a cash outflow from investing activities because we expect to generate future income and cash flows from these assets if they can be developed into commercially successful products.

If the acquisition is determined to be a business combination, all tangible and intangible assets acquired, including any IPR&D asset, and liabilities assumed, including contingent consideration, are recorded at their fair value. Goodwill is recognized for any difference between the price of acquisition and our fair value determination. In addition, direct transaction costs in connection with business combinations are expensed as incurred, rather than capitalized.

Fair Value of Financial Instruments

Our financial instruments, including cash and cash equivalents, other current assets, accounts payable and accrued liabilities are carried at cost, which approximates their fair value because of the short-term nature of these financial instruments. See Notes 6 and 7 for financial instruments measured or disclosed at fair value for marketable securities, contingent consideration liabilities and common stock warrant liabilities.

Cash Equivalents and Marketable Securities

We consider cash equivalents to be only those investments which are highly liquid, readily convertible to cash and have an original maturity of three months or less at the date of purchase.

We invest our excess cash in marketable securities with high credit ratings including money market funds and certificates of deposit, securities issued by the U.S. government and its agencies, corporate debt securities and commercial paper. All of our marketable securities have been accounted for as available-for-sale and carried at fair value. We have classified all of our available-for-sale marketable securities, including those with maturity dates beyond one year, as current assets on the consolidated balance sheets as we may sell these securities at any time for use in current operations even if they have not yet reached maturity. The amortized cost of debt securities is adjusted for amortization of premiums and accretion of discounts to maturity, which is included in interest income on the consolidated statements of operations and comprehensive loss. Realized gains and losses and declines in value determined to be other than temporary, if any, on marketable securities are included in other income (expense). Gains and losses on sales are recorded based on the trade date and determined using the specific identification method.

We evaluate our marketable securities to assess whether those with unrealized loss positions are other-than-temporarily impaired. We consider impairments to be other than temporary if they are related to deterioration in credit risk or if it is likely we will sell the securities before the recovery of their cost basis. To date, there have been no declines in value deemed to be other than temporary for any of our marketable securities.

Concentration of Credit Risk

Financial instruments that potentially subject us to concentrations of credit risk are cash equivalents and marketable securities. As stated in our investment policy, the primary objective of our investment activities is to preserve principal and maintain a desired level of liquidity to meet working capital needs. Accordingly, our investment portfolio consists of investment-grade rated securities with active secondary or resale markets and is subject to established guidelines relative to diversification and maturities to maintain safety and liquidity. Historically, we have not experienced any material credit losses on our investments and we believe our exposure to credit risk related to our investing activities are limited. We maintain amounts on deposit with various financial institutions, which may exceed federally insured limits. However, management periodically evaluates the credit-worthiness of those institutions, and we have not experienced any losses on such deposits.

Concentration of Supplier Risk

Certain materials and key components that we utilize in our operations are obtained through single suppliers. Since the suppliers of key components and materials must be named in a New Drug Application (NDA) filed with the FDA for a product, significant delays can occur if the qualification of a new supplier is required. If delivery of material from our suppliers were interrupted for any reason, we may be unable to supply any of our product candidates for clinical trials.

Property and Equipment, Net

Property and equipment is recorded at cost, net of accumulated depreciation. Depreciation is calculated on a straight-line basis over the estimated useful lives of the respective assets and primarily consists of the following:

Computer equipment and software	3 years
Furniture and fixtures	3-7 years
Leasehold improvements	Shorter of estimated useful life or lease term

Depreciation expense for 2019, 2018 and 2017 was $1.3 million, $0.2 million and $0.4 million, respectively.

Segment Information

Operating segments are defined as components of an enterprise for which discrete financial information is available that is evaluated on a regular basis by our chief operating decision-maker (CODM) in deciding how to allocate resources to an individual segment and in assessing performance of the segment. We operate as a single business segment: the research, development and commercialization of pharmaceutical products. Our CODM, which is our President/Chief Executive Officer, reviews our operating results on a consolidated basis and manages our operations as a single operating segment. Substantially all of our long-lived assets are located in the United States.

Goodwill

The goodwill balance of $6.2 million at December 31, 2019 and 2018 is directly attributable to our business acquisition of Brabant Pharma Limited (Brabant) in 2014 to obtain worldwide development and commercialization rights to Fintepla. Goodwill represents the excess of the purchase price of acquired businesses over the estimated fair value assigned to the individual assets acquired and liabilities assumed. Goodwill is not amortized, but instead is reviewed for impairment at least annually on our assessment date of October 1, or more frequently if events occur or circumstances change that would indicate the carrying amount may be impaired. Goodwill is assigned to, and impairment testing is performed at, the reporting unit level. We determined we have only one reporting unit, which is the same as our operating segment, as well as our reportable segment. Accordingly, our impairment testing is performed at the entity-wide level.

For 2019, we performed a quantitative impairment test by comparing the fair value of our net assets with their carrying amounts. As we have a single reporting unit, an appropriate measure of the fair value of our net assets is our market capitalization on the assessment date. Our market capitalization, excluding any potential adjustment for a control premium, exceeded the carrying amount of our net assets as of October 1, 2019 by a significant amount and we determined our goodwill was not impaired. There were no goodwill impairment losses recorded for all periods presented.

Indefinite-Lived Intangible Assets

The indefinite-lived intangible asset balance of $102.5 million at both December 31, 2019 and 2018 consists of IPR&D related to Fintepla acquired through the business acquisition of Brabant in 2014. IPR&D represents the fair value assigned to incomplete research projects that we acquire through business combinations which, at the time of acquisition, have not reached technological feasibility, regardless of whether they have alternative use. The primary basis for determining the technological feasibility of these projects at the time of acquisition is obtaining regulatory approval to market the underlying products in an applicable geographic region. The amounts are capitalized and are accounted for as indefinite-lived intangible assets, subject to impairment testing until completion or abandonment of the associated research and development efforts. If the research and development efforts are successfully completed and commercial feasibility is reached, we will make a determination as to the then useful life of the intangible asset and begin amortization. Upon permanent abandonment, we would write-off the remaining carrying amount of the associated IPR&D intangible asset.

Indefinite-lived intangible assets are not amortized, but instead are reviewed for impairment at least annually as of October 1, or more frequently if events occur or circumstances change that would indicate the carrying amount may be impaired. In performing each annual impairment assessment and any interim impairment assessment, the accounting guidance allows an entity the option to first assess qualitative factors to determine whether it is necessary to perform a quantitative test. If we believe, as a result of our qualitative assessment, that it is more-likely-than-not that the fair value of our IPR&D asset is less than its carrying amount, the quantitative impairment test is required. Otherwise, no further testing is required.

When performing a qualitative test, we consider the results of our most recent quantitative impairment test and identify the most relevant divers of the fair value for the IPR&D asset. The most relevant drivers of fair value we have identified are consistent with the assumptions used in the quantitative estimate of the IPR&D asset discussed below. Using these drivers of fair value, we identify events and circumstances that may have an effect on the fair value of the IPR&D asset since the last time the IPR&D's fair value was quantitatively determined. We then weigh these factors to determine and conclude if it is not more likely than not that the IPR&D asset is impaired. If it is more-likely-than-not that the IPR&D asset is impaired, we will proceed with quantitatively determining the fair value of the IPR&D asset.

Under a quantitative test, we use an income approach to determine the fair value of our IPR&D asset. This approach calculates fair value by estimating the after-tax cash flows attributable to an in-process project over its useful life and then discounting these after-tax cash flows back to a present value. This estimate includes judgmental assumptions regarding the estimates that market participants would make in evaluating the IPR&D asset, including the probability of successfully completing clinical trials and obtaining regulatory approval to market the IPR&D asset, the timing of and the expected costs to complete IPR&D projects, future net cash flows from potential drug sales, which are based on estimates of the sales price of the drug, the number of patients who will be diagnosed and treated and our competitive position in the marketplace, and appropriate discount and tax rates. If the fair value is less than the carrying amount based on our test, any impairment loss is recognized in our consolidated statements of operations by adjusting the carrying value of the IPR&D asset on our consolidated balance sheet to its fair value.

For 2019, we performed a qualitative test and concluded that it is more-likely-than-not that the fair value of our IPR&D asset exceeded its carrying value and no further testing was deemed necessary. There were no impairment losses recorded for our indefinite-lived intangible asset in any of the years presented.

Long-Lived Assets

Long-lived assets, including right-of-use operating lease assets, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of such assets (group) may not be recoverable. Recoverability of assets is determined by comparing the estimated undiscounted net cash flows of the operations related to the assets (asset group) to their carrying amount. If the carrying value of the assets (asset group) exceeds its undiscounted cash flows, we then compare the fair value of the assets (asset group) to its carrying value to determine the impairment loss. The impairment loss will be allocated to the carrying values of the long-lived assets (asset group), but not below their individual fair values.

Common Stock Warrant Liabilities

In accordance with accounting guidance for common stock warrants that may potentially require cash settlement under certain circumstances, we classify such common stock warrants as current liabilities on the consolidated balance sheet. At each reporting date, the warrant liability is adjusted for changes in fair value with an offsetting change recorded as a component of other income (expense) in our consolidated statements of operations.

Research and Development Expense and Accruals

Research and development costs are expensed as incurred unless there is an alternative future use in other research and development projects. Research and development costs include personnel-related costs, outside contracted services including clinical trial costs, facilities costs, fees paid to consultants, milestone payments prior to FDA approval, license fees prior to FDA approval, professional services, travel costs, dues and subscriptions, depreciation, materials used in clinical trials and research and development and costs incurred related to our agreement with Nippon Shinyaku Co., Ltd. We expense costs relating to the purchase and production of pre-approval inventories as research and development expense in the period incurred until FDA approval is received. Payments made prior to the receipt of goods or services to be used in research and development are recorded as prepaid assets on our consolidated balance sheets until the goods or services are realized or consumed. We classify such prepaid assets as current or non-current assets based on our estimates of the timing of when the goods or services will be realized or consumed.

Our expense accruals for clinical trials are based on estimates of the services received from clinical trial investigational sites, contract research organizations (CROs), contract manufacturing organizations (CMOs) and other third-party vendors that support us in our research and development efforts. Payments under some of our contracts with these service providers depend on factors such as the achievement of clinical milestones such as the successful enrollment of certain numbers of patients, site initiation, reservation of manufacturing capacity, or completion of a clinical trial. In accruing for these services at each reporting date, we estimate the time period over which services will be performed and the level of effort to be expended in each

period. If available, we obtain information regarding unbilled services directly from these service providers. However, we may be required to estimate our accrual based only on information available to us. Once established, accruals are adjusted from time to time, as appropriate, in light of additional information. Amounts ultimately incurred in relation to amounts accrued for these services at a reporting date may be substantially higher or lower than our estimates.

Income Taxes

Income taxes are accounted for under the asset and liability method of accounting. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases, as well as for operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in the results of operations in the period that includes the enactment date. We provide a valuation allowance against net deferred tax assets unless, based upon the available evidence, it is more likely than not that the deferred tax asset will be realized. We recognize the tax benefit from an uncertain tax position only if it is more likely than not that the tax position will be sustained on examination by the taxing authorities based on the technical merits of the tax position.

U.K.'s Research and Development (R&D) Tax Relief Scheme

We carry out extensive research and development activities that benefit from U.K.'s small and medium-sized enterprises (SME) R&D tax relief scheme, whereby an entity has an option to receive an enhanced U.K. tax deduction on its eligible R&D activities or, when an SME entity is in a net operating loss position, elect to surrender net operating losses that arise from its eligible R&D activities in exchange for a cash payment from the U.K. tax authorities. As the tax incentives may be received without regard to an entity's actual tax liability, they are not subject to accounting for income taxes. Amounts realized under the SME R&D tax relief scheme are recorded as a component of other income after an election for tax relief in the form of cash payments has been made for a discrete tax year by submitting a claim, and collectability is deemed probable and reasonably assured.

Foreign Currency Translation and Transactions

We have certain foreign operations where their functional currency was determined to be their local currency. Local currency assets and liabilities are translated to U.S. Dollars at the rates of exchange in effect on the balance sheet date, and local currency revenues and expenses are translated to U.S. Dollars at average rates of exchange in effect during the period. The resulting translation gains or losses are included in our consolidated statements of comprehensive income (loss) as a component of other comprehensive income (loss) and in the consolidated statements of stockholders' equity. We also recognize gains and losses on transactions that are denominated in a currency other than the respective entity's functional currency in other expense, net in the consolidated statements of operations. Gains and losses from foreign currency translation and transactions were not material for all periods presented.

Other Comprehensive Income (Loss)

Components of other comprehensive income (loss) include changes in fair value of our available-for-sale marketable securities and reclassification adjustments from realization of gain (loss) on sale of marketable securities included in net loss.

Stock-Based Compensation

We recognize stock-based compensation for all equity awards made to employees based upon the awards' estimated grant date fair value. For equity awards that vest subject to the satisfaction of service requirements, compensation expense is measured based on the fair value of the award on the date of grant and expense is recognized on a straight-line basis over the requisite service period. We account for forfeitures as they occur. From time to time, we may grant broad-based restricted stock units to employees, including executive officers, that vest upon the satisfaction of both service-based and performance-based vesting conditions. The performance-based vesting conditions are generally satisfied upon regulatory approval of a product candidate we have been developing. We recognize stock-based compensation over the requisite service period for awards with a performance condition if the performance condition is deemed probable of being met. Since obtaining regulatory approval involves numerous risks and uncertainties, many of which are outside of our control, achievement of regulatory approval is not deemed to be probable until the event occurs. As a result, our stock-based compensation expense may experience fluctuations, which may impact our reported financial results and period-to-period comparisons of our consolidated statements of operations.

Valuation of Stock Options

The fair value of each option granted was estimated on the date of grant using the Black-Scholes option-pricing model with the following assumptions:

- Expected term—The expected term represents the estimated length of time over which we expect an option will be outstanding. We used the simplified method, as provided for under the applicable guidance for entities with a limited history of relevant stock option exercise activity, to estimate the expected term.
- Expected volatility—The expected volatility was calculated based on our historical stock prices over the expected term.
- Risk-free interest rate—The risk-free interest rate was based on the U.S. Treasury yield curve in effect at the time of grant and with a maturity that approximated the expected term of the option.
- Expected dividend yield—The expected dividend yield was based on our historical practice and anticipated dividends over the expected term of the option.

Valuation of Restricted Stock Units

The fair value of each restricted stock unit was based on our closing stock price on the date of grant.

Loss from Continuing Operations per Share

Basic net loss from continuing operations per share is calculated by dividing the net loss from continuing operations by the weighted average number of common shares outstanding for the period reduced by weighted average shares subject to repurchase, without consideration for common stock equivalents. Diluted net loss from continuing operations per share is computed by dividing the net loss from continuing operations by the weighted average number of common share equivalents outstanding for the period determined using the treasury-stock method and as-if converted method, as applicable. For purposes of this calculation, stock options, restricted stock units and warrants to purchase common stock are considered to be common stock equivalents and are only included in the calculation of diluted net loss from continuing operations per share when their effect is dilutive.

The calculation of diluted loss per share also requires that, to the extent the average market price of the underlying shares for the reporting period exceeds the exercise price of the warrants to purchase common stock and the presumed exercise of such securities are dilutive to loss per share for the period, adjustments to net income or net loss used in the calculation are required to remove the change in fair value of the common stock warrant liability for the period. In addition, adjustments to the denominator are similarly made to reflect the related dilutive shares.

The following table presents the computation of basic and diluted loss from continuing operations per share (in thousands, except per share amounts):

	Year Ended December 31,		
	2019	2018	2017
Numerator			
Net loss from continuing operations	$ (419,503)	$ (123,716)	$ (126,022)
Denominator			
Weighted average common shares outstanding, basic and diluted	43,078	37,884	27,301
Loss from continuing operations per share, basic and diluted	$ (9.74)	$ (3.27)	$ (4.62)

The following table presents the potential common shares outstanding that were excluded from the computation of diluted loss from continuing operations per share of common stock for the periods presented because including them would have been antidilutive (in thousands):

	Year Ended December 31,		
	2019	2018	2017
Shares subject to outstanding common stock options	4,085	3,770	3,865
Shares subject to outstanding restricted stock units	382	289	237
Shares subject to outstanding warrants to purchase common stock	28	33	282
	4,495	4,092	4,384

Accounting Pronouncements Recently Adopted

Collaborative Arrangements

Accounting Standards Update (ASU) 2018-18, *Collaborative Arrangements: Clarifying the Interaction between Topic 808 and Topic 606* makes targeted improvements for collaborative arrangements by (1) clarifying that certain transactions between collaborative arrangement participants should be accounted for as revenue under the contract with customer guidance (Topic 606) when the collaborative arrangement participant is a customer, (2) adding unit of account guidance to assess whether the collaborative arrangement, or a part of the arrangement, is with a customer and (3) precluding a company from presenting transactions with collaborative arrangement participants that are not directly related to sales to third parties together with revenue from contracts with customers. Entities must apply the guidance retrospectively as of the date of their initial application of Topic 606 and should recognize the cumulative effect of initially applying the amendments as an adjustment to opening retained earnings as of the later of (1) the earliest annual period presented and (2) the annual period that includes the date of the entity's initial application of Topic 606. ASU 2018-18 is effective for fiscal years beginning after December 15, 2019, including interim periods therein. Early adoption is permitted.

We elected to early adopt this standard effective January 1, 2019 and have applied its guidance to our arrangement entered into in March 2019 with Nippon Shinyaku Co., Ltd. (See Note 4). No retrospective adjustment to our consolidated financial statements was required as a result of our application of these amendments.

Leases

ASU 2016-02, *Leases (Topic 842)* establishes a right-of-use (ROU) asset model that requires all lessees to recognize ROU assets and liabilities for leases with a duration greater than one year on the balance sheet as well as provide disclosures with respect to certain qualitative and quantitative information regarding the amount, timing and uncertainty of cash flows arising from leases.

We adopted Topic 842 effective January 1, 2019 using the modified retrospective approach and elected the package of practical expedients permitted under the transition guidance within the new standard. Consequently, prior period financial information and related disclosures have not been adjusted and will continue to be presented in accordance with the previous lease standard. In addition, we elected the package of transition provisions available for existing contracts, which allowed us to carryforward our historical assessments of (1) whether contracts are or contain leases, (2) lease classification and (3) initial direct lease costs for existing leases. We did not elect the practical expedient allowing the use-of-hindsight which would require us to reassess the lease term of our leases based on all facts and circumstances through the effective date and did not elect the practical expedient pertaining to land easements as this is not applicable to the current contract portfolio.

The adoption of Topic 842 did not have a material impact on our consolidated statements of operations and cash flows. The impact on our consolidated balance sheet as of January 1, 2019 was as follows (in thousands):

	December 31, 2018	Adjustments Due to the Adoption of Topic 842	January 1, 2019
Assets			
Operating lease right-of-use assets	$ —	$ 8,641	$ 8,641
Liabilities			
Other accrued liabilities	1,845	$ (363)	$ 1,482
Current portion of operating lease liabilities	—	1,058	1,058
Operating lease liabilities, net of current portion	—	11,776	11,776
Deferred rent and lease incentive obligation	3,830	(3,830)	—
Total	$ 5,675	$ 8,641	$ 14,316

Upon adoption on January 1, 2019, we recorded operating lease ROU assets and lease liabilities of $8.6 million and $12.8 million, respectively, with the difference between ROU assets and lease liabilities attributed to the reclassifications of deferred rent and lease incentive obligations, a cease-use liability and initial direct leasing costs as a component of ROU assets.

Prior to January 1, 2019, we recognized related rent expense on a straight-line basis over the term of the lease. Incentives granted under our operating lease, including allowances for leasehold improvements and rent holidays, were recognized as reductions to rent expense on a straight-line basis over the term of the lease. Deferred rent consisted of the difference between rent expense recognized on a straight-line basis and cash rent payments. Subsequent to the adoption of Topic 842 on January 1, 2019, we determine whether the arrangement is or contains a lease at the inception of the arrangement and if such a lease is classified as a financing lease or operating lease at lease commencement. All of our leases are classified as operating leases. Leases with an initial term greater than one year are recorded on our consolidated balance sheet at December 31, 2019 as lease ROU assets and lease liabilities. If a lease contains an option to renew, the renewal option is included in the calculation of lease liabilities if we are reasonably certain at lease commencement the renewal option will be exercised. Lease liabilities and their corresponding ROU assets are measured at the present value of the remaining lease payments, discounted at an appropriate incremental borrowing rate at lease commencement, or as of January 1, 2019, for our existing leases. Management uses judgment to estimate the appropriate incremental borrowing rate, which is the rate incurred to borrow on a collateralized basis over a similar term an amount equal to the lease payments in a similar economic environment. Certain adjustments to the ROU asset may be required for items such as initial direct lease costs, lease incentives, scheduled rent escalations and impairment charges if we determine the ROU asset is impaired. Operating lease expense is recognized on a straight-line basis over the lease term.

We elected the post-transition practical expedient to not separate lease components from non-lease components for all existing lease classes. We also elected a policy of not recording leases on our consolidated balance sheets when a lease has a term of one year or less.

Accounting Pronouncements Issued But Not Yet Effective

ASU 2016-13, *Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments* revises the measurement of credit losses for most financial instruments measured at amortized cost, including trade receivables, from an incurred loss methodology to an expected loss methodology which results in earlier recognition of credit losses. Under the incurred loss model, a loss is not recognized until it is probable that the loss-causing event has already occurred. The new standard introduces a forward-looking expected credit loss model that requires an estimate of the expected credit losses over the life of the instrument by considering all relevant information including historical experience, current conditions, and reasonable and supportable forecasts that affect collectability. In addition, this standard also modifies the impairment model for available-for-sale debt securities, which are measured at fair value, by eliminating the consideration for the length of time fair value has been less than amortized cost when assessing credit loss for a debt security and provides for reversals of credit losses through income upon credit improvement. The new standard is effective for us beginning January 1, 2020. We will apply the standard's provisions as a cumulative-effect adjustment to retained earnings as of the beginning of the first reporting period in which the guidance is adopted (modified-retrospective approach). A prospective transition approach is required for debt securities for which an other-than-temporary impairment had been recognized before the effective date. Based on the composition of our investment portfolio, which reflects our primary investment objective of capital preservation, current market conditions and historical credit loss activity, the adoption of this new standard is not expected to have a material impact on our consolidated financial statements or related disclosures.

ASU 2017-04, *Intangibles-Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment* (ASU 2017-04) simplifies how an entity is required to test goodwill for impairment by eliminating Step 2 from the goodwill impairment test. Step 2 measures a goodwill impairment loss by comparing the implied fair value of a reporting unit's goodwill with the carrying amount of that goodwill. The implied fair value for a reporting unit is determined in the same manner as the amount of goodwill recognized in a business acquisition of the reporting unit. Under the amendments in ASU 2017-04, an entity shall recognize an impairment charge for the amount by which the carrying amount of a reporting unit exceeds its fair value; however, the loss recognized should not exceed the total amount of goodwill allocated to that reporting unit. The updated guidance requires adoption on a prospective basis. ASU 2017-04 is effective for us beginning January 1, 2020. The adoption of this standard update is not expected to have a material impact on our consolidated financial statements; however, any goodwill impairment losses recognized subsequent to adoption will be measured following the updated standard.

ASU 2018-13, *Fair Value Measurement (Topic 820): Disclosure Framework—Changes to the Disclosure Requirements for Fair Value Measurement* modifies the disclosure requirements in Topic 820 by removing certain disclosure requirements related to the fair value hierarchy, modifying existing disclosure requirements related to measurement uncertainty and adding new disclosure requirements, such as disclosing the changes in unrealized gains and losses for the period included in other comprehensive income for recurring Level 3 fair value measurements held at the end of the reporting period and disclosing the range and weighted average of significant unobservable inputs used to develop Level 3 fair value measurements. This ASU is

effective for us beginning January 1, 2020. The adoption of this standard update is not expected to have a material impact on our consolidated financial statements, but certain disclosures related to the range and weighted average of significant unobservable inputs used to develop Level 3 fair value measurements will need to be disclosed.

ASU 2019-12, *Simplifying the Accounting for Income Taxes (Topic 740)* removes certain exceptions to the general principles in Topic 740 related to the approach for intraperiod tax allocation, the methodology for calculating income taxes in an interim period and the recognition of deferred tax liabilities for outside basis differences. The new guidance also simplifies aspects of the accounting for franchise taxes and enacted changes in tax laws or rates and clarifies the accounting for transactions that result in a step-up in the tax basis of goodwill. This ASU is effective for us for all interim and annual periods beginning January 1, 2021, with early adoption permitted. We are currently evaluating the impact of adopting this ASU on our consolidated financial statements and related disclosures.

Note 3 — Acquisitions

Asset Acquisition of Modis

On September 6, 2019, the date the transaction closed, we acquired all of the outstanding equity interests of Modis, a privately-held biopharmaceutical company, to expand our late-stage development pipeline. Modis was formed in May 2016 through a collaboration with academic experts in mitochondrial biology. Modis holds an exclusive worldwide license from Columbia University in New York City (Columbia) to certain intellectual property rights owned or controlled by Columbia to develop and commercialize MT1621. MT1621 is an investigational deoxynucleoside substrate enhancement therapy (SET) for the treatment of thymidine kinase 2 deficiency (TK2d), an inherited mitochondrial DNA depletion disorder that predominantly affects children and is often fatal. Aggregate upfront consideration transferred of approximately $246.5 million consisted of $175.5 million in cash payments made and 1,595,025 unregistered shares of our common stock issued to the outstanding shareholders of Modis as well as employee award holders under the legacy Modis 2017 Stock Plan (Modis Plan). The fair value of common stock issued as acquisition consideration was $68.1 million on the date the transaction closed. Also included in the aggregate upfront consideration transferred were $3.5 million of transaction costs incurred, reduced by a net working capital adjustment receivable of $0.6 million. Pursuant to the terms of the Modis purchase agreement, certain unvested awards held by employees under the Modis Plan converted into the right to receive a pro-rata share of the purchase consideration at the date of acquisition, with no future service requirement. A component of the total consideration transferred was attributed to the unvested awards with a fair value of $4.9 million and was accounted for as a separate transaction from the asset acquisition. This amount was immediately expensed and included in acquired in-process research and development and related costs in the consolidated statements of operations for the year ended December 31, 2019.

Of the upfront cash consideration, $25.0 million was deposited into an escrow account to fund post-closing net working capital adjustments, and general representations and warranties for a one-year period. In addition, the former shareholders of Modis are eligible to receive milestone payments consisting of $100.0 million upon FDA approval and $50.0 million upon EMA approval of MT1621, as well as a 5% royalty on any future net sales of specified Modis products. The upfront cash consideration was funded by our cash and marketable securities on hand. The shares of our common stock provided as consideration were subsequently registered under our existing shelf registration statement on Form S-3 (No. 333-220759).

We determined substantially all of the fair value of Modis was concentrated in a single IPR&D asset group, which included license rights, clinical trial data, clinical trial development plans, research and development materials, formulations and intellectual property related to MT1621. Accordingly, the acquired set of assets and activities did not meet the definition of a business. As a result, we accounted for the transaction as an asset acquisition and allocated the remaining upfront consideration transferred to the identifiable tangible and intangible assets acquired and liabilities assumed based on their relative fair values resulting in $244.5 million being assigned to the IPR&D asset associated with MT1621 and $2.8 million for assumed net liabilities. In connection with the acquisition, 13 former Modis employees continued their employment with Zogenix on an at-will basis. The relative fair value attributed to this assembled workforce was deemed to be insignificant.

As of the acquisition date, Modis had completed a pivotal Phase 2 retrospective treatment clinical trial study (RETRO) of MT1621 substrate enhancement therapy in patients with TK2d and commenced a Phase 2 prospective, open-label extension clinical trial study of patients with TK2d. As the MT1621 program had not yet reached technological feasibility and had no alternative future use, the purchased IPR&D asset was expensed immediately subsequent to the acquisition within our consolidated statements of operations. As we had no tax basis in the acquired IPR&D asset, and the acquired IPR&D asset was expensed prior to the measurement of any deferred taxes, no deferred taxes were recognized for the initial differences between the amounts recognized for financial reporting and tax purposes.

Amounts placed in escrow of $25.0 million to cover net working capital adjustments and sellers' general representations and warranties during the one-year period from the acquisition date was recorded within current assets with a corresponding current liability, net of working capital adjustment of $0.6 million on our consolidated balance sheet at December 31, 2019.

The milestone payments due upon FDA or EMA approval and royalty payments on future net sales of MT1621 products were determined to be contingent consideration. We determined the contingent consideration was not subject to derivative accounting and will be recognized when the contingency is resolved, and the consideration is paid or becomes payable.

The nature of the remaining efforts for completion of the MT1621 program primarily consist of performing clinical trials and validating contract manufacturing abilities, the cost, length and success of which are extremely difficult to determine. Numerous risks and uncertainties can delay or stop clinical development of a pharmaceutical product prior to the receipt of marketing approval, including, but not limited to, results from clinical trials that do not support continuing development, issues related to manufacturing or intellectual property protection, and other events or circumstances that cause unanticipated delays, technical problems or other difficulties. Given these risks and uncertainties, there can be no assurance that the development of MT1621 will be successfully completed. If the development of MT1621 is not successful, in whole or in part, or completed in a timely manner, we may not realize the expected financial benefits from the development of MT1621.

Other Asset Acquisitions

In December 2019, we paid a total of $2.0 million to acquire an option to license rights for a preclinical development program for orphan central nervous system disorders in an asset acquisition. The project had not yet reached technological feasibility and had no alternative future use which resulted in a write-off of IPR&D to acquired in-process research and development and related costs in our consolidated statement of operations.

Note 4 — Collaborative Arrangement

In March 2019, we entered into an agreement (Shinyaku Agreement) with Nippon Shinyaku Co., Ltd. (Shinyaku) for the exclusive distribution of Fintepla in Japan for the treatment of Dravet syndrome and LGS. As part of the Shinyaku Agreement, we are responsible for completing the global clinical development and all regulatory approval activities for Fintepla to support the submission of new drug applications in Japan for Dravet syndrome and LGS. Shinyaku will be responsible for the commercialization activities including the promotion, marketing, sale and distribution of Fintepla in Japan. Upon regulatory approval of Fintepla in Japan, Shinyaku will also act as our exclusive distributor for commercial shipment and distribution of Fintepla in Japan. If we pursue global development of Fintepla for indications other than Dravet syndrome or LGS, Shinyaku has the option to participate in the development for such indications in Japan, subject to cost sharing requirements pursuant to the agreement. Activities under the Shinyaku Agreement will be governed by a joint steering committee (JSC) consisting of three representatives from each party to the agreement. All decisions of the JSC are to be made by a unanimous vote with tie-breaking rights provided to each party for certain matters related to development, regulatory approval and commercialization.

Shinyaku has agreed to support development and regulatory approval of Fintepla in Japan by actively participating in the design of non-clinical, clinical and manufacturing requirements needed for regulatory submission, actively planning and participating in product labeling decisions and discussions with the Japanese Ministry of Health, Labor and Welfare (MHLW) and obtained distribution exclusivity through the payment of $20.0 million, of which $17.0 million has been received with the remainder payable over the next two years. We will be actively running the clinical trials, performing manufacturing validation activities, preparing regulatory filings and holding discussions with MHLW, and negotiating pricing. We and Shinyaku have agreed to proportionally share the Japan specific development costs that may arise outside of the initial development plan and any post-approval clinical study costs in Japan. In addition, we can earn up to $66.0 million from Shinyaku for the achievement of certain regulatory milestones related to the treatment of Dravet syndrome and the treatment of LGS.

After regulatory approval of Fintepla in Japan has been obtained, we have agreed to supply Shinyaku with Fintepla upon receipt of purchase orders at our actual manufacturing cost plus a fixed transfer price mark-up, a fixed percentage of Shinyaku's net sales of Fintepla in Japan for such fiscal year, and a net price mark-up based on a percent of the applicable aggregate sales of Fintepla by Shinyaku for such fiscal year. The net price mark-up percentage increases with Shinyaku's sales of Fintepla annual net sales in Japan and ranges between mid-twenties and is capped at a low thirties of the aggregate annual net sales for an applicable fiscal year.

In addition, we can earn up to an additional $42.5 million tied to the achievement of certain net sales milestones by Shinyaku through the term of the agreement.

The Shinyaku Agreement expires in September of 2045, unless earlier terminated by either party for a change in control, a material breach, bankruptcy, dissolution, or winding up of such other party. The Shinyaku Agreement may be also terminated by either party: (1) with one year prior written notice to the other party on or after the date of the first commercial sale of a competing generic version of the Fintepla in Japan, (2) if, prior to the launch of the Fintepla in Japan, a party has a good faith concern, based on credible evidence, that such launch is not likely to be possible with commercially reasonable efforts, or (3) if a party believes Fintepla poses a substantial safety concern. We may also terminate the agreement following the second anniversary of the first commercial sale of the Fintepla in Japan if Shinyaku has failed to achieve or maintain certain diligence obligations under the Shinyaku Agreement. Shinyaku may also terminate the agreement if, prior to the launch of the Fintepla in Japan, Shinyaku has a good faith concern that Fintepla will not be commercially viable in Japan.

We concluded that collaborative activities under the Shinyaku Agreement prior to regulatory approval are within the scope of the collaborative arrangements guidance as both parties are active participants and are exposed to significant risks and rewards dependent on the success of commercializing Fintepla in Japan. Shinyaku is not a customer as it does not obtain an output of our development and regulatory approval activities for Fintepla as they were not provided a license to its intellectual property or the ability to manufacture the product, and we do not consider performing development and regulatory approval services to be a part of our ongoing activities.

We considered the revenue from contracts with customers guidance by analogy in determining the unit of account, and the recognition and measurement of such unit of account for collaborative activities under the Shinyaku Agreement and concluded that there are two development programs akin to performance obligations related to collaborative activities for development and regulatory approval efforts for Dravet and LGS. Participation on the JSC was concluded to be both quantitatively and qualitatively immaterial in the context of the Shinyaku Agreement. We are the principal as it relates to the collaborative development and regulatory approval activities primarily because we are responsible for the acceptability of the results of the work of the third-party vendors that are used to assist us in performing such activities. Therefore, such collaboration revenue has been presented on a gross basis in our consolidated statements of operations apart from research and development expenses incurred.

The initial collaboration consideration allocated on a relative standalone selling price basis to each associated development program was determined using the most likely method to consist solely of the fixed consideration payments of $20.0 million. Analogizing to the revenue from contracts with customers variable consideration guidance, all potential regulatory milestone payment consideration will be included in the collaboration consideration if and when it is probable that a significant reversal in the amount of cumulative collaboration consideration recognized will not occur when the uncertainty associated with the variable collaboration consideration is subsequently resolved. We determined at contract inception and as of December 31, 2019, this consideration should be fully constrained, as the achievement of the events tied to these regulatory milestone payments was highly dependent on factors outside of our control.

Collaboration revenue is being recognized over time as the collaborative activities related to each development program are rendered. We determined an input method is a reasonable representative depiction of the performance of the collaborative activities under the Shinyaku Agreement. The method of measuring progress towards completion incorporates actual internal and external costs incurred, relative to total internal and external costs expected to be incurred over an estimated period to satisfy the collaborative activities. The period over which total costs are estimated reflects our estimate of the period over which it will perform the collaborative activities for each development program. We expect to recognize collaboration revenue for each development program over periods ranging from three to four years. Changes in estimates of total internal and external costs expected to be incurred are recognized in the period of change as a cumulative catch-up adjustment to collaboration revenue.

As of December 31, 2019, we had received $17.0 million out of the $20.0 million in fixed consideration. The remaining $3.0 million will be billed in accordance with the terms of the agreement and will be recorded when there is an unconditional right to receive this payment. During 2019, we recognized collaboration revenue of $3.6 million. As of December 31, 2019, $13.4 million related to this agreement was recorded as deferred revenue, which is classified as either current or net of current portion in the accompanying consolidated balance sheets based on the period over which the collaboration revenue is expected to be recognized. We expect to recognize collaboration revenue related to these collaborative activities through the end of 2023.

We concluded that the supply of Fintepla to Shinyaku will be within the scope of the revenue from contracts with customers guidance if regulatory approval in Japan occurs and when a purchase order is received from Shinyaku. Such activity is considered to be a vendor customer relationship as Shinyaku will be a party that has contracted with an us to obtain goods or services that are an output of our ordinary activities in exchange for consideration and selling approved commercial product to a customer is expected to be part of our ongoing activities. Each purchase order for a shipment of Fintepla will be identified as a

separate performance obligation as we did not grant Shinyaku intellectual property rights. The agreed upon price for the supply of Fintepla (cost plus a fixed transfer price mark-up, fixed percentage of aggregate sales of Fintepla by Shinyaku per year, the net price mark-up and sales milestones) to Shinyaku does not represent a material right, and therefore is not a performance obligation, and such pricing on an aggregate basis represents the standalone selling price a distributor would typically pay for such a product in that region or market. There are also no minimum purchase commitments. The transaction price to be allocated to the performance obligation will include the fixed consideration associated with the cost-plus price of Fintepla and variable consideration associated with a fixed percentage of aggregate sales of Fintepla by Shinyaku per year, the net price mark-up and sales milestones subject to the constraint. To date, Shinyaku has not provided us with any purchase orders and thus no revenue has been recognized for the supply of Fintepla.

Note 5 — Strategic License Agreements

Fintepla

Brabant

In October 2014, we acquired Brabant in a business acquisition and obtained worldwide development and commercialization rights to Fintepla, one of our lead product candidates. Under the terms of the acquisition, we agreed to make future milestone payments to the former owners of Brabant for up to $95.0 million in the event we achieve certain milestones with respect to Fintepla, consisting of $50.0 million in regulatory milestones and $45.0 million in sales milestones. In 2019, our Fintepla MAA submission for the treatment of Dravet syndrome was accepted by the EMA for filing and our NDA submission for the treatment of Dravet syndrome was accepted by the FDA for filing. Each acceptance by the respective regulatory agency triggered a $10.0 million milestone payment. To date, we have paid $20.0 million of the maximum $50.0 million in regulatory milestones under the purchase agreement.

Universities of Antwerp and Leuven in Belgium (the Universities)

In addition, we have a collaboration and license agreement with the that runs through September 2045. Under the terms of the agreement, the Universities granted us an exclusive worldwide license to use the data obtained from a study related to low-dose fenfluramine for the treatment of Dravet syndrome, as well as certain other intellectual property. We are required to pay a mid-single-digit percentage royalty on net sales of products containing low-dose fenfluramine for the treatment of Dravet syndrome or, in the case of a sublicense of products containing low-dose fenfluramine for the treatment of Dravet syndrome, a percentage in the mid-twenties of the sub-licensing revenues. The agreement may be terminated by the Universities if we (a) do not use commercially reasonable efforts to (i) develop and commercialize products containing low-dose fenfluramine for the treatment of Dravet syndrome or related conditions stemming from infantile epilepsy, or (ii) seek approval of products containing low-dose fenfluramine for the treatment of Dravet syndrome in the United States; or (b) if we become insolvent or makes an assignment for the benefit of creditors or should any petition in bankruptcy, or similar relief, be filed by or against us. We can terminate the agreement upon specified prior written notice to the Universities.

MT1621

License Agreement with Columbia University

As a result of our acquisition of Modis, we became party to the Exclusive License Agreement, by and between Modis and the Trustees of Columbia University in the City of New York, dated as of September 26, 2016, related to MT1621. We are required to use commercially reasonable efforts to develop and commercialize licensed products worldwide, including to meet certain development and commercialization milestones within specified periods of time. Upon the achievement of certain regulatory and commercial milestones, we are required to pay Columbia University up to $2.9 million and $25.0 million, respectively, as well as tiered royalties on sales for each licensed product, at percentages ranging from the mid-single digits to the high single-digits. The royalty obligations and License Agreement will expire on a country-by-country and product-by-product basis upon the later of (i) 15 years after the first bona fide commercial sale of a licensed product, (ii) the expiration of the last to expire valid patent claim covering a licensed product in a country or (iii) expiration of any regulatory exclusivity covering such licensed product. The License Agreement may be terminated by either by Columbia or by us in the event of an uncured material breach by the other party, or by Columbia in the event we are subject to specified bankruptcy, insolvency or similar circumstances. We can terminate the License Agreement either in its entirety or on a product-by-product and country-by-country basis, upon specified prior written notice to Columbia, provided we are not exploiting licensed products in such countries.

Other License Agreement Assumed

We also became party to a license agreement between two other research institutions related to MT1621 where we may be required to pay up to $3.0 million for research, development and regulatory milestone events and up to $10.0 million for certain sales milestone events. We are also required to pay tiered royalties ranging from low to mid-single digits on net sales of licensed product.

Note 6 — Cash, Cash Equivalents and Marketable Securities

The following table summarizes the amortized cost and fair value of our cash, cash equivalents and marketable securities by major investment category as of December 31, 2019 and 2018 (in thousands):

	December 31, 2019			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
Current assets:				
Cash and cash equivalents:				
Cash	$ 43,058	$ —	$ —	$ 43,058
Money market funds	11,527	—	—	11,527
Commercial paper	7,485	—	—	7,485
Total cash and cash equivalents	$ 62,070	$ —	$ —	$ 62,070
Marketable securities:				
Commercial paper	$ 73,366	$ —	$ —	$ 73,366
Corporate debt securities	74,038	381	(2)	74,417
Certificates of deposit	41,302	—	—	41,302
Total marketable securities	$ 188,706	$ 381	$ (2)	$ 189,085
Total cash, cash equivalents and marketable securities	$ 250,776	$ 381	$ (2)	$ 251,155

	December 31, 2018			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
Current assets:				
Cash and cash equivalents:				
Cash	$ 5,222	$ —	$ —	$ 5,222
Money market funds	63,232	—	—	63,232
Total cash and cash equivalents	$ 68,454	$ —	$ —	$ 68,454
Marketable securities:				
Commercial paper	$ 152,940	$ —	$ —	$ 152,940
Corporate debt securities	60,622	58	(75)	60,605
Certificates of deposit	128,647	—	—	128,647
U.S. Treasuries	103,521	31	(11)	103,541
Total marketable securities	$ 445,730	$ 89	$ (86)	$ 445,733
Total cash, cash equivalents and marketable securities	$ 514,184	$ 89	$ (86)	$ 514,187

The following table summarizes the amortized cost and fair value of marketable securities based on stated effective maturities as of December 31, 2019 (in thousands):

	Amortized Cost	Estimated Fair Value
Due within one year	$ 156,620	$ 156,833
Due between one and two years	32,086	32,252
Total	$ 188,706	$ 189,085

As of December 31, 2019, no individual security has been in a continuous loss position for greater than 12 months. There were no other-than-temporary impairment write-downs on marketable securities in any of the years presented.

See Note 7 for further information regarding the fair value of our financial instruments.

Note 7 — Fair Value Measurements

Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability (an exit price) in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date. A three-level valuation hierarchy has been established under GAAP for disclosure of fair value measurements. The valuation hierarchy is based on the transparency of inputs to the valuation of an asset or liability as of the measurement date. The three levels are defined as follows:

- Level 1 - Observable inputs such as quoted prices in active markets;
- Level 2 - Inputs, other than the quoted prices in active markets, that are observable either directly or indirectly; and
- Level 3 - Unobservable inputs in which there is little or no market data, which require the reporting entity to develop its own assumptions.

The following tables summarize assets and liabilities recognized or disclosed at fair value on a recurring basis at December 31, 2019 and 2018 (in thousands):

	December 31, 2019			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents:				
Money market funds	$ 11,527	$ —	$ —	$ 11,527
Commercial paper		7,485		7,485
Marketable securities:				
Commercial paper	—	$ 73,366	—	73,366
Corporate debt securities	—	74,417	—	74,417
Certificates of deposit	—	41,302	—	41,302
Total assets[1]	$ 11,527	$ 196,570	$ —	$ 208,097
Liabilities:				
Common stock warrant liabilities[2]	$ —	$ —	$ 198	$ 198
Contingent consideration liabilities[3]	—	—	63,800	63,800
Total liabilities	$ —	$ —	$ 63,998	$ 63,998

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents:				
Money market funds	$ 63,232	$ —	$ —	$ 63,232
Marketable securities:				

Commercial paper	—	152,940	—	152,940
Corporate debt securities	—	60,605	—	60,605
Certificates of deposit	—	128,647	—	128,647
U.S. Treasury securities	—	103,541	—	103,541
Total assets[1]	$ 63,232	$ 445,733	$ —	$ 508,965
Liabilities:				
Common stock warrant liabilities[2]	$ —	$ —	$ 343	$ 343
Contingent consideration liabilities[3]	—	—	78,200	78,200
Total liabilities	$ —	$ —	$ 78,543	$ 78,543

(1) Fair value is determined by taking into consideration valuations obtained from third-party pricing services. The third-party pricing services utilize industry standard valuation models, for which all significant inputs are observable, either directly or indirectly, to estimate fair value. These inputs include reported trades of and broker/dealer quotes on the same or similar securities; issuer credit spreads; benchmark securities; and other observable inputs.

(2) Represents the fair value of common stock warrants outstanding that may require cash settlement under certain circumstances. As of December 31, 2019 and 2018, common stock warrant liabilities consists of warrants issued in July 2011 in connection with a debt financing arrangement. The warrants entitle the holder to purchase up to 28,125 shares of common stock at an exercise price of $72.00 per share and expires in July 2021.

(3) In connection with the acquisition of Brabant in 2014 (See Note 5), we may be required to pay future consideration that is contingent upon the achievement of specified development, regulatory approval or sales-based milestone events. We estimate the fair value of contingent purchase consideration liabilities using a probability-weighted income approach, which reflects the probability and timing of future payments. This fair value measurement is based on significant Level 3 inputs such as the anticipated timelines and probability of achieving development, regulatory approval or sales-based milestone events and projected revenues. The resulting probability-weighted cash flows are discounted at risk-adjusted rates. Subsequent to the acquisition date, at each reporting period prior to settlement, we remeasure these liabilities by performing a review of the assumptions discussed above and record an adjustment to reflect any changes in the estimated fair value of our contingent consideration liabilities. In the absence of any significant changes in key assumptions during a reporting period, the fair value of the contingent consideration liability is expected to increase each period with the recognition of change in fair value of contingent consideration resulting from the passage of time at the applicable discount rate as we approach the payment dates of the contingent consideration. Significant judgment is used in determining Level 3 inputs and fair value measurements as of a reporting date. Updates to assumptions could have a significant impact on our results of operations in a reporting period and actual results may differ from estimates. For example, significant increases in the estimated probability of achieving a milestone or projected revenues would result in a significantly higher fair value measurement while significant decreases in the estimated probability of achieving a milestone or projected revenues would result in a significantly lower fair value measurement. Significant increases in the discount rate or in the anticipated timelines would result in a significantly lower fair value measurement while significant decreases in the discount rate or anticipated timelines would result in a significantly higher fair value measurement. Through December 31, 2019, we have made milestone payments of $20.0 million. The potential amount of future payments that we may be required to make related to the remaining contingent consideration is between zero, if none of the remaining milestones are achieved, to a maximum of $75.0 million (undiscounted). As of December 31, 2019, we classified $25.6 million of the total contingent consideration liabilities of $38.2 million as current liabilities. The balance sheet classification between current and non-current liabilities was based upon our reasonable expectation as to the timing of settlement of certain specified milestones.

There have been no transfers between fair value measurement levels for all periods presented. See Note 6 for further information regarding the carrying value of our financial instruments.

The following table provides a reconciliation of assets and liabilities measured at fair value on a recurring basis using significant unobservable inputs (Level 3) for the years ended December 31, 2019 and 2018 (in thousands):

	Contingent Consideration	Common Stock Warrant Liabilities
Balance at December 31, 2017	$ 76,900	$ 512
Settlements	—	—
Changes in fair value	1,300	(169)
Balance at December 31, 2018	78,200	343
Settlements	(20,000)	—
Changes in fair value	5,600	(145)
Balance at December 31, 2019	$ 63,800	$ 198

Changes in the estimated fair value of contingent consideration are reflected as operating expenses in the consolidated statements of operations. Changes in the estimated fair value of common stock warrant liabilities are included as a component of other income (expense) in the consolidated statements of operations.

Note 8 — Balance Sheet Components

The following tables provide details of selected balance sheet components (in thousands):

Property and Equipment, Net

Property and equipment, net consisted of the following (in thousands):

	December 31,	
	2019	2018
Computer equipment and software	$ 291	$ 216
Leasehold improvements	9,431	3,210
Furniture and fixtures	978	880
Total	10,700	4,306
Less accumulated depreciation	(1,276)	(1,436)
Property and equipment, net	$ 9,424	$ 2,870

Other Current Liabilities:

Accrued and other current liabilities consisted of the following (in thousands):

	December 31,	
	2019	2018
Accrued compensation	7,179	5,277
Other accrued liabilities	4,074	1,845
Common stock warrant liabilities	198	343
Total	$ 11,451	$ 7,465

Note 9 — Commitments and Contingencies

On April 12, 2019, a plaintiff stockholder filed a class action lawsuit against us and certain of our executive officers alleging violations of Sections 10(b) and 20(a) of the Securities Exchange Act in the United States District Court for the Northern District of California captioned *Lake v. Zogenix*, Case No. 3:19-cv-01975-RS. The plaintiff sought to represent a class of investors who purchased our stock between February 6, 2019 and April 8, 2019, and alleges that certain statements made during this period regarding the prospects for our NDA for Fintepla were false or misleading. On October 4, 2019, we filed a motion to dismiss the complaint in the action. On January 27, 2020, the court entered an order dismissing the complaint without prejudice. Rather than amend the complaint, the plaintiffs opted to voluntarily dismiss their claims. A final judgment in favor of Zogenix and our executive officers was filed on February 13, 2020.

On January 17, 2020, a plaintiff stockholder filed a shareholder derivative lawsuit against our directors and officers alleging violations of Sections 10(b) and 20(a) of the Securities Exchange Act, breach of fiduciary duties, unjust enrichment, and waste of corporate assets, in the United States District Court for the Northern District of California captioned *Lui v. Farr*, Case No. 3:20-cv-00390. The plaintiff alleges that certain statements regarding the prospects for our NDA for Fintepla were false or misleading, and that we failed to maintain adequate internal controls in connection with its FDA submission process. We believe the allegations lack merit and intend to defend the claims vigorously. It is not possible to determine the outcome of this matter and while we do not believe a loss is probable, we cannot reasonably estimate the maximum potential exposure or the range of possible loss.

We may become involved in various legal proceedings and claims that arise in the ordinary course of business. Such matters are subject to uncertainty and there can be no assurance that such legal proceedings will not have a material adverse effect on our business, results of operations, financial position or cash flows.

See Notes 3 and 5 for our commitments under collaboration and licensing agreements.

Note 10 — Leases

We have non-cancelable operating leases consisting of administrative and research and development office space for our Emeryville, California headquarters and former headquarters in San Diego, California that will expire in May 2027 and March 2020, respectively. Our Emeryville lease includes a renewal option for an additional five years, which was not included in our determination of the lease term under the legacy lease standard as renewal was not reasonably assured at the inception of the lease. As a result, the renewal option to extend the lease was not included in determining our ROU assets and lease liabilities. Our former headquarters has been subleased to an unrelated third party for the remainder of our original lease term, which expires on March 31, 2020. As part of our acquisition of Modis in September 2019, we assumed the lease for Modis' headquarters in Oakland, California. The Oakland lease expires in July 2021 and has been included in our ROU assets and lease liabilities in our consolidated balance sheets. We do not have any material finance leases or service contracts with lease arrangements. Our lease agreements do not contain any material residual value guarantees or material restrictive covenants.

Information regarding lease expense, remaining lease term, discount rate, and other select lease information for the year ended December 31, 2019 were as follows (in thousands):

	Year Ended December 31, 2019
Components of lease costs:	
Operating lease cost	$ 2,045
Short-term lease cost[1]	851
Sublease income	(580)
Total lease expense	$ 2,316

[1] Short-term lease cost included $0.2 million related to a short-term lease that expired in March 2019.

Other lease information	Year Ended December 31, 2019
Cash paid for amounts included in the measurement of lease liabilities	$ 1,842
Right-of-use lease assets obtained in exchange for new lease liabilities, noncash	$ 354

Supplemental balance sheet information related to operating leases	December 31, 2019
Right-of-use assets	$ 7,774
Current portion of operating lease liabilities	$ 1,322
Operating lease liabilities, net of current portion	10,752
Total operating lease liabilities	12,074
Weighted average remaining lease term	7.2 years
Weighted average discount rate, weighted based on the remaining balance of lease payments	6.0 %

Maturities of operating lease liabilities as of December 31, 2019 were as follows (in thousands):

	Operating Lease
2020	$ 1,986
2021	1,957
2022	1,894
2023	1,951
2024	2,010
Thereafter	5,101
Total lease payments	14,899
Less: imputed interest	(2,825)
Total operating lease liabilities	$ 12,074

Prior to the adoption of the new lease standard on January 1, 2019, our leases were all classified as operating leases. As a result, they were not required to be recorded on the consolidated balance sheets. Total rent expense under operating leases for the years ended December 31, 2018 and 2017 was $1.6 million and $1.8 million, respectively.

As of December 31, 2018, future minimum rental payments under our non-cancelable operating leases and future minimum payments to be received from subleases were as follows (in thousands):

	Gross Rental Payments	Sublease Rental Income	Net Rental Payments
2019	$ 1,777	$ (576)	$ 1,201
2020	1,788	(148)	1,640
2021	1,839	—	1,839
2022	1,894	—	1,894
2023	1,951	—	1,951
Thereafter	7,296	—	7,296
Total	$ 16,545	$ (724)	$ 15,821

Note 11 — Stockholders' Equity

Preferred Stock

We have 10,000,000 shares of preferred stock authorized for issuance, par value of $0.001 per share. As of December 31, 2019 and 2018, no shares of preferred stock were issued and outstanding.

Common Stock

On May 21, 2019, our stockholders approved and we filed an amendment to our Fifth Amended and Restated Certificate of Incorporation, as amended, to increase the total number of authorized shares of common stock from 50,000,000 to 100,000,000. Each holder of our common stock, par value of $0.001 per share, is entitled to one vote for each share of such stock held. As of December 31, 2019 and 2018, there were 45,272,088 and 42,078,164 shares of common stock issued and outstanding.

The following table presents common stock reserved for future issuance for the following equity instruments as of December 31, 2019 and 2018 (in thousands):

	December 31,	
	2019	2018
Stock options and RSUs outstanding	4,692	4,033
Warrants to purchase common stock	28	28
Available for future grants under employee equity plans	4,926	1,684
Total common stock reserved for future issuance	9,646	5,745

Sale of Common Stock

At-the-Market Offerings

In May 2016, we entered into an at-the-market sales agreement (the ATM Sales Agreement) with Cantor Fitzgerald & Co. (Cantor) pursuant to which Cantor agreed to act as a sales agent in connection with sales of our common stock from time to time pursuant to an effective registration statement. In May 2016, we filed a registration on Form S-3, which was declared effective by the SEC on May 24, 2016, which included a prospectus covering the offering, issuance and sale of up to $25.0 million in gross aggregate proceeds of common stock from time to time, through Cantor as our sales agent. In the third quarter of 2017, we sold 1,550,880 shares of our common stock resulting in net proceeds of approximately $19.4 million, after deducting commissions and other offering expenses.

In December 2017, we filed a prospectus supplement (the 2017 ATM Prospectus), to our automatic “shelf” registration statement on Form S-3 registering the offering, issuance and sale of up to $75.0 million in gross aggregate proceeds of common stock pursuant to the ATM Sales Agreement. During the years ended December 31, 2019 and 2018, we sold 903,573 and 740,417 shares of common stock, respectively, resulting in net proceeds of approximately $42.6 million and $30.3 million, respectively, after deducting commissions and other offering costs. As of December 31, 2019, there were no amounts remaining for future sales under the 2017 ATM Prospectus.

Underwritten Public Offerings

In October 2017, we completed an underwritten public offering for the sale of 7,700,000 shares of our common stock. The shares were sold at an offering price of $37.50 per share. Net proceeds raised from the offering amounted to approximately $271.3 million, after deducting underwriting discounts and commissions and other offering expenses.

In August 2018, we completed an underwritten public offering for the sale of 6,000,000 shares of our common stock. The shares were sold at an offering price of $52.00 per share. Net proceeds raised from the offering amounted to approximately$292.9 million, after deducting underwriting discounts and commissions and other offering expenses.

Note 12 — Stock-Based Compensation

Summary of Equity Incentive Plans

2006 Plan

We granted options under our 2006 Equity Incentive Award Plan, as amended (2006 Plan) until the adoption of our 2010 Plan (discussed below) in November 2010, which serves as the successor plan to the 2006 Plan. While no further grants may be made from the 2006 Plan, outstanding options to purchase 20,218 shares of common stock as of December 31, 2019 remained subject to the terms under the 2006 Plan.

2010 Plan

Our 2010 Equity Incentive Award Plan (2010 Plan), which was previously amended in June 2012, provides for the grant of incentive stock options, non-qualified stock options, stock appreciation rights, restricted stock units and rights to purchase restricted stock to eligible recipients. Service-based options granted pursuant to the 2010 Plan has a contractual term of ten years and generally vest over four years. Performance-based awards are subject to the employee’s continued service and become vested based on the completion of the applicable performance conditions.

On May 21, 2019, our stockholders approved the amendment and restatement of our 2010 Plan (2010 Restated Plan). The 2010 Restated Plan included the following material changes: (1) the aggregate number of shares available for issuance under the plan increased from 7.5 million to 11.5 million shares; (2) the evergreen provision that provided for automatic annual increases based on 4% of common stock issued and outstanding as of each January 1 was eliminated; and (3) the extension of the expiration date of the plan to March 2029.

As of December 31, 2019, 4,907,684 shares remained available for future grants. Subsequent to the 2010 Restated Plan's effective date on May 21, 2019, all future equity awards will be issued from this plan (other than shares available for purchase under our 2010 Employee Stock Purchase Plan).

Inducement Plan

In December 2013, our board of directors adopted the Employment Inducement Equity Incentive Award Plan (Inducement Plan) and initially reserved 337,500 shares of common stock for issuance, which was subsequently increased to 637,500 shares in May 2018. The Inducement Plan is a non-shareholder approved stock plan adopted pursuant to the “inducement exception” provided under Nasdaq listing rules. The Inducement Plan was used exclusively for the issuance of non-statutory stock options and restricted stock units to certain new hires who satisfy the requirements to be granted inducement grants under Nasdaq rules as an inducement material to the individual’s entry into employment with us. The terms of the Inducement Plan are substantially similar to the terms of our 2010 Restated Plan. Subsequent to the effective date of our 2010 Restated Plan on May 21, 2019, we no longer issue grants under the Inducement Plan.

Employee Stock Purchase Plan

In November 2010, our board of directors adopted the 2010 Employee Stock Purchase Plan (ESPP), which allows employees to purchase shares of our common stock during specified offering periods at a discount to the fair market value at the time of purchase. The ESPP has a term of 10 years and will expire in November 2020. The ESPP is implemented by overlapping, twelve-month offering periods and each offering period may contain up to two purchase periods of six months each. At any one time, there may be up to two offering periods under the ESPP. In general, a new twelve-month offering period commences on each June 1st and December 1st of a calendar year.

Common stock may be purchased under the ESPP at a price equal to 85% of the fair market value of our common stock on either the date of purchase or the first day of an offering period, whichever is lower. Eligible employees may elect to withhold up to 20% of their compensation through payroll deductions during an offering period for the purchase of stock. The ESPP contains a reset provision whereby if the price of our common stock on the first day of a new offering period is less than the price on the first day of any preceding offering period, all participants in a preceding offering period with a higher first day price will be automatically withdrawn from such offering periods and re-enrolled in the new offering period. The reset feature, when triggered, will be accounted for as a modification to the original offering period, resulting in incremental expense to be recognized over the twelve-month period of the new offering.

The ESPP limits the maximum number of shares that may be purchased by any one participant in an offering period to 2,500 shares. In addition, the Internal Revenue Code limits purchases under an ESPP to $25,000 worth of stock in any one calendar year, valued as of the first day of an offering period. As of December 31, 2019, 18,347 shares of common stock were available for purchase, which number increased by 31,250 shares as of January 1, 2020 in accordance with the evergreen provision under the ESPP.

Equity Incentive Plan Activity

The following sections summarize activity under our equity incentive plans.

Stock Options

The following table summarizes our stock option activity for 2019:

	Shares (in thousands)	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (years)	Aggregate Intrinsic Value (in thousands)
Outstanding at December 31, 2018	3,744	$ 20.69		
Granted	1,247	$ 48.88		
Exercised	(647)	$ 14.49		
Canceled	(91)	$ 35.17		
Outstanding at December 31, 2019	4,253	$ 29.59	6.8	$ 96,524
Exercisable at December 31, 2019	2,556	$ 21.24	5.6	79,083

The total intrinsic value of options exercised during 2019, 2018 and 2017 was $22.4 million, $11.8 million and $14.3 million, respectively.

Restricted Stock Units (RSUs)

The following table summarizes the Company's restricted stock unit activity for 2019:

	Shares (in thousands)	Weighted Average Fair Value per RSU at Grant Date
Nonvested at December 31, 2018	289	$ 25.56
Granted	235	50.46
Vested	(37)	43.10
Canceled	(48)	29.71
Nonvested at December 31, 2019	439	36.97

The total intrinsic value of RSUs vested during 2019 and 2018 was $1.9 million and $4.2 million, respectively. There were no RSUs vested during 2017. As of December 31, 2019, outstanding RSUs included approximately 130,000 shares granted in March 2017 to employees and executives that are performance-based. These performance-based RSUs vest upon FDA approval of our NDA for Fintepla, provided such approval occurs within five years following the grant date. Since obtaining FDA approval involves numerous risks and uncertainties, many of which are outside of our control, this performance condition is not deemed to be probable until the event actually occurs. Accordingly, no compensation expense has been recognized to date. As of December 31, 2019, total unrecognized compensation costs related to such awards were $1.4 million.

As of December 31, 2019, restricted stock units outstanding not subject to a performance condition had a weighted average remaining contractual term of 1.5 years with an intrinsic value of $16.1 million.

In October 2015, we granted employees certain performance-based stock options for retention purposes. The stock options would vest upon satisfaction of a specified regulatory milestone within three years of the date of grant. In 2017, management determined the achievement of the performance condition was no longer probable and the cumulative compensation expense previously recognized of $0.7 million was reversed. In September 2018, these awards were modified to allow for 90% of such options outstanding at the modification date to vest immediately. The remaining 10% of the awards were canceled in October 2018 since the performance condition was not met. This improbable to probable modification resulted in the calculation and recognition of incremental stock-based compensation expense of $3.5 million in 2018.

ESPP

Employees purchased 28,146 shares, 32,679 shares and 35,934 shares under our ESPP during 2019, 2018 and 2017, respectively.

Valuation of Equity Awards

We use the Black-Scholes option-pricing model for determining the estimated fair value and stock-based compensation related to stock options and ESPP awards. A summary of the assumptions used to estimate the fair values of stock option grants for the years presented is as follows:

	Year Ended December 31,		
	2019	2018	2017
Risk free interest rate	1.4% to 2.6%	2.3% to 3.0%	1.8% to 2.3%
Expected term	5.3 to 6.1 years	5.3 to 6.1 years	5.1 to 6.1 years
Expected volatility	73.5% to 82.3%	80.1% to 85.2%	75.1% to 85.8%
Expected dividend yield	—%	—%	—%
Weighted-average fair value of option on grant date	$32.64	$30.87	$7.43

The fair value of ESPP awards were not material for all periods presented.

Stock-Based Compensation Expense Allocation

The following table summarizes the components of total stock-based compensation expense included in the consolidated statements of operations for the periods presented (in thousands):

	Year Ended December 31,		
	2019	2018	2017
Cost of contract manufacturing	$ —	$ —	$ 71
Research and development	8,293	6,317	1,933
Selling, general and administrative	12,954	9,175	4,151
Total	$ 21,247	$ 15,492	$ 6,155

As of December 31, 2019, there was approximately $58.2 million of total unrecognized compensation costs related to outstanding equity awards scheduled to be recognized over a weighted average period of 2.7 years.

Note 13 — Employee Benefit Plans

We maintain defined contribution retirement plans for our employees. We established a 401(k) Plan for our U.S. employees and a defined benefit pension plan for our U.K. employees by which participants may defer taxation on a portion of their earnings, subject to a maximum amount under each applicable plan. We may make discretionary matching contributions to the plans on behalf of participants in any plan year. Any discretionary matching contributions made on behalf of participants become immediately vested and non-forfeitable to the participant. Total expense recognized by us for discretionary matching contributions made in 2019, 2018 and 2017 was $0.5 million, $0.2 million, and $0.2 million, respectively.

Note 14 — Income Taxes

For financial reporting purposes, the components of loss from continuing operations before income taxes were as follows (in thousands):

	December 31,		
	2019	2018	2017
United States	$ (325,769)	$ (35,838)	$ (32,112)
Foreign	(93,734)	(87,878)	(93,910)
Total	$ (419,503)	$ (123,716)	$ (126,022)

At December 31, 2019, our federal, state, and foreign net operating loss carryforwards, including the acquired net operating losses from our acquisition of Modis, were approximately $389.5 million, $234.6 million and $227.7 million, respectively, which may be subject to limitations as described below. If not utilized, a significant portion of our federal tax loss carryforwards incurred prior to 2018 will begin to expire in 2029 and the state tax loss carryforwards incurred prior to 2018 will begin to expire in 2021. Under the Tax Cut and Jobs Act of 2017 (Tax Act), federal net operating losses incurred in 2018 and in future years may be carried forward indefinitely. However, the deductibility of such federal net operating losses is limited to 80% of taxable income. It is uncertain if and to what extent various states will conform to the Tax Act. Our net operating losses in the U.K. do not expire, but deductiblility of the net operating losses is limited to 50% of taxable income, subject to a regulatory established allowance per group.

In addition, we have federal and California research and development income tax credit carryforwards of approximately $6.0 million and $4.0 million. If not utilized, the federal research and development income tax credit carryforwards will begin to expire in 2027. The California research and development income tax credit carryforwards do not expire and can be carried forward indefinitely. As of December 31, 2019, we had federal orphan drug tax credit carryforwards of $2.0 million, which begin to expire in 2036. Due to the net operating loss carryforwards, all years remain open for income tax examination by tax authorities in the United States, various states and foreign tax jurisdictions in which we file tax returns. We are currently not under audit by any tax jurisdiction.

As of December 31, 2019, we have experienced at least three ownership changes. The first ownership change occurred in August 2006 and resulted in a reduction to our net operating loss carryforwards of $1.9 million. We had a second ownership change in September 2011 which resulted in reductions to our federal net operating loss carryforwards of $121.1 million, research and development income tax credits of $3.0 million, and California net operating loss carryforwards of $53.3 million. We had a third ownership change in January 2014, which did not result in any reductions of federal and California net operating loss carryforwards or research and development income tax credits. We recently completed an evaluation of the potential effect of Section 382 on our ability to utilize our net operating losses, including those acquired from our acquisition of Modis. However, we do not anticipate these limitations will significantly impact our ability to utilize our operating losses and tax credit carryforwards. Pursuant to the IRC, the use of our net operating loss and research and development income tax credit carryforwards may be limited in the event of a future cumulative change in ownership of more than 50% within a three-year period.

A reconciliation of income tax provision to amounts computed by applying the statutory federal income tax rate to loss from continuing operations before income taxes is shown as follows (in thousands):

	December 31,		
	2019	2018	2017
Income tax at federal statutory rate	$ (88,096)	$ (26,022)	$ (42,846)
State taxes, net of federal benefit	(65)	(8)	(19)
Non-deductible acquired IPR&D charge and other expenses[(1)]	52,044	—	—
Change in valuation allowance	21,155	16,949	(11,208)
Impact of U.S. statutory rate change on revaluing deferred tax assets	—	—	36,085
Impact of foreign rate change on deferred taxes	1,887	1,961	1,619
Other permanent differences	4,101	(701)	8,086
State tax rate benefit	(18)	169	56
Foreign rate differential	1,883	1,731	10,636
Stock-based compensation	(2,674)	(1,344)	(2,462)
Net operating losses surrendered under U.K.'s R&D tax relief scheme	9,349	6,322	—
Credits and other	434	943	53
Income tax provision	$ —	$ —	$ —

(1) Amounts attributable to our asset acquisition of Modis. See Note 3 for additional information.

The Tax Act has resulted in significant changes to the U.S. corporate income tax system. These changes include a federal statutory rate reduction from 35% to a flat rate of 21% for tax years beginning after December 31, 2017, limitation of the deduction for net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks, implementing a territorial tax system, and requiring a mandatory one-time tax on U.S. owned undistributed foreign earnings and profits known as the transition tax.

Pursuant to Staff Accounting Bulletin No. 118, an entity may select between one of three scenarios to determine a reasonable estimate arising from the Tax Act. We were able to provide a reasonable estimate for the revaluation of deferred taxes and the effects of the transition tax on undistributed foreign earnings and profits. As a result, for the year ended December 31, 2017, we recorded a $36.1 million reduction in deferred tax assets for the revaluation of deferred taxes, which was offset by a corresponding decrease to our full valuation allowance. During the fourth quarter of 2018, we completed our accounting for the impact of the Tax Act and determined there were no material changes to our original analysis.

The significant components of deferred tax assets (liabilities) were as follows (in thousands):

	December 31,	
	2019	2018
Deferred tax assets:		
Federal and state net operating loss carryforwards	$ 134,009	$ 103,187
Capitalized research and development	925	1,537
Accrued expenses	1,311	1,300
Research and development credits	5,343	5,343
Amortization	1028	528
Lease liability	2,547	—
Stock-based compensation	6,464	5,868
Other, net	1,979	775
Total deferred tax assets	153,606	118,538
Less: valuation allowance	(151,544)	(118,064)
Total deferred tax assets, net of valuation allowance	2,062	474
Deferred tax liabilities:		
Operating lease right-of-use asset	$ (1,640)	$ —
IPR&D	(17,425)	(17,425)
Depreciation	(422)	(474)
Total deferred tax liabilities	(19,487)	(17,899)
Total net deferred tax liabilities	$ (17,425)	$ (17,425)

For the years ended December 31, 2019, 2018 and 2017, no income tax provision was recorded due to recurring losses and our assessment a full valuation allowance should be established against any net deferred tax assets due to the uncertainty regarding our ability to realize them in the future. The increase in valuation allowance of $33.5 million during 2019 was attributable to our current year taxable loss and deferred tax assets related to acquired net operating loss carryovers from our acquisition of Modis.

As of December 31, 2019 and 2018, the net deferred tax liability of $17.4 million on the consolidated balance sheets is related to book and tax basis differences for intangible assets with indefinite lives from our 2014 business acquisition of Brabant. In accordance with accounting for income taxes guidance, the deferred tax liability related to the intangible assets cannot be used to offset deferred tax assets when determining the amount of the valuation allowance for deferred tax assets which are not more-likely-than-not to be realized. This results in a net deferred tax liability, even though we have a full valuation allowance on our other net deferred tax assets. This net deferred tax liability will continue to be reflected on the balance sheet until the related intangible assets are no longer held by us.

We recognize liabilities for uncertain tax positions based on a two-step process. The first step is to evaluate the tax position for recognition by determining if the weight of available evidence indicates it is more likely than not that the position will be sustained on audit, including resolution of related appeals or litigation processes, if any. The second step is to measure the tax benefit as the largest amount which is more than 50% likely of being realized upon ultimate settlement.

The following table summarizes the activity related to our unrecognized tax benefits (in thousands):

	December 31,		
	2019	2018	2017
Beginning balance of unrecognized tax benefits	$ 1,487	$ 2,030	$ 1,248
Gross increases based on tax positions related to current year	1,495	—	633
Gross increases based on tax positions related to prior years	559	91	149
Gross decreases based on tax positions related to prior years	—	(634)	—
Settlements with taxing authorities	—	—	—
Expiration of statute of limitations	—	—	—
Ending balance of unrecognized tax benefits	$ 3,541	$ 1,487	$ 2,030

As at December 31, 2019 and 2018, there were no unrecognized tax benefits that, if recognized, would affect our effective tax rate as any tax benefit would increase a deferred tax asset, which is currently offset by a full valuation allowance.

We record interest and, if applicable, penalties related to income tax matters as a component of income tax expense. No interest or penalties have been recorded for all periods presented. We do not expect any significant increases or decreases to our unrecognized tax benefits in the next twelve months.

Note 15 — U.K.'s R&D Tax Relief Scheme

We conduct extensive research and development activities that benefit from U.K.'s small and medium-sized enterprises (SME) R&D tax relief scheme. Under this tax relief scheme, a SME has an option to receive an enhanced U.K. tax deduction on its eligible R&D activities or, when an SME entity is in a net operating loss position, can elect to surrender net operating losses that arise from its eligible R&D activities in exchange for a cash payment from the U.K. tax authorities. As the tax incentives may be received without regard to an entity's actual tax liability, they are not subject to accounting for income taxes. Amounts recognized by us for cash payment claims under the SME R&D tax relief scheme are recorded as a component of other income after an election for tax relief has been made by submitting a claim for a discrete tax year and collectability is deemed probable and reasonably assured.

Other income for 2018 included $10.1 million for claims related to our 2015 and 2016 U.K. tax years. As of December 31, 2019, we have made similar elections and submitted two individual claims for refundable cash credits related to our 2017 and 2018 U.K. tax years. Amounts submitted for reimbursement for qualifying expenditures incurred in 2017 and 2018 are higher than claims received for prior tax years due to increases in qualifing expenditures incurred in those periods. We have not recorded a receivable for these refundable cash credits at December 31, 2019 as collectability was not probable or reasonably assured. For our 2019 tax year, we have not yet decided whether to seek tax relief by surrendering some of our losses for refundable cash credits or electing to receive enhanced U.K. tax deductions on our eligible R&D activities. Under U.K's tax legislation, there is a two-year window after the end of a tax year to seek relief under this scheme.

Note 16 — Selected Quarterly Financial Information (Unaudited)

The following tables show a summary of our quarterly financial information for each of the four quarters of 2019 and 2018 and have been prepared in accordance with GAAP for interim financial information. In the opinion of management, all adjustments (consisting of normal recurring accruals) considered necessary for a fair presentation have been included.

	2019 Quarter Ended			
	March 31	June 30	September 30	December 31
	(in thousands, except per share amounts)			
Revenue	$ —	$ 1,069	$ 630	$ 1,949
Loss from continuing operations	$ (35,202)	$ (37,763)	$ (290,478)	$ (56,060)
Loss from discontinued operations	$ —	$ —	$ —	$ —
Net loss	$ (35,202)	$ (37,763)	$ (290,478)	$ (56,060)
Net loss per share, basic and diluted	$ (0.83)	$ (0.89)	$ (6.75)	$ (1.26)

	2018 Quarter Ended			
	March 31	June 30	September 30	December 31
	(in thousands, except per share amounts)			
Revenue	$ —	$ —	$ —	$ —
Loss from continuing operations	$ (30,180)	$ (28,839)	$ (42,264)	$ (22,433)
Loss from discontinued operations	$ —	$ (198)	$ —	$ —
Net loss	$ (30,180)	$ (29,037)	$ (42,264)	$ (22,433)
Net loss per share, basic and diluted	$ (0.87)	$ (0.83)	$ (1.08)	$ (0.53)

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

None.

Item 9A. Controls and Procedures

Conclusions Regarding the Effectiveness of Disclosure Controls and Procedures

We maintain disclosure controls and procedures that are designed to ensure that information required to be disclosed in our Exchange Act reports is recorded, processed, summarized and reported within the timelines specified in the SEC's rules and forms, and that such information is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate, to allow timely decisions regarding required disclosure. In designing and evaluating the disclosure controls and procedures, management recognized that any controls and procedures, no matter how well designed and operated, can only provide reasonable assurance of achieving the desired control objectives, and in reaching a reasonable level of assurance, management necessarily was required to apply its judgment in evaluating the cost-benefit relationship of possible controls and procedures.

As required by SEC Rule 13a-15(b), we carried out an evaluation, under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, of the effectiveness of the design and operation of our disclosure controls and procedures, as of the end of the period covered by this report. Based on the foregoing, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were effective as of December 31, 2019 at the reasonable assurance level.

Changes in Internal Control Over Financial Reporting

There have been no changes in our internal control over financial reporting during our most recent fiscal quarter that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Management's Annual Report on Internal Control Over Financial Reporting

Internal control over financial reporting refers to the process designed by, or under the supervision of, our Chief Executive Officer and Chief Financial Officer, and effected by our board of directors, management and other personnel, 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, and includes those policies and procedures that: (1) pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of our assets; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that our receipts and expenditures are being made only in accordance with authorizations of our management and directors; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the company's assets that could have a material effect on the financial statements.

Internal control over financial reporting cannot provide absolute assurance of achieving financial reporting objectives because of its inherent limitations. Internal control over financial reporting is a process that involves human diligence and compliance and is subject to lapses in judgment and breakdowns resulting from human failures. Internal control over financial reporting also can be circumvented by collusion or improper management override. Because of such limitations, there is a risk that material misstatements may not be prevented or detected on a timely basis by internal control over financial reporting. However, these inherent limitations are known features of the financial reporting process. Therefore, it is possible to design into the process safeguards to reduce, though not eliminate, this risk.

Management is responsible for establishing and maintaining adequate internal control over our financial reporting, as such term is defined in Rule 13a-15(f) under the Exchange Act. Under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting. Management has used the framework set forth in the report entitled "*Internal Control — Integrated Framework (2013)*" published by the Committee of Sponsoring Organizations of the Treadway Commission to evaluate the effectiveness of our internal control over financial reporting. Based on this evaluation, management has concluded that our internal control over financial reporting was effective as of December 31, 2019, the end of our most recent fiscal year. Pursuant to Section 404(c) of the Sarbanes-Oxley Act, our independent registered public accounting firm has issued an attestation report on the effectiveness of our internal control over financial reporting for the year ended December 31, 2019, which is included below.

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Zogenix, Inc.

Opinion on Internal Control over Financial Reporting

We have audited Zogenix, Inc.'s internal control over financial reporting as of December 31, 2019, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) ("the COSO criteria"). In our opinion, Zogenix, Inc. ("the Company") maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the consolidated balance sheets of the Company as of December 31, 2019 and 2018, the related consolidated statements of operations, comprehensive loss, stockholders' equity, and cash flows for each of the three years in the period ended December 31, 2019, and the related notes and our report dated March 2, 2020 expressed an unqualified opinion thereon.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Annual Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects.

Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

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

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Ernst & Young LLP

Redwood City, California
March 2, 2020

Item 9B. Other Information

None.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

Information required by this item will be contained in our Definitive Proxy Statement to be filed with the Securities and Exchange Commission in connection with our 2020 Annual Meeting of Stockholders, which is expected to be filed not later than 120 days after the end of our fiscal year ended December 31, 2019, under the headings “Election of Directors,” “Corporate Governance and Other Matters,” “Executive Officers,” and “Section 16(a) Beneficial Ownership Reporting Compliance,” and is incorporated herein by reference .

We have adopted a Code of Business Conduct and Ethics that applies to our officers, directors and employees which is available on our internet website at www.zogenix.com. The Code of Business Conduct and Ethics contains general guidelines for conducting the business of our company consistent with the highest standards of business ethics, and is intended to qualify as a “code of ethics” within the meaning of Section 406 of the Sarbanes-Oxley Act of 2002 and Item 406 of Regulation S-K. In addition, we intend to promptly disclose (1) the nature of any amendment to our Code of Business Conduct and Ethics that applies to our principal executive officer, principal financial officer, principal accounting officer or controller or persons performing similar functions and (2) the nature of any waiver, including an implicit waiver, from a provision of our code of ethics that is granted to one of these specified officers, the name of such person who is granted the waiver and the date of the waiver on our website in the future.

Item 11. Executive Compensation

Information required by this item will be contained in our Definitive Proxy Statement under the heading “Executive Compensation and Other Information” and is incorporated herein by reference.

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

Information required by this item will be contained in our Definitive Proxy Statement under the headings “Security Ownership of Certain Beneficial Owners and Management” and is incorporated herein by reference.

Item 13. Certain Relationships, Related Transactions and Director Independence

Information required by this item will be contained in our Definitive Proxy Statement under the headings “Certain Relationships and Related Party Transactions” and “Independence of the Board of Directors” and is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services

Information required by this item will be contained in our Definitive Proxy Statement under the heading “Independent Registered Public Accounting Firm’s Fees” and is incorporated herein by reference.

PART IV

Item 15. Exhibits, Financial Statement Schedules

(a) Documents filed as part of this report

(1) All Financial Statements

(2) All Financial Statements

All financial statement schedules have been omitted, since the required information is not applicable or is not present in amounts sufficient to require submission of the schedule, or because the information required is included in the consolidated financial statements and accompanying notes included in this Form 10-K.

(3) Exhibits required by Item 601 of Regulation S-K

A list of exhibits to this Annual Report on Form 10-K is set forth in the following the Exhibit Index.

EXHIBIT INDEX

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File Number	Date of Filing	Exhibit No.	
2.1†	Sale and Purchase Agreement dated October 24, 2014 by and among the Registrant, Zogenix Europe Limited, Brabant Pharma Limited and Anthony Clarke, Richard Stewart, Ann Soenen-Darcis, Jennifer Watson, Rekyer Securities plc and Aquarius Life Science Limited, as sellers	8-K/A	001-34962	December 23, 2014	10.1	
2.2*	Agreement and Plan of Merger, dated August 23, 2019, by and among Zogenix, Inc., Xena Merger Sub, Inc., Modis Therapeutics, Inc. and Shareholder Representative Services, LLC, as the shareholders' representative	8-K	001-34962	August 26, 2019	2.1	
3.1	Fifth Amended and Restated Certificate of Incorporation	S-1/A	333-169210	October 27, 2010	3.5	
3.2	Certificate of Amendment of Fifth Amended and Restated Certificate of Incorporation	10-Q	001-34962	November 8, 2012	3.2	
3.3	Certificate of Amendment of Fifth Amended and Restated Certificate of Incorporation	10-Q	001-34962	August 10, 2015	3.3	
3.4	Certificate of Amendment of Fifth Amended and Restated Certificate of Incorporation	10-Q	001-34962	August 6, 2019	3.4	
3.5	Amended and Restated Bylaws	S-1/A	333-169210	October 27, 2010	3.7	
4.1	Form of the Registrant's Common Stock Certificate	S-1/A	333-169210	November 4, 2010	4.1	
4.2	Warrant dated July 18, 2011 issued by the Registrant to Healthcare Royalty Partners (formerly Cowen Healthcare Royalty Partners II, L.P.)	10-Q	001-34962	August 12, 2011	4.12	
4.3	Description of Registered Securities					X
10.1	Form of Director and Executive Officer Indemnification Agreement	S-1/A	333-169210	October 27, 2010	10.1	
10.2#	2006 Equity Incentive Plan, as amended, and forms of option agreements thereunder	S-1	333-169210	September 3, 2010	10.3	
10.3#	2010 Equity Incentive Award Plan, as amended through May 22, 2019	8-K	001-34962	May 22, 2019	10.1	
10.4#	2010 Employee Stock Purchase Plan and form of Offering document thereunder	S-1/A	333-169210	October 27, 2010	10.6	
10.5#	Form of Restricted Stock Unit Award Agreement under the 2010 Equity Incentive Award Plan	10-Q	001-34962	August 8, 2013	10.1	
10.6#	Form of Stock Option Grant Notice and Stock Option Agreement under the 2010 Equity Incentive Award Plan					X
10.7#	Employment Inducement Equity Incentive Award Plan and form of stock option agreement thereunder	8-K	001-34962	December 5, 2013	10.1	
10.8#	Annual Incentive Plan	10-Q	001-34962	May 11, 2015	10.3	
10.9#	Independent Director Compensation Policy as amended and restated effective March 14, 2018	10-Q	001-34962	May 9, 2018	10.1	

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File Number	Date of Filing	Exhibit No.	
10.10#	Amended and Restated Employment Agreement, dated April 27, 2015, by and between the Registrant and Stephen J. Farr, Ph.D.	10-Q	001-34962	August 10, 2015	10.4	
10.11#	Employment Agreement, dated June 29, 2015, by and between the Registrant and Gail M. Farfel, Ph.D.	10-Q	001-34962	August 10, 2015	10.5	
10.12#	Employment Agreement dated December 17, 2013 by and between the Registrant and Bradley S. Galer, M.D.	10-K	001-34962	March 7, 2014	10.44	
10.13#	Employment Agreement dated January 16, 2017, by and between the Registrant and Michael P. Smith	10-Q	001-34962	May 4, 2017	10.2	
10.14#	Employment Agreement dated July 2, 2018, by and between the Registrant and Ashish Sagrolikar	10-Q	001-34962	November 8, 2018	10.1	
10.15†	Collaboration and License Agreement dated as of October 23, 2014 by and among The Katholieke Universiteit Leuven, University Hospital Antwerp and Brabant Pharma Limited	10-Q	001-34962	November 6, 2014	10.5	
10.16	Office Lease dated August 5, 2014 by and between the Registrant and Kilroy Realty, L.P.	10-Q	001-34962	November 6, 2014	10.6	
10.17	Lease Agreement, dated October 1, 2018, by and between the Registrant and Emery Station West, LLC	10-K	001-34962	February 28, 2019	10.21	
10.18	Controlled Equity Offering Sales Agreement, dated May 10, 2016, by and between the Registrant and Cantor Fitzgerald & Co.	S-3	333-211265	May 10, 2016	1.2	
10.19+	Manufacturing and Supply Agreement dated January 31, 2019 by and between Zogenix International Limited and Aptuit (Oxford) Limited	10-Q	001-34962	May 9, 2019	10.1	
10.20+	Distributorship Agreement dated March 18, 2019 by and between the Registrant and Nippon Shinyaku Company, Ltd.	10-Q	001-34962	May 9, 2019	10.2	
10.21+	Exclusive License Agreement by and between the Trustees of Columbia University and Modis Therapeutics, Inc. (as successor-in-interest to Meves Pharmaceuticals, LLC), dated September 26, 2016	10-Q	001-34962	November 7, 2019	10.1	
10.22+	Amendment No. 1 to Exclusive License Agreement by and between the Trustees of Columbia University and Modis Therapeutics, Inc., dated December 5, 2019					X
10.23	Supply Agreement, by and between the Registrant and Penn Pharmaceutical Services Limited, trading as PCI Pharma Services, dated July 17, 2019	10-Q	001-34962	November 7, 2019	10.2	
21.1	Subsidiaries of the Registrant					X
23.1	Consent of Independent Registered Public Accounting Firm					X

Exhibit No.	Description	Incorporated by Reference				Filed Herewith
		Form	File Number	Date of Filing	Exhibit No.	
31.1	Certification of Chief Executive Officer pursuant to Section 302 of the Public Company Accounting Reform and Investor Protection Act of 2002 (18 U.S.C. §1350, as adopted)					X
31.2	Certification of Chief Financial Officer pursuant to Section 302 of the Public Company Accounting Reform and Investor Protection Act of 2002 (18 U.S.C. §1350, as adopted)					X
32.1‡	Certification of Chief Executive Officer pursuant to Section 906 of the Public Company Accounting Reform and Investor Protection Act of 2002 (18 U.S.C. §1350, as adopted)					
32.2‡	Certification of Chief Financial Officer pursuant to Section 906 of the Public Company Accounting Reform and Investor Protection Act of 2002 (18 U.S.C. §1350, as adopted)					X
101	Inline XBRL Document Set for the consolidated financial statements and accompanying notes in Part II, Item 8, “Financial Statements and Supplementary Data” of this Annual Report on Form 10-K.					X
104	Inline XBRL for the cover page of this Annual Report on Form 10-K, included in the Exhibit 101 Inline XBRL Document Set.					X

† Confidential treatment has been granted or requested, as applicable, for portions of this exhibit. These portions have been omitted from the Registration Statement and filed separately with the Securities and Exchange Commission

* Confidential portions of this Exhibit were redacted pursuant to Item 601(b)(2) of Regulation S-K and Zogenix, Inc. agrees to furnish supplementally to the Securities and Exchange Commission a copy of any redacted information or omitted schedule and/or exhibit upon request.

+ Confidential portions of this Exhibit were redacted pursuant to Item 601(b)(10) of Regulation S-K and Zogenix, Inc. agrees to furnish supplementally to the Securities and Exchange Commission a copy of any redacted information or omitted schedule and/or exhibit upon request.

# Indicates management contract or compensatory plan.

‡ Furnished herewith.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

ZOGENIX, INC.

Date: March 2, 2020

By: /s/ Stephen J. Farr
President and Chief Executive Officer

Date: March 2, 2020

By: /s/ Michael P. Smith
Executive Vice President, Chief Financial Officer, Treasurer and Secretary

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.

Name	Title	Date
/S/ STEPHEN J. FARR, PH.D. **Stephen J. Farr, Ph.D.**	President and Chief Executive Officer (Principal Executive Officer)	March 2, 2020
/S/ MICHAEL P. SMITH **Michael P. Smith**	Executive Vice President, Chief Financial Officer, Treasurer and Secretary (Principal Financial and Accounting Officer)	March 2, 2020
/S/ CAM L. GARNER **Cam L. Garner**	Chairman of the Board	March 2, 2020
/S/ LOUIS C. BOCK **Louis C. Bock**	Director	March 2, 2020
/S/ JAMES B. BREITMEYER, M.D., Ph.D. **James B. Breitmeyer, M.D., Ph.D**	Director	March 2, 2020
/S/ ERLE T. MAST **Erle T. Mast**	Director	March 2, 2020
/S/ RENEE TANNENBAUM, Pharm.D. **Renee Tannenbaum, Pharm.D.**	Director	March 2, 2020
/S/ MARK WIGGINS **Mark Wiggins**	Director	March 2, 2020

Exhibit 4.3

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

Zogenix, Inc. ("Zogenix," "we," "our" and "us") has one class of securities registered pursuant to Section 12 of the Securities Exchange Act of 1934, as amended: our common stock.

Description of Common Stock

General

The following summary of the terms of our common stock does not purport to be complete and is subject to and qualified in its entirety by reference to our Amended and Restated Certificate of Incorporation, as amended (certificate of incorporation), and Amended and Restated Bylaws (bylaws), which are filed as exhibits to our most recent Annual Report on Form 10-K and are incorporated by reference herein. We encourage you to read our certificate of incorporation and our bylaws for additional information.

Under our certificate of incorporation, the total number of shares of all classes of stock that we have authority to issue is 110,000,000, consisting of 10,000,000 shares of preferred stock, par value $0.001 per share, and 100,000,000 shares of common stock, par value $0.001 per share.

Common Stock

Voting Rights

The holders of our common stock are entitled to one vote for each share held of record on all matters submitted to a vote of the stockholders, including the election of directors, and do not have cumulative voting rights. Accordingly, the holders of a majority of the outstanding shares of common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they so choose, other than any directors that holders of any preferred stock we may issue may be entitled to elect. Pursuant to our bylaws, directors are elected upon a plurality of the votes cast.

Dividends

Subject to limitations under Delaware law and preferences that may be applicable to any then outstanding preferred stock, holders of common stock are entitled to receive ratably those dividends, if any, as may be declared by our board of directors out of legally available funds.

Liquidation

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

Rights and Preferences

Holders of common stock have no preemptive or conversion rights or other subscription rights and there are no redemption or sinking funds provisions applicable to the common stock. The rights, preferences and privileges of holders of common stock are subject to and may be adversely affected by the rights of the holders of shares of any series of preferred stock that we may designate and issue in the future.

Fully Paid and Nonassessable

All outstanding shares of common stock are duly authorized, validly issued, fully paid and nonassessable.

Anti-Takeover Effects of Delaware Law and Our Certificate of Incorporation and Bylaws

Some provisions of Delaware law, our certificate of incorporation and our bylaws contain provisions that could make the following transactions more difficult: an acquisition of us by means of a tender offer; an acquisition of us by means of a proxy contest or otherwise; or the removal of our incumbent officers and directors. It is possible that these provisions could make it

more difficult to accomplish or could deter transactions that stockholders may otherwise consider to be in their best interest or in our best interests, including transactions which provide for payment of a premium over the market price for our shares.

These provisions, summarized below, are intended to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed to encourage persons seeking to acquire control of us to first negotiate with our board of directors. We believe that the benefits of the increased protection of our potential ability to negotiate with the proponent of an unfriendly or unsolicited proposal to acquire or restructure us outweigh the disadvantages of discouraging these proposals because negotiation of these proposals could result in an improvement of their terms.

Undesignated Preferred Stock

The ability of our board of directors, without action by the stockholders, to issue up to 10,000,000 shares of undesignated preferred stock with voting or other rights or preferences as designated by our board of directors could impede the success of any attempt to change control of us. These and other provisions may have the effect of deferring hostile takeovers or delaying changes in control or management of our company.

Stockholder Meetings

Our bylaws provide that a special meeting of stockholders may be called only by our chairman of the board, chief executive officer or president, or by a resolution adopted by a majority of our board of directors.

Requirements for Advance Notification of Stockholder Nominations and Proposals

Our bylaws establish advance notice procedures with respect to stockholder proposals to be brought before a stockholder meeting and the nomination of candidates for election as directors, other than nominations made by or at the direction of the board of directors or a committee of the board of directors.

Elimination of Stockholder Action by Written Consent

Our certificate of incorporation and bylaws eliminate the right of stockholders to act by written consent without a meeting.

Staggered Board

Our board of directors is divided into three classes. The directors in each class will serve for a three-year term, one class being elected each year by our stockholders. This system of electing and removing directors may tend to discourage a third-party from making a tender offer or otherwise attempting to obtain control of us, because it generally makes it more difficult for stockholders to replace a majority of the directors.

Removal of Directors

Our certificate of incorporation provides that no member of our board of directors may be removed from office by our stockholders except for cause and, in addition to any other vote required by law, upon the approval of not less than two-thirds (66 2/3%) of the total voting power of all of our outstanding voting stock then entitled to vote in the election of directors.

Stockholders Not Entitled to Cumulative Voting

Our certificate of incorporation does not permit stockholders to cumulate their votes in the election of directors. Accordingly, the holders of a majority of the outstanding shares of our common stock entitled to vote in any election of directors can elect all of the directors standing for election, if they choose, other than any directors that holders of our preferred stock may be entitled to elect.

Delaware Anti-Takeover Statute

We are subject to Section 203 of the Delaware General Corporation Law. This statute regulating corporate takeovers prohibits a Delaware corporation from engaging in any business combination with any interested stockholder for three years following the date that the stockholder became an interested stockholder, unless:

- prior to the date of the transaction, the Board approved either the business combination or 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 number of shares outstanding (a) shares owned by persons who are directors and also officers and (b) shares owned by employee stock plans in which employee participants do not have the right to determine confidentially whether shares held subject to the plan will be tendered in a tender or exchange offer; or
- on or subsequent to the date of the transaction, the business combination is approved by the Board and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least two-thirds (66 2/3%) 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, 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;
- 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; or
- 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 an 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 such entity or person.

Amendment of Charter Provisions

The amendment of any of the above provisions, except for the provision making it possible for our board of directors to issue preferred stock, would require approval by holders of at least two-thirds (66 2/3%) of the total voting power of all of our outstanding voting stock.

The provisions of Delaware law, our certificate of incorporation and our bylaws could have the effect of discouraging others from attempting hostile takeovers and, as a consequence, they may also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions may also have the effect of preventing changes in the composition of our board and management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders may otherwise deem to be in their best interests.

Listing

Our common stock is listed for trading on the Nasdaq Global Market under the symbol “ZGNX.”

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company, LLC.

Exhibit 10.6

ZOGENIX, INC.

2010 EQUITY INCENTIVE AWARD PLAN

STOCK OPTION GRANT NOTICE AND STOCK OPTION AGREEMENT

Zogenix, Inc., a Delaware corporation (the "***Company***"), pursuant to its 2010 Equity Incentive Award Plan (the "***Plan***"), hereby grants to the holder listed below ("***Participant***"), an option to purchase the number of shares of the Company's Stock set forth below (the "***Option***"). This Option is subject to all of the terms and conditions set forth herein and in the Stock Option Agreement attached hereto as Exhibit A (the "***Stock Option Agreement***") and the Plan, which are incorporated herein by reference. Unless otherwise defined herein, the terms defined in the Plan shall have the same defined meanings in this Grant Notice and the Stock Option Agreement.

Participant:	_____
Grant Date:	_____
Vesting Commencement Date:	_____
Exercise Price per Share of Stock:	$
Total Exercise Price:	$
Total Number of Shares of Stock Subject to the Option:	_____ shares
Expiration Date:	_____

Type of Option: ☐ Incentive Stock Option ☐ Non-Qualified Stock Option

Vesting Schedule: [To be specified in individual agreements]

By his or her signature, Participant agrees to be bound by the terms and conditions of the Plan, the Stock Option Agreement and this Grant Notice. Participant has reviewed the Stock Option Agreement, the Plan and this Grant Notice in their entirety, has had an opportunity to obtain the advice of counsel prior to executing this Grant Notice and fully understands all provisions of this Grant Notice, the Stock Option Agreement and the Plan. Participant hereby agrees to accept as binding, conclusive and final all decisions or interpretations of the Administrator upon any questions arising under the Plan or relating to the Option.

ZOGENIX, INC.		**PARTICIPANT**	
By:	_____	By:	_____
Print Name:	_____	Print Name:	_____
Title:	_____		
Address:	_____	Address:	_____
	_____		_____

EXHIBIT A

TO STOCK OPTION GRANT NOTICE

STOCK OPTION AGREEMENT

Pursuant to the Stock Option Grant Notice (the "***Grant Notice***") to which this Stock Option Agreement (this "***Agreement***") is attached, Zogenix, Inc., a Delaware corporation (the "***Company***"), has granted to Participant an Option under the Company's 2010 Equity Incentive Award Plan (the "***Plan***") to purchase the number of shares of Stock indicated in the Grant Notice.

ARTICLE I
GENERAL

1.1 Defined Terms. Capitalized terms not specifically defined herein shall have the meanings specified in the Plan and the Grant Notice.

1.2 Incorporation of Terms of Plan. The Option is subject to the terms and conditions of the Plan which are incorporated herein by reference. In the event of any inconsistency between the Plan and this Agreement, the terms of the Plan shall control.

ARTICLE II
GRANT OF OPTION

2.1 Grant of Option. In consideration of Participant's past and/or continued employment with or service to the Company or a Parent or Subsidiary and for other good and valuable consideration, effective as of the Grant Date set forth in the Grant Notice (the "***Grant Date***"), the Company irrevocably grants to Participant the Option to purchase any part or all of an aggregate of the number of shares of Stock set forth in the Grant Notice, upon the terms and conditions set forth in the Plan, the Grant Notice and this Agreement. Unless designated as a Non-Qualified Stock Option in the Grant Notice, the Option shall be an Incentive Stock Option to the maximum extent permitted by law.

2.2 Exercise Price. The exercise price of the shares of Stock subject to the Option shall be as set forth in the Grant Notice, without commission or other charge; *provided*, *however*, that the price per share of the shares of Stock subject to the Option shall not be less than 100% of the Fair Market Value of a share of Stock on the Grant Date. Notwithstanding the foregoing, if this Option is designated as an Incentive Stock Option and the Participant owns (within the meaning of Section 424(d) of the Code) more than 10% of the total combined voting power of all classes of stock of the Company or any "subsidiary corporation" of the Company or any "parent corporation" of the Company (each within the meaning of Section 424 of the Code), the price per share of the shares of Stock subject to the Option shall not be less than 110% of the Fair Market Value of a share of Stock on the Grant Date.

2.3 No Right to Continued Employment. Nothing in the Plan, the Grant Notice, or this Agreement shall confer upon the Participant any right to continue in the employ or service of the Company or any Parent or Subsidiary or shall interfere with or restrict in any way the rights of the Company and any Parent or Subsidiary, which rights are hereby expressly reserved, to discharge or terminate the services of the Participant at any time for any reason whatsoever, except to the extent expressly provided otherwise in a written agreement between the Company or a Parent or Subsidiary and the Participant.

ARTICLE III

PERIOD OF EXERCISABILITY

3.1 Commencement of Exercisability.

(a) Subject to Sections 3.2, 3.3 and 5.6, the Option shall become vested and exercisable in such amounts and at such times as are set forth in the Grant Notice.

(b) No portion of the Option which has not become vested and exercisable at the date of Participant's Termination of Service shall thereafter become vested and exercisable, except as may be otherwise provided in the Grant Notice or provided by the Administrator or as set forth in a written agreement between the Company and Participant.

3.2 Duration of Exercisability. The installments provided for in the vesting schedule set forth in the Grant Notice are cumulative. Each such installment which becomes vested and exercisable pursuant to the vesting schedule set forth in the Grant Notice shall remain vested and exercisable until it becomes unexercisable under Section 3.3.

3.3 Expiration of Option. The Option may not be exercised to any extent by anyone after the first to occur of the following events:

(a) The expiration of ten years from the Grant Date;

(b) If this Option is designated as an Incentive Stock Option and Participant owned (within the meaning of Section 424(d) of the Code), at the time the Option was granted, more than 10% of the total combined voting power of all classes of stock of the Company or any "subsidiary corporation" of the Company or any "parent corporation" of the Company (each within the meaning of Section 424 of the Code), the expiration of five years from the Grant Date;

(c) The expiration of three months following the date of Participant's Termination of Service, unless such termination occurs by reason of Participant's death, Disability or for Misconduct;

(d) The expiration of one year from the date of Participant's death if Participant dies prior to his or her Termination of Service or within three months after his or her Termination of Service;

(e) The expiration of one year from the date of Participant's Termination of Service by reason of the Participant's Disability; or

(f) The date of Participant's Termination of Service by the Company for Misconduct.

If the Option is an Incentive Stock Option, note that, to obtain the federal income tax advantages associated with an "incentive stock option," the Code requires that at all times beginning on the date of grant of the Option and ending on the day three months before the date of Option's exercise, Participant must be an Employee of the Company or an affiliate, except in the event of Participant's death or Disability. The Company has provided for extended exercisability of Participant's Option under certain circumstances for Participant's benefit but cannot guarantee that Participant's Option will

necessarily be treated as an "incentive stock option" if Participant continues to be employed by or provide services to the Company or an affiliate as a Consultant or Director after Participant's employment terminates or if Participant otherwise exercises its options more than three months after the date Participant's employment terminates.

3.4 Special Tax Consequences. Participant acknowledges that, to the extent that the aggregate Fair Market Value (determined as of the time the Option is granted) of all shares of Stock with respect to which Incentive Stock Options, including the Option, are exercisable for the first time by Participant in any calendar year exceeds $100,000, the Option and such other options shall be Non-Qualified Stock Options to the extent necessary to comply with the limitations imposed by Section 422(d) of the Code. Participant further acknowledges that the rule set forth in the preceding sentence shall be applied by taking the Option and other "incentive stock options" into account in the order in which they were granted, as determined under Section 422(d) of the Code and the Treasury Regulations thereunder.

ARTICLE IV

EXERCISE OF OPTION

4.1 Person Eligible to Exercise. Except as provided in Section 5.1, during the lifetime of the Participant, only Participant may exercise the Option or any portion thereof, unless it has been disposed of pursuant to a DRO. After the death of Participant, any exercisable portion of the Option may, prior to the time when the Option becomes unexercisable under Section 3.3, be exercised by Participant's personal representative or by any person empowered to do so under the deceased Participant's will or under the then applicable laws of descent and distribution.

4.2 Partial Exercise. Any exercisable portion of the Option or the entire Option, if then wholly exercisable, may be exercised in whole or in part at any time prior to the time when the Option or portion thereof becomes unexercisable under Section 3.3.

4.3 Manner of Exercise. The Option, or any exercisable portion thereof, may be exercised solely by delivery to the Secretary of the Company (or any third party administrator or other person or entity designated by the Company) of all of the following prior to the time when the Option or such portion thereof becomes unexercisable under Section 3.3:

(a) An Exercise Notice in writing signed by Participant or any other person then entitled to exercise the Option or portion thereof, stating that the Option or portion thereof is thereby exercised, such notice complying with all applicable rules established by the Administrator. Such notice shall be substantially in the form attached as Exhibit B to the Grant Notice (or such other form as is prescribed by the Administrator);

(b) The receipt by the Company of full payment for the shares of Stock with respect to which the Option or portion thereof is exercised, including payment of any applicable withholding tax, which may be in one or more of the forms of consideration permitted under Section 4.4;

(c) Any other written representations as may be required in the Administrator's reasonable discretion to evidence compliance with the Securities Act or any other applicable law, rule, or regulation; and

(d) In the event the Option or portion thereof shall be exercised pursuant to Section 4.1 by any person or persons other than Participant, appropriate proof of the right of such person or persons to exercise the Option.

Notwithstanding any of the foregoing, the Company shall have the right to specify all conditions of the manner of exercise, which conditions may vary by country and which may be subject to change from time to time.

4.4 Method of Payment. Payment of the exercise price and any applicable withholding tax shall be by any of the following, or a combination thereof, at the election of Participant, subject to Section 10.1 of the Plan:

(a) Cash;

(b) Check;

(c) Delivery of a notice that the Participant has placed a market sell order with a broker with respect to shares of Stock then issuable upon exercise of the Option, and that the broker has been directed to pay a sufficient portion of the net proceeds of the sale to the Company in satisfaction of the aggregate exercise price; *provided*, that payment of such proceeds is then made to the Company upon settlement of such sale;

(d) With the consent of the Administrator, by delivery of a full recourse promissory note on such terms and conditions as may be approved by the Administrator;

(e) With the consent of the Administrator, surrender of other shares of Stock which (A) in the case of shares of Stock acquired from the Company, have been owned by the Participant for more than six (6) months on the date of surrender (or such longer or shorter period as may be determined by the Administrator), and (B) have a Fair Market Value on the date of surrender equal to the aggregate exercise price of the shares of Stock with respect to which the Option or portion thereof is being exercised;

(f) With the consent of the Administrator, surrendered shares of Stock issuable upon the exercise of the Option having a Fair Market Value on the date of exercise equal to the aggregate exercise price of the shares of Stock with respect to which the Option or portion thereof is being exercised; or

(g) With the consent of the Administrator, property of any kind which constitutes good and valuable consideration.

(h) Notwithstanding any other provision of the Plan or this Agreement, if Participant is a Director or "executive officer" of the Company within the meaning of Section 13(k) of the Exchange Act, he or she shall not be permitted to make payment pursuant to this

Section 4.4, or continue any extension of credit with respect to such payment with a loan from the Company or a loan arranged by the Company, in violation of Section 13(k) of the Exchange Act.

4.5 Conditions to Issuance of Stock Certificates. The shares of Stock deliverable upon the exercise of the Option, or any portion thereof, may be either previously authorized but unissued shares of Stock or issued shares of Stock which have then been reacquired by the Company. Such shares of Stock shall be fully paid and nonassessable. The Company shall not be required to issue or deliver any shares of Stock purchased upon the exercise of the Option or portion thereof prior to fulfillment of all of the following conditions:

(a) The admission of such shares of Stock to listing on all stock exchanges on which such Stock is then listed;

(b) The completion of any registration or other qualification of such shares of Stock under any state or federal law or under rulings or regulations of the Securities and Exchange Commission or of any other governmental regulatory body, which the Administrator shall, in its discretion, deem necessary or advisable;

(c) The obtaining of any approval or other clearance from any state or federal governmental agency which the Administrator shall, in its discretion, determine to be necessary or advisable;

(d) The lapse of such reasonable period of time following the exercise of the Option as the Administrator may from time to time establish for reasons of administrative convenience; and

(e) The receipt by the Company of full payment for such shares of Stock, including payment of any applicable withholding tax, which may be in one or more of the forms of consideration permitted under Section 4.4.

4.6 Rights as Stockholder. The holder of the Option shall not be, nor have any of the rights or privileges of, a stockholder of the Company in respect of any shares of Stock purchasable upon the exercise of any part of the Option unless and until such shares of Stock shall have been issued by the Company to such holder (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company) and, once issued, such shares of Stock shall be freely tradeable and non-forfeitable. No adjustment will be made for a dividend or other right for which the record date is prior to the date the shares of Stock are issued, except as provided in Article 11 of the Plan.

ARTICLE V

OTHER PROVISIONS

5.1 Option Generally Not Transferable.

(a) Subject to Section 5.1(c), the Option may not be sold, pledged, assigned or transferred in any manner other than by will or the laws of descent and distribution or, subject to the consent of the Administrator, pursuant to a DRO, unless and until the shares of Stock underlying the Option have been issued, and all restrictions applicable to such shares of Stock have lapsed. Neither the Option nor any interest or right therein shall be liable for the debts, contracts or engagements of Participant or his or her successors in interest or shall be subject to disposition by transfer, alienation, anticipation, pledge, encumbrance, assignment or any other means whether such disposition be voluntary or involuntary or by operation of law by judgment, levy, attachment, garnishment or any other legal or equitable proceedings (including bankruptcy), and any attempted disposition thereof shall be null and void and of no effect, except to the extent that such disposition is permitted by the preceding sentence.

(b) Unless transferred to a Permitted Transferee in accordance with Section 5.1(c), during the lifetime of Participant, only Participant may exercise the Option or any portion thereof, unless it has been disposed of pursuant to a DRO. After the death of Participant, any exercisable portion of the Option may, prior to the time when the Option becomes unexercisable under Section 3.3, be exercised by Participant's personal representative or by any person empowered to do so under the deceased Participant's will or under the then applicable laws of descent and distribution.

(c) Notwithstanding any other provision in this Agreement, with the consent of the Administrator and to the extent the Option is designated as a Non-Qualified Stock Option, the Option may be transferred to, exercised by and paid to one or more Permitted Transferees, subject to the terms and conditions set forth in Section 10.3 of the Plan. Subject to such conditions and procedures as the Administrator may require, a Permitted Transferee may exercise the Option or any portion thereof during the Participant's lifetime.

5.2 Adjustments. The Participant acknowledges that the Option is subject to modification and termination in certain events as provided in this Agreement and Article 11 of the Plan.

5.3 Notices. Any notice to be given under the terms of this Agreement to the Company shall be addressed to the Company in care of the Secretary of the Company at the address given beneath the signature of the Company's authorized officer on the Grant Notice, and any notice to be given to Participant shall be addressed to Participant at the address given beneath Participant's signature on the Grant Notice. By a notice given pursuant to this Section 5.3, either party may hereafter designate a different address for notices to be given to that party. Any notice which is required to be given to Participant shall, if Participant is then deceased, be given to the person entitled to exercise his or her Option pursuant to Section 4.1 by written notice under this Section 5.3. Any notice shall be deemed duly given when sent via email or when sent by certified mail (return receipt requested) and deposited (with postage prepaid) in a post office or branch post office regularly maintained by the United States Postal Service.

5.4 Titles. Titles are provided herein for convenience only and are not to serve as a basis for interpretation or construction of this Agreement.

5.5 Governing Law; Severability. The laws of the State of California shall govern the interpretation, validity, administration, enforcement and performance of the terms of this Agreement regardless of the law that might be applied under principles of conflicts of laws. Should any provision of this Agreement be determined by a court of law to be illegal or unenforceable, the other provisions shall nevertheless remain effective and shall remain enforceable.

5.6 Conformity to Securities Laws. Participant acknowledges that the Plan, the Grant Notice and this Agreement are intended to conform to the extent necessary with all provisions of the Securities Act and the Exchange Act and any and all regulations and rules promulgated by the Securities and Exchange Commission thereunder, and state securities laws and regulations. Notwithstanding anything herein to the contrary, the Plan shall be administered, and the Option is granted and may be exercised, only in such a manner as to conform to such laws, rules and regulations. To the extent permitted by applicable law, the Plan, the Grant Notice and this Agreement shall be deemed amended to the extent necessary to conform to such laws, rules and regulations.

5.7 Entire Agreement; Amendments. The Plan and this Agreement (including all Exhibits hereto) constitute the entire agreement of the parties and supersede in their entirety all prior undertakings and agreements of the Company and Participant with respect to the subject matter hereof. This Agreement may not be modified, amended or terminated except by an instrument in writing, signed by Participant or such other person as may be permitted to exercise the Option pursuant to Section 4.1 and by a duly authorized representative of the Company.

5.8 Successors and Assigns. The Company may assign any of its rights under this Agreement to single or multiple assignees, and this Agreement shall inure to the benefit of the successors and assigns of the Company. Subject to the restrictions on transfer herein set forth in Section 5.1, this Agreement shall be binding upon Participant and his or her heirs, executors, administrators, successors and assigns.

5.9 Notification of Disposition. If this Option is designated as an Incentive Stock Option, Participant shall give prompt notice to the Company of any disposition or other transfer of any shares of Stock acquired under this Agreement if such disposition or transfer is made (a) within two years from the Grant Date with respect to such shares of Stock or (b) within one year after the transfer of such shares of Stock to the Participant. Such notice shall specify the date of such disposition or other transfer and the amount realized, in cash, other property, assumption of indebtedness or other consideration, by Participant in such disposition or other transfer.

5.10 Limitations Applicable to Section 16 Persons. Notwithstanding any other provision of the Plan or this Agreement, if Participant is subject to Section 16 of the Exchange Act, the Plan, the Option and this Agreement shall be subject to any additional limitations set forth in any applicable exemptive rule under Section 16 of the Exchange Act (including any amendment to Rule 16b-3 of the Exchange Act) that are requirements for the application of such exemptive rule. To the extent permitted by applicable law, this Agreement shall be deemed amended to the extent necessary to conform to such applicable exemptive rule.

5.11 Not a Contract of Employment. Nothing in this Agreement, the Grant Notice, or the Plan shall confer upon the Participant any right to continue to serve as an employee or other service provider of the Company or any Parent or Subsidiary.

EXHIBIT B

TO STOCK OPTION GRANT NOTICE

FORM OF EXERCISE NOTICE

Effective as of today, _____, _____ the undersigned *(*"***Participant***") hereby elects to exercise Participant's option to purchase _____ shares of the Stock (the "***Shares***") of Zogenix, Inc. (the "***Company***") under and pursuant to the Zogenix, Inc. 2010 Equity Incentive Award Plan (the "***Plan***") and the Stock Option Grant Notice and Stock Option Agreement dated _____, ____ (the "***Option Agreement***"). Capitalized terms used herein without definition shall have the meanings given in the Option Agreement.

Grant Date:	_____
Number of Shares of Stock as to which Option is Exercised:	_____
Exercise Price per Share of Stock:	$_____
Total Exercise Price:	$_____
Certificate to be issued in name of:	_____
Cash Payment delivered herewith:	$_____ (Representing the full Exercise Price for the Shares, as well as any applicable withholding tax)

Type of Option: ☐ Incentive Stock Option ☐ Non-Qualified Stock Option

1. Representations of Participant. Participant acknowledges that Participant has received, read and understood the Plan and the Option Agreement. Participant agrees to abide by and be bound by their terms and conditions

2. Rights as Stockholder. Until the Shares are issued (as evidenced by the appropriate entry on the books of the Company or of a duly authorized transfer agent of the Company), no right to vote or receive dividends or any other rights as a stockholder shall exist with respect to Shares subject to the Option, notwithstanding the exercise of the Option. No adjustment will be made for a dividend or other right for which the record date is prior to the date the Shares are issued, except as provided in Article 11 of the Plan. The Shares shall be freely tradeable and non-forfeitable.

3. Tax Consultation. Participant understands that Participant may suffer adverse tax consequences as a result of Participant's purchase or disposition of the Shares. Participant represents that Participant has consulted with any tax consultants Participant deems advisable in connection with the purchase or disposition of the Shares and that Participant is not relying on the Company for any tax advice.

4. Successors and Assigns. This Agreement shall inure to the benefit of the successors and assigns of the Company. Subject to the restrictions on transfer herein set forth, this Agreement shall be binding upon Participant and his or her heirs, executors, administrators, successors and assigns.

5. Interpretation. Any dispute regarding the interpretation of this Agreement shall be submitted by Participant or by the Company forthwith to the Administrator, which shall review such dispute at its next regular meeting. The resolution of such a dispute by the Administrator shall be final and binding on the Company and on Participant.

6. Governing Law; Severability. This Agreement shall be governed by and construed in accordance with the laws of the State of California, excluding that body of law pertaining to conflicts of law. Should any provision of this Agreement be determined by a court of law to be illegal or unenforceable, the other provisions shall nevertheless remain effective and shall remain enforceable.

7. Notices. Any notice required or permitted hereunder shall be given in accordance with the provisions set forth in Section 5.3 of the Option Agreement.

8. Further Instruments. The parties agree to execute such further instruments and to take such further action as may be reasonably necessary to carry out the purposes and intent of this Agreement.

9. Entire Agreement. The Plan and Option Agreement are incorporated herein by reference. This Agreement, the Plan and the Option Agreement constitute the entire agreement of the parties and supersede in their entirety all prior undertakings and agreements of the Company and Participant with respect to the subject matter hereof.

ACCEPTED BY:

ZOGENIX, INC.

By: ___
Print Name: ___
Title: ___

SUBMITTED BY:

PARTICIPANT

By: ___
Print Name: ___

Address:

_____

_____

Exhibit 10.23

Amendment No. 1 to Exclusive License Agreement

This Amendment to the Exclusive License Agreement (this "**Amendment No. 1**") is entered into and effective as of December 5, 2019 ("**Amendment No. 1 Effective Date**") by and between THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK, a New York corporation ("**Columbia**"), and MODIS THERAPEUTICS, INC., a Delaware limited liability company ("**Company**"). Columbia and Company shall be collectively referred to hereinafter as the "**Parties**."

WHEREAS, Columbia and Company (f/k/a Meves Pharmaceuticals, LLC) entered into that certain Exclusive License Agreement dated September 26, 2016 with respect to a certain therapy for the treatment for thymidine kinase 2 deficiency (TK2d), which therapy involves the use of a combination of nucleosides, including deoxycytidine and deoxythymidine (the "**Agreement**"); and

WHEREAS, the Parties desire to amend and clarify certain terms of the Agreement on the terms and subject to the conditions set forth in this Amendment.

NOW, THEREFORE, in consideration of the mutual covenants set forth in the Agreement and this Amendment No. 1 and for other good and valuable consideration, the receipt and sufficiency of which the Parties acknowledge, the Parties agree as follows:

1. Amendment to Section 1(c). Section 1(c) of the Agreement is hereby amended and restated in its entirety as set forth below:

   "c. "Challenge" means [***]"

2. Amendment to Section 2(b). Section 2(b) of the Agreement is hereby amended and restated in its entirety as set forth below:

   "b. Columbia grants to Company the right to grant sublicenses (through multiple tiers) under the rights granted to it pursuant to Section 2a, provided that: (i) any sublicense granted to any Affiliate or Sublicensee shall be in writing and shall be subject to, and consistent with, the terms and provisions of this Agreement applicable to the Sublicensee's exercise of the rights under its sublicense (excluding for clarity the payment obligations set forth Section 4 herein); (ii) in the event any Sublicensee (or any entity or person acting on its behalf) initiates any Challenge, Company shall, upon written request by Columbia, terminate forthwith the sublicense agreement with such Sublicensee unless such Sublicensee terminates or withdraws such Challenge within thirty (30) days of receipt of notice of termination from Company, and the sublicense agreement shall provide for such right of termination by Company; (iii) the sublicense agreement shall provide that, in the event of any inconsistency between the sublicense agreement and this Agreement, this Agreement shall control; (iv) the Sublicensee will submit annual reports to Company consistent with the reporting provision of Section 5a herein; (v) Company remains fully liable for the performance of its obligations hereunder and its Sublicensee's compliance with the terms and provisions of this Agreement applicable to the Sublicensee's exercise of the rights under its sublicense; (vi) Company provides to Columbia, upon request, a copy

of any sublicense agreement within thirty (30) days following the execution thereof, provided such copy may be reasonably redacted to exclude confidential information of Company, its Affiliates or Sublicensee that is not reasonably necessary for assessing Company's compliance with this Section 2b.; and (vii) no such sublicense or attempt to obtain a sublicensee shall relieve Company of its obligations under Section 6 hereof to exercise Commercially Reasonable Efforts, directly or through a sublicense, to research, discover, develop and market Products, nor relieve Company of its obligations to pay Columbia any and all license fees, royalties and other payments due under the Agreement, including but not limited to under Sections 4, 5 and 11 of the Agreement."

3. Amendment to Section 2(c). Section 2(c) of the Agreement is hereby amended by inserting the following sentence after the second sentence of the section:

"At the request of Company, Columbia shall seek to obtain, and/or assist Company in seeking to obtain, a waiver from the applicable government agency to permit the manufacture of Product outside the United States."

4. Amendment to Section 3(a). Section 3(a) of the Agreement is hereby amended by deleting the following sentence:
"Nothing in this Agreement shall be interpreted to limit in any way the right of
Columbia and its faculty or employees to practice and use such Patents and Materials for any purpose outside the Field or to license or permit such use outside the Field by third parties."

5. Amendment to Section 4(f). Section 4(f) of the Agreement is hereby amended and restated in its entirety as set forth below:

"f. Duration of Product Royalties. Royalties shall be payable on a country-by-country and Product-by-Product basis until the later of (i) [***] after the first bona fide commercial sale of a Product anywhere in the Territory, (ii) the expiration of the last to expire Valid Claim Covering a Product in such country, or (iii) expiration of any Regulatory Exclusivity Covering such Product in such country (the "Royalty Term")."

6. Amendment to Section 6(b). Section 6(b) of the Agreement is hereby amended by replacing the first sentence of the section with the following sentence:

"Company shall use Commercially Reasonable Efforts to achieve the first commercial sale of a Product within [***] from the Effective Date."

7. Amendment to Section 6(c). Section 6(c) of the Agreement is hereby deleted in its entirety.

8. Amendment to Article 13. Article 13 of the Agreement is hereby amended and restated in its entirety as set forth below:

"Company shall mark all Patent Products (or their containers) made, sold, offered for sale, imported, or otherwise disposed of by Company under the license granted in this Agreement in accordance with applicable law. The Company shall cause its Affiliates to

comply with the marking requirements of this Section 13 and shall contractually require its Sublicensees, Designees and their Affiliates to comply with such requirements."

9. Amendment to Article 15. Article 15 of the Agreement is hereby deleted in its entirety.

10. Amendment to Article 18. Article 18 of the Agreement is hereby amended and restated in its entirety as set forth below:

"18. Assignment. Neither party may assign this Agreement, or any of its rights or obligations hereunder without the other party's prior written consent, which consent shall not be unreasonably withheld, provided that, notwithstanding the foregoing, each party shall be entitled, without the other Party's prior written consent, to assign or transfer this Agreement: (a) to an Affiliate, (b) in connection with the transfer or sale of all or substantially all of such party's assets or business related to this Agreement, or (c) in the event of such party's merger, consolidation, reorganization, Change of Control or similar transaction. Any permitted assignee of either party shall, as a condition to such assignment, assume all obligations of its assignor arising under this Agreement following such assignment. Any purported assignment by a Party of this Agreement, or any of such party's rights or obligations hereunder, in violation of this Section 18 shall be void."

11. Agreement Continuing Effect. Except as provided in this Amendment No. 1, the terms and conditions of the Agreement shall remain in full force and effect and capitalized terms shall have the same meaning as ascribed to such terms in the Agreement. This Amendment No. 1 is hereby integrated into and made part of the Agreement. The execution, delivery and effectiveness of this Amendment No. 1 shall not, except as expressly provided herein, operate as a waiver of any right, power or remedy of the parties to the Agreement, nor constitute a waiver of any provision of the Agreement.

12. Counterparts. This Amendment No. 1 may be executed in any number of counterparts, each of which when so executed shall be deemed to be an original and all of which when taken together shall constitute this Amendment. Signatures provided by facsimile transmission or in Portable Document Format (PDF) sent by electronic mail shall be deemed to be original signatures.

SIGNATURES IMMEDIATELY FOLLOWING ON NEXT PAGE

IN WITNESS WHEREOF, the undersigned have executed this Amendment No. 1 as of the Amendment No. 1 Effective Date written above.

	The Trustees of Columbia University in the City of New York		**Modis Therapeutics, Inc.**
By:	/s/ Scot G. Hamilton	By:	/s/ Michael P. Smith
Name:	Scot G. Hamilton	Name:	Michael P. Smith
Title:	Senior Director and AVP Columbia Technology Ventures (Duly authorized)	Title:	EVP and CFO Zogenix, Inc. (Duly authorized)

TTS#54942

Exhibit 21.1

SUBSIDIARIES OF ZOGENIX, INC.

All subsidiaries are wholly-owned, directly or indirectly, by Zogenix, Inc.

Name of Subsidiary	Jurisdiction of Formation
Modis Therapeutics, Inc.	Delaware

Name of Non-U.S. Subsidiary	Jurisdiction of Formation
Zogenix Europe Limited	United Kingdom
Zogenix GmbH	Germany
Zogenix International Limited	United Kingdom
Zogenix ROI Limited	Ireland
Zogenix S.r.l.	Italy

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

We consent to the incorporation by reference in the Registration Statements:

(1) Registration Statement (Form S-3 No. 333-220759) and in the related Prospectuses of Zogenix, Inc.,

(2) Registration Statement (Form S-8 No. 333-170875) pertaining to the 2006 Equity Incentive Plan, the 2010 Equity Incentive Award Plan and the 2010 Employee Stock Purchase Plan of Zogenix, Inc.,

(3) Registration Statement (Form S-8 No. 333-181543) pertaining to the 2010 Equity Incentive Award Plan of Zogenix, Inc.,

(4) Registration Statement (Form S-8 No. 333-197998) pertaining to the Employment Inducement Equity Incentive Award Plan, as amended of Zogenix Inc.,

(5) Registration Statement (Form S-8 No. 333-224797) pertaining to the Employment Inducement Equity Incentive Award Plan and the 2010 Employee Stock Purchase Plan of Zogenix, Inc., and

(6) Registration Statement (Form S-8 No. 333-233062) pertaining to the 2010 Equity Incentive Award Plan, as amended of Zogenix Inc.

of our reports dated March 2, 2020, with respect to the consolidated financial statements of Zogenix, Inc., and the effectiveness of internal control over financial reporting of Zogenix, Inc., and to the reference to our firm under the captions “Risk Factors” included in this Annual Report (Form 10-K) for the year ended December 31, 2019.

/s/ Ernst & Young LLP

Redwood City, California
March 2, 2020

Exhibit 31.1

CERTIFICATION OF CHIEF EXECUTIVE OFFICER PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Stephen J. Farr, certify that:

1. I have reviewed this Annual Report on Form 10-K of Zogenix, Inc. for the fiscal year ended December 31, 2019;
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 consolidated 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.

/s/ Stephen J. Farr

Stephen J. Farr

President and Chief Executive Officer

Date: March 2, 2020

Exhibit 31.2

CERTIFICATION OF CHIEF FINANCIAL OFFICER PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Michael P. Smith, certify that:

1. I have reviewed this Annual Report on Form 10-K of Zogenix, Inc. for the fiscal year ended December 31, 2019;
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 consolidated 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.

/s/ Michael P. Smith

Michael P. Smith

Chief Financial Officer

Date: March 2, 2020

Exhibit 32.1

CERTIFICATION
Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
(Subsections (a) and (b) of Section 1350, Chapter 63 of Title 18, United States Code)

In connection with the Annual Report on Form 10-K of Zogenix, Inc. (the "Company") for the period ended December 31, 2019, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Stephen J. Farr, as Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to my knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 2, 2020

/s/ Stephen J. Farr

Stephen J. Farr

Chief Executive Officer

The foregoing certification is being furnished solely to accompany the Report pursuant to 18 U.S.C. § 1350, and is not being filed for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, and is not to be incorporated by reference into any filing of the Company, whether made before or after the date hereof, regardless of any general incorporation language in such filing. A signed original of this written statement required by Section 906 has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.

Exhibit 32.2

CERTIFICATION
Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
(Subsections (a) and (b) of Section 1350, Chapter 63 of Title 18, United States Code)

In connection with the Annual Report on Form 10-K of Zogenix, Inc. (the "Company") for the period ended December 31, 2019, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Michael P. Smith, as Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to my knowledge:

1. The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 2, 2020

/s/ Michael P. Smith
Michael P. Smith
Chief Financial Officer

The foregoing certification is being furnished solely to accompany the Report pursuant to 18 U.S.C. § 1350, and is not being filed for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, and is not to be incorporated by reference into any filing of the Company, whether made before or after the date hereof, regardless of any general incorporation language in such filing. A signed original of this written statement required by Section 906 has been provided to the Company and will be retained by the Company and furnished to the Securities and Exchange Commission or its staff upon request.