UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

FORM 10-K

(Mark One)

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

For the fiscal year ended December 31, 2017

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 001-35409

Merrimack Pharmaceuticals, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**04-3210530**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
One Kendall Square, Suite B7201 **Cambridge, MA**	**02139**
(Address of principal executive offices)	**(Zip Code)**

Registrant's telephone number, including area code: (617) 441-1000

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

Title of each class	Name of each exchange on which registered
Common Stock, $0.01 par value	**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 Section 15(d) of the Act. ☐ Yes ☒ No

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

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate website, if any, every Interactive Data File required to be submitted and posted 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 and post such files). ☒ Yes ☐ No

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

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

Large accelerated filer	☐		Accelerated filer	☒
Non-accelerated filer	☐	(Do not check if a smaller reporting company)	Smaller reporting company	☐
			Emerging growth company	☐

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

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

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the registrant, based on the last sale price for such stock on June 30, 2017, was $157,909,117.

As of March 7, 2018, there were 13,342,784 shares of Common Stock, $0.01 par value per share, outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

The registrant intends to file a definitive proxy statement pursuant to Regulation 14A in connection with its 2018 Annual Meeting of Stockholders. Portions of such proxy statement are incorporated by reference into Part III of this Annual Report on Form 10-K.

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FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements that involve substantial risks and uncertainties. All statements, other than statements of historical facts, contained in this Annual Report on Form 10-K, including statements regarding our strategy, future operations, future financial position, future revenues, projected costs, prospects, plans and objectives of management, are forward-looking statements. The words “anticipate,” “believe,” “estimate,” “expect,” “intend,” “may,” “plan,” “predict,” “project,” “target,” “potential,” “will,” “would,” “could,” “should,” “continue” and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words.

The forward-looking statements in this Annual Report on Form 10-K include, among other things, statements about:

- our plans to develop and commercialize our clinical stage product candidates and diagnostics;
- our ongoing and planned discovery programs, preclinical studies and clinical trials;
- the timing of the completion of our clinical trials and the availability of results from such trials;
- our ability to establish and maintain collaborations for our product candidates;
- our receipt of payments related to the milestone events under the asset purchase and sale agreement with Ipsen S.A. or under the license and collaboration agreement between Baxalta Incorporated, Baxalta US Inc., Baxalta GmbH and Ipsen S.A., when expected or at all;
- the timing of and our ability to obtain and maintain regulatory approvals for our product candidates;
- the rate and degree of market acceptance and clinical utility of our product candidates;
- our intellectual property position;
- our commercialization, marketing and manufacturing capabilities and strategy;
- the potential advantages of our approach to drug research and development; and
- our estimates regarding expenses, future revenues, capital requirements and needs for additional financing.

We may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Actual results or events could differ materially from the plans, intentions and expectations disclosed in the forward-looking statements we make. We have included important factors in the cautionary statements included in this Annual Report on Form 10-K, particularly in Part I, Item 1A. Risk Factors, that could cause actual results or events to differ materially from the forward-looking statements that we make. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures or investments that we may make.

You should read this Annual Report on Form 10-K and the documents that we have filed as exhibits to 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. We do not assume any obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by law.

NOTE REGARDING TRADEMARKS

ONIVYDE® is a registered trademark of Ipsen S.A. Any other trademarks, trade names and service marks referred to in this Annual Report on Form 10-K are the property of their respective owners.

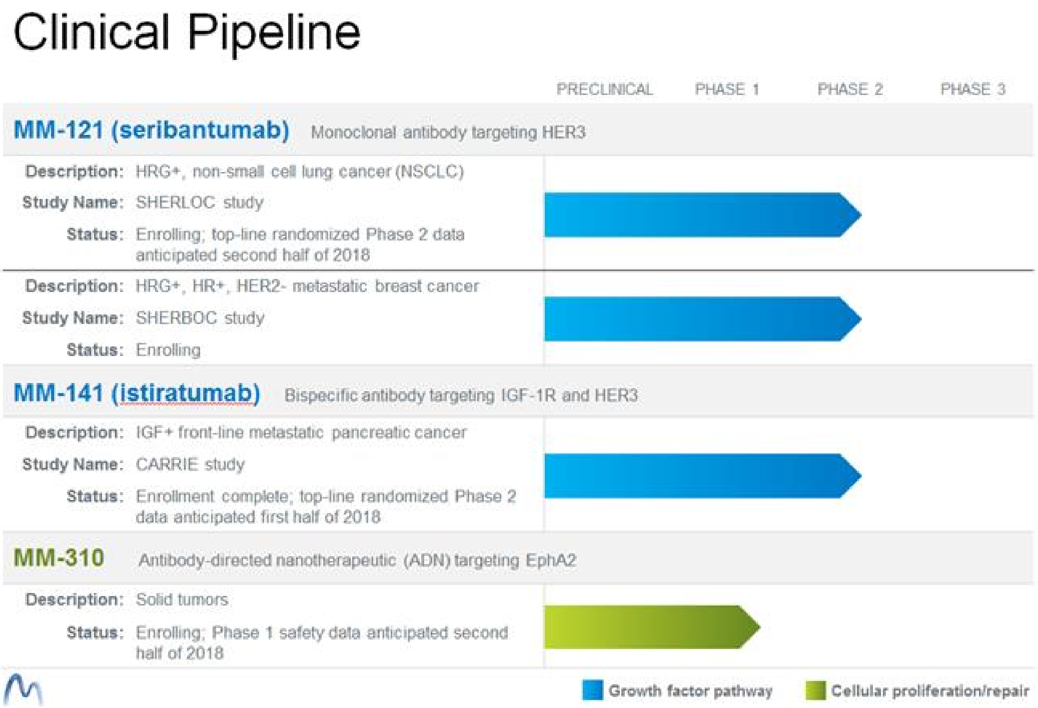
PART I

Item 1. Business

Overview

We are a clinical stage biopharmaceutical company based in Cambridge, Massachusetts that is outthinking cancer by targeting biomarker-defined cancers. Our vision is to ensure that cancer patients and their families live fulfilling lives. Our mission is to transform cancer care through the smart design and development of targeted solutions based on a deep understanding of cancer pathways and biological markers. All of our development programs, including four clinical trials and six candidates in preclinical development, fit into our strategy of (1) understanding the biological problems we are trying to solve, (2) designing specific solutions against the problems we are trying to solve and (3) developing those solutions for biomarker-selected patients. This three-pronged strategy seeks to ensure optimal patient outcomes.

We currently own worldwide development and commercial rights to all of our clinical and preclinical programs. The following table summarizes our clinical programs as of March 1, 2018, each of which is described in further detail below.



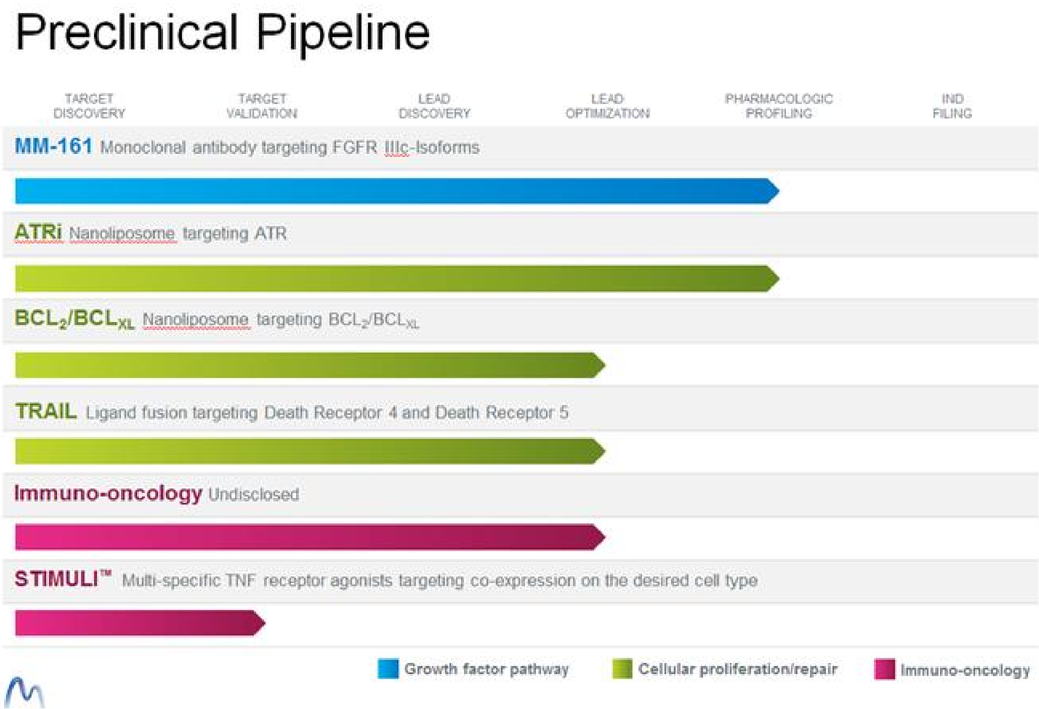
A further description of our clinical programs is as follows:

- **MM-121 (seribantumab)**: MM-121 is a fully human monoclonal antibody that binds to the ErbB3 (HER3) receptor and targets heregulin positive cancers. There are two active development programs for MM-121, each in a Phase 2 clinical trial. We are currently conducting the global, open-label, biomarker-selected, Phase 2 randomized SHERLOC clinical trial, evaluating MM-121 in combination with docetaxel in patients with heregulin positive non-small cell lung cancer, or NSCLC. We are also conducting the global, double-blinded, placebo-controlled, biomarker-selected, Phase 2 randomized SHERBOC clinical trial evaluating MM-121 in combination with fulvestrant in patients with heregulin positive, hormone receptor positive, ErbB2 (HER2) negative, metastatic breast cancer.
- **MM-141 (istiratumab)**: MM-141 is a fully human tetravalent bispecific antibody designed to block tumor survival signals by targeting receptor complexes containing the insulin-like growth factor 1, or IGF-1, receptor and ErbB3 (HER3) cell surface receptor. We are currently conducting and have completed enrollment of the global, double-blinded, placebo-

controlled, Phase 2 randomized CARRIE clinical trial evaluating MM-141 in combination with nab-paclitaxel and gemcitabine in patients with previously untreated metastatic pancreatic cancer with high serum levels of free IGF-1.

- **MM-310**: MM-310 is an antibody-directed nanotherapeutic that targets the ephrin receptor A2, or EphA2, receptor and contains a novel prodrug of the highly potent chemotherapy docetaxel. The EphA2 receptor is highly expressed in most solid tumor types, such as prostate, ovarian, bladder, gastric, pancreatic and lung cancers. We initiated a Phase 1 clinical trial to evaluate safety and preliminary activity of MM-310 and to identify the maximum tolerated dose in the first quarter of 2017.

The table below summarizes our preclinical pipeline as of March 1, 2018. We have six preclinical programs that we are actively working to advance into the clinic. Our preclinical programs focus on three areas of expertise: disruption of growth factor pathways, disruption of cellular proliferation and repair, and immuno-oncology.



We are also developing *in vitro* diagnostics for use with each of our oncology product candidates. Our *in vitro* diagnostics employ biophysical or biochemical markers of cancer, or biomarkers. We believe that our biomarker-driven development strategy utilizing companion diagnostics will allow us to improve the efficiency and productivity of our clinical development and enhance the potential efficacy and pharmacoeconomic benefit of our product candidates.

On April 3, 2017, we completed the sale, or the asset sale, to Ipsen S.A., or Ipsen, of all of our right, title and interest in the non-cash assets, equipment, inventory, contracts and intellectual property primarily related to or used in our business operations and activities involving or relating to developing, manufacturing and commercializing ONIVYDE, our first commercial product, and MM-436, or the commercial business. Additional information about the asset sale is described in Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations. Our non-commercial assets, including our clinical and preclinical development programs described above, or the pipeline business, were not included in the asset sale and remain assets of ours.

Our Approach to Cancer Research

We are executing a three-pronged strategy as the basis for our approach to drug development. Our process begins with identifying the problems we are trying to solve and developing a fundamental understanding of how cancer cell signaling pathways and drug metabolism affect those problems. We then engineer product candidates, which include both antibodies and antibody-directed nanotherapeutics, which are designed to match the problem and fit our understanding of the target. Finally, we test our product candidates in biomarker-defined populations that are more homogenous than the general unselected disease population. This strategy improves our ability to detect a clear signal early in clinical development and enables us to pursue smaller, shorter, more personalized studies with lower development costs and a potentially accelerated timeframe to clinically meaningful data.

Step 1: Understand the problem

To understand the problems we are trying to solve, we begin by developing a deep understanding of how cancer pathways and drug metabolism affect those problems. Using systems biology and systems pharmacology, our goal is to understand how the complex molecular interactions that occur within cell signaling pathways, or networks, lead to cancer. Our approach utilizes proprietary, dynamic biological data generated in a high-throughput method in which we test multiple biological or chemical parameters using engineering, analytical and modeling expertise, and from which we build computational models of cell biology to further our drug discovery, design and predictive development. We have developed an expertise in generating kinetic data, describing molecular changes or interactions over time, to illuminate the dynamic interactions that occur within biological systems. We apply those insights throughout the research and development process, including for target identification, lead compound design and optimization, diagnostic discovery and the design of clinical trial protocols.

Our models are constructed and validated using internally generated and proprietary data sets. Following the validation of a comprehensive model of a cell signaling network, we are able to use the model for drug discovery. A significant portion of our discovery work takes place *in silico*, or using the model for computer simulation, which we believe is a more efficient and productive approach for drug discovery and development than traditional approaches.

Step 2: Design a specific solution

Once we understand the problem that we are trying to solve and have developed a clear target, we design a very specific solution to fit our deep understanding of the target, using two internal platforms: our engineered antibody platform and our antibody-directed nanotherapeutics platform.

Human monoclonal antibodies

Human antibodies are a key component of many of our targeted therapies based on a range of favorable attributes, including significant target specificity and avidity relative to small molecules and well-understood pharmacokinetic properties. Our human monoclonal antibody engineering platform provides us with the ability to create antibodies that are designed to inhibit specific nodes responsible for tumor growth and survival, or to address inherent drug resistance by simultaneously targeting redundant signaling pathways. We have designed antibodies both for use as stand-alone therapeutics and as targeting or docking agents for our antibody-directed nanotherapeutics. We have worked with several antibody formats, including:

- fully human recombinant monoclonal antibodies and fragments of fully human recombinant monoclonal antibodies that include the antibody binding domain. Monoclonal antibodies and antibody fragments are proteins that bind specifically to one defined site on a cell surface protein or receptor;
- stabilized ligand-fusions, either alone or in a bispecific targeted format with an antibody domain;
- multi-specific antibody formats, which are comprised of two or more antibodies or antibody fragments linked to a common scaffold molecule to produce a single molecule that binds to distinct epitopes on two or more target cell surface proteins or receptors; and
- oligoclonal antibody mixtures, which are comprised of defined ratios of two or more recombinant human monoclonal antibodies that target two or more distinct epitopes on a single cell surface protein or receptor.

Antibody-directed nanotherapeutics

Our antibody-directed nanotherapeutics platform is a next-generation antibody drug conjugate, or ADC, that enables us to create actively targeted liposomes that can contain different chemotherapeutic agents. Our targeted nanotherapeutics are lipidic particles constructed to stably encapsulate active drug payloads. Nanoscale objects typically, though not exclusively, have dimensions on the order of 100 nanometers or smaller. We believe that our nanotherapeutics offer the following potentially favorable attributes:

- a multi-layered targeting strategy that includes an antibody targeting ligand against a preferentially expressed cell-surface receptor on tumor cells, size-controlled accessibility to the tumor microenvironment but not to most normal tissues, and a selective active payload for delivery;

- a uniform nanoscale size, which is intended to enable targeting and preferential deposition within tumors by taking advantage of the enhanced permeability and retention effect to selectively enter, and subsequently accumulate in, tumors with leaky vasculature;
- a formulation designed to minimize the leakage of active drug payload out of the particle before the nanotherapeutic has reached the tumor, with the goal of limiting systemic exposure and the associated occurrence of adverse events, while maximizing the amount of active drug that reaches the target;
- encapsulation of small molecules or nucleic acids in lipidic nanoparticles, designed to protect the active drug payload as it passes through the circulation and organs of the body, such as the liver, and to prevent premature clearance or metabolism of the active drug, and thereby extend the pharmacokinetic profile and enable more convenient dosing regimens; and
- a customizable payload by which our nanotherapeutics can contain a variety of drug payloads, including chemotherapies, cytotoxics, molecularly targeted small molecule drugs, and nucleic acids, such as siRNA and genes. Unlike conventional ADCs, our antibody-directed nanotherapeutics do not require the use of ultra-high potency drugs or direct conjugation to the antibody, both of which can constitute considerable limitations to the conventional ADC platform.

Step 3: Test the solution in a homogenous patient population

With a clear understanding of the problem and a custom-designed solution, we target our product candidates to biomarker-defined populations. Every program must utilize a biomarker signature, and accordingly our companion diagnostics are being designed to test for such biomarkers and thereby provide prognostic and predictive value for enrichment of the patient populations. Utilizing companion diagnostics to identify the biomarker-defined population, our clinical trials are designed to test our product candidates in more homogenous patient populations.

Ultimately, we believe that our approach will result in better treatments for complex diseases by incorporating the identification of biomarkers and the development of associated companion diagnostics into the drug development process. We believe this may enable physicians to better deliver the right drug to the right set of patients at the right time, which may in turn improve patient outcomes, reduce the overall costs of treating and caring for cancer patients, and ultimately may provide a basis for seeking favorable reimbursement of approved drugs from payors.

Our Most Advanced Product Candidates

The table and descriptions below summarize key information about our clinical stage product candidate assets, MM-121, MM-141 and MM-310. Each of these product candidates is a targeted therapy, designed to efficiently act on selected cancer cells. These targeted therapies are either monoclonal antibodies or monoclonal antibody-derived molecules that are designed to block oncogenic signaling pathways, such as MM-121 and MM-141, or an antibody-directed nanotherapeutic designed to selectively deliver a large cytotoxic payload to the tumor tissue, such as MM-310. None of our product candidates is approved for any indication by the U.S. Food and Drug Administration, or FDA, or any other regulatory agency.

Product Candidate	Development Program Status	Commercial Rights (Territory)
MM-121 (seribantumab) (ErbB3 (HER3) targeted monoclonal antibody)	• Conducting a Phase 2 clinical trial in patients with heregulin positive NSCLC in combination with docetaxel. We refer to this trial as the SHERLOC trial. • Top-line results are expected in the second half of 2018.	Merrimack (worldwide)
MM-121 (seribantumab) (ErbB3 (HER3) targeted monoclonal antibody)	• Conducting a Phase 2 clinical trial in patients with heregulin positive, hormone receptor positive, ErbB2 (HER2) negative, metastatic breast cancer in combination with fulvestrant. We refer to this trial as the SHERBOC trial.	Merrimack (worldwide)
MM-141 (istiratumab) (IGF-1R and ErbB3 (HER3) targeted tetravalent bispecific antibody)	• Conducting a Phase 2 clinical trial in patients with previously untreated metastatic pancreatic cancer with high serum levels of free IGF-1 in combination with nab-paclitaxel and gemcitabine. Enrollment is complete for this clinical trial. We refer to this trial as the CARRIE trial. • Top-line results are expected in the first half of 2018.	Merrimack (worldwide)
MM-310 (antibody-directed nanotherapeutic; EphA2 targeted docetaxel pro-drug)	• Conducting a Phase 1 clinical trial to evaluate safety and preliminary activity in patients with solid tumors. • Safety data and a maximum tolerated dose are expected in the second half of 2018.	Merrimack (worldwide)

MM-121 (seribantumab)

MM-121 overview

MM-121 is a fully human monoclonal antibody that targets ErbB3 (HER3), a cell surface receptor that is activated by its ligand heregulin. Heregulin-driven ErbB3 (HER3) signaling has been implicated as a mechanism of tumor growth and broad resistance to cytotoxic, anti-endocrine, targeted and immuno-oncology therapies. When used in combination with anti-cancer drugs, MM-121 is designed to block heregulin-driven ErbB3 (HER3) signaling and enhance the anti-tumor effect of combination therapy partners.

Heregulin is the cognate ligand of the ErbB3 (HER3) receptor and a powerful driver of cell survival signaling. Based on the central role of heregulin and ErbB3 (HER3) in cancer growth and survival, we believe that MM-121 may be applicable to a broad range of metastatic tumors, including lung, breast, prostate, ovarian, head and neck, colon and pancreatic cancers, among others. Our preclinical studies of several hundred tumor samples and the analysis of tumor samples from our Phase 2 clinical trials suggest that MM-121 may be able to target heregulin-dependent ErbB3 (HER3) signaling that is relevant in approximately 35-50% of cancer patients with these types of tumors, defining a highly drug-tolerant cancer cell phenotype potentially contributing to poor prognosis and thus potentially addressing a high unmet medical need.

In 2017, we obtained orphan drug designation in the United States for MM-121 for the treatment of heregulin positive non-small cell lung cancer.

Our three-pronged drug development strategy informs our approach to our MM-121 program:

Understand the problem. The ErbB3 (HER3) pathway is a drug resistance pathway, allowing cancer cells to escape death and survive the effect of other drugs. The ErbB3 (HER3) pathway is activated by its ligand heregulin, which binds to the ErbB3 (HER3) receptor. We have identified this pathway as a key node in cellular signaling networks and a prime target for cancer drug development.

Design a specific solution. MM-121 is an engineered monoclonal antibody designed to block the ErbB3 (HER3) pathway by preventing the binding between heregulin and the ErbB3 (HER3) receptor.

Test the solution in a homogenous patient population. Consistent with cell biology data, human clinical trials in three different cancers (lung, breast and ovarian) have independently pointed to the potential value of investigating MM-121 in tumors with a high expression of heregulin. Our SHERLOC and SHERBOC randomized Phase 2 clinical trials are designed to prospectively test the therapeutic effect of MM-121 in lung and breast cancer patients, respectively, whose tumors have high expression of heregulin.

MM-121 Phase 2 clinical trial in non-small cell lung cancer

In February 2015, we initiated the global, open-label, biomarker-selected, Phase 2 randomized SHERLOC clinical trial evaluating MM-121 in combination with docetaxel, versus docetaxel alone, in patients with heregulin positive non-small cell lung cancer. The trial was amended in 2017 into a proof-of-concept study in a more defined patient population, namely second or third-line heregulin positive adenocarcinoma of the lung. In March 2018, we announced an amendment to the SHERLOC clinical trial to increase the number of patients from 80 to 100. The primary endpoint of the trial is progression free survival, or PFS, and secondary endpoints include overall survival, objective response rate, safety and tolerability. We expect to report top-line results from the SHERLOC clinical trial in the second half of 2018.

MM-121 Phase 2 clinical trial in breast cancer

In August 2017, we initiated the global, double-blinded, placebo-controlled, biomarker-selected, Phase 2 randomized SHERBOC clinical trial of MM-121 in combination with fulvestrant, versus fulvestrant alone, in patients with heregulin positive, hormone receptor positive, ErbB2 (HER2) negative, metastatic breast cancer. This is a double-blinded, placebo-controlled randomized trial, and we plan to enroll 80 patients. The primary endpoint of the trial is investigator-assessed PFS and secondary endpoints include overall survival, time to progression, objective response rate, safety and pharmacokinetics.

MM-121 previous clinical trials

We have evaluated MM-121 in multiple Phase 1 and Phase 2 clinical trials in combination with both chemotherapies and other targeted agents across a wide spectrum of solid tumor patient populations, including patients with ovarian, breast and lung cancers. Over 700 patients were treated with MM-121 in those previous clinical trials. The goal of these clinical trials was to explore the efficacy and safety of MM-121 in combination with other agents and to establish and validate clinically meaningful biomarkers to identify patients most likely to benefit from MM-121.

Three such previous Phase 2 clinical trials of MM-121 in unselected patient populations with NSCLC, ovarian cancer and breast cancer enrolled a total of 464 patients and evaluated whether MM-121 in combination with a standard of care therapy was more effective than the standard of care therapy alone in prolonging PFS. In the NSCLC trial, two of the three cohorts (Groups A and C) did not meet their primary endpoints, and the third cohort (Group B) did not pass its planned interim analysis and ceased enrolling patients. Additionally, the previous Phase 2 clinical trials of MM-121 in patients with ovarian cancer and in patients with breast cancer did not meet the primary endpoints. However, retrospective biomarker analysis of each of these three trials identified heregulin as a key biomarker for MM-121. In 2014, we announced biomarker results from a meta-analysis of these three trials. This meta-analysis highlighted heregulin as the principal biomarker for MM-121 efficacy. High levels of heregulin mRNA correlated with favorable hazard ratios in all three of these trials. A hazard ratio, or HR, is a measure of how often a particular event happens in one group compared to how often it happens in another group over time. In cancer research, hazard ratios are often used in clinical trials to measure survival at any point in time in a group of patients who have been given a specific treatment compared to a control group given another treatment or a placebo. A hazard ratio of one means that there is no difference in survival between the two groups, while a hazard ratio of greater than one or less than one means that survival was better in one of the groups. The confidence interval, or CI, given after the HR reflects the amount of certainty in the estimate of the HR. A HR value that is not contained within a 95% CI is unlikely to be the true HR.

In the lung cancer clinical trial, heregulin-high patients had a PFS HR of 0.35 (95% CI [0.16–0.76]) (37 of 69 evaluable patients were heregulin positive; prevalence of 54%); in the ovarian cancer clinical trial, heregulin-high patients had a PFS HR of 0.37 (95% CI [0.18–0.76]) (57 of 151 evaluable patients were heregulin positive; prevalence of 38%); and in the breast cancer clinical trial, heregulin-high patients had a PFS HR of 0.26 (95% CI [0.11–0.63]) (34 of 76 evaluable patients were heregulin positive; prevalence of 45%). In ovarian cancer, the definition of biomarker positive also required that patients have low ErbB2 (HER2) levels. In breast cancer, where only ErbB2 (HER2) negative patients were enrolled in the clinical trial, this requirement was not needed. In lung cancer, where ErbB2 (HER2) levels are naturally low, this requirement was also not needed. Across these previous clinical trials, there was a consistent, but modest and tolerable, increase in adverse events when MM-121 was combined with erlotinib (lung), paclitaxel (ovarian) and exemestane (breast). Most adverse events were reported as mild to moderate in severity and included diarrhea, fatigue, vomiting, rash, hypokalemia and stomatitis.

MM-121 diagnostic development

In partnership with Leica Biosystems Newcastle, Ltd., or Leica, we are developing a companion diagnostic assay for MM-121 using RNA in situ hybridization, or RNA-ISH, as the method to detect heregulin expression in tumor cells. In this assay, a section of formalin-fixed paraffin-embedded, or FFPE, tissue, obtained through a biopsy procedure, is stained for heregulin mRNA and scored by a certified pathologist. This assay format is currently being utilized in both our SHERLOC and SHERBOC clinical trials.

MM-141

MM-141 overview

MM-141 is a fully human tetravalent bispecific antibody designed to block tumor survival signals by targeting receptor complexes containing the insulin-like growth factor 1 receptor, or IGF-1R, and ErbB3 (HER3) cell surface receptors. A tetravalent bispecific antibody is a single molecule that has four binding sites, two for each of two different target cell surface receptors. IGF-1R and ErbB3 (HER3) both activate a major signaling pathway, PI3K/AKT/mTOR, that allows tumor cells to grow and develop resistance to chemotherapy. We designed MM-141 to suppress the PI3K/AKT/mTOR signaling pathway by reducing the levels of IGF-1R and ErbB3 (HER3) that trigger the pathway.

In 2014, we obtained orphan drug designation in the United States for MM-141 for the treatment of pancreatic cancer.

Our three-pronged drug development strategy informs our approach to our MM-141 program:

Understand the problem. Our research suggests that two pathways, IGF-1R and ErbB3 (HER3), cooperate to drive a master control of cancer cells' growth. Our research also suggests that the blockade of these two pathways should be more effective if one drug blocks both receptors rather than two drugs acting separately.

Design a specific solution. MM-141 is an engineered tetravalent bispecific antibody that blocks both pathways by binding to both IGF-1R and ErbB3 (HER3).

Test the solution in a homogenous patient population. We are prospectively testing the therapeutic effect of MM-141 in pancreatic cancer patients who have high blood levels of free IGF-1, the signal for IGF-1R, in our CARRIE clinical trial. High serum levels of free IGF-1 are prevalent in approximately 50% of pancreatic cancer patients, and high levels are believed to be associated with more aggressive forms of pancreatic cancer.

MM-141 Phase 2 clinical trial in metastatic pancreatic cancer

In May 2015, we initiated the global, double-blinded, placebo-controlled, Phase 2 randomized CARRIE clinical trial of MM-141 in combination with nab-paclitaxel and gemcitabine, versus nab-paclitaxel and gemcitabine alone, in patients with newly diagnosed metastatic pancreatic cancer who have high serum levels of free IGF-1. In January 2017, we reduced the planned enrollment for this clinical trial from approximately 140 patients to approximately 80 patients, and enrollment for this trial is complete. Eligible patients for the trial had to have received no prior radiotherapy, surgery, chemotherapy or investigational therapy for the treatment of metastatic disease. The primary endpoint of the trial is PFS and secondary endpoints include overall survival, objective response rate, safety and tolerability. We expect to report top-line results from the CARRIE clinical trial in the first half of 2018.

MM-141 Phase 1 clinical trial

The design of our CARRIE clinical trial was informed by our multi-arm Phase 1 clinical trial evaluating the safety and tolerability of MM-141 as a monotherapy and in combination with everolimus or with nab-paclitaxel and gemcitabine in patients with advanced solid tumors. Patients in the Phase 1 trial were enrolled in one of three arms: MM-141 as a monotherapy, MM-141 in combination with everolimus and MM-141 in combination with nab-paclitaxel and gemcitabine. Trial data showed common co-expression of IGF-1R and ErbB3 (HER3) in solid tumors, and suggested that the presence of this co-expression in metastatic pancreatic cancer was associated with decreased patient survival. An analysis of pre- and post-treatment biopsies confirmed that levels of IGF-1R and ErbB3 (HER3) were decreased following MM-141 administration. Hyperglycemia was reported as an adverse event of Grade 3 or higher in one out of 42 patients in the trial (2.4%). The most common treatment-emergent adverse events in the trial, of any grade, were vomiting (47.6%), decreased appetite (42.9%), headache (42.9%) and nausea (42.9%). The only dose limiting toxicity in the trial was in the combination arm of MM-141 with everolimus, and was a Grade 4 infusion-related reaction. MM-141 monotherapy was well tolerated with no dose limiting toxicities. The observed safety profile of MM-141 in combination with nab-paclitaxel and gemcitabine was comparable to expected toxicities reported with the individual safety profiles of the chemotherapy agents.

MM-141 diagnostic development

Our CARRIE clinical trial uses a proprietary, validated test to prospectively select patients with high serum levels of free IGF-1 for inclusion in the trial. We are conducting additional research and development on an *in vitro* diagnostic for MM-141 that may help determine which patients would benefit the most from MM-141. This research is focused on identifying pathway-relevant biomarkers and assessing their correlation with the magnitude of patient response to MM-141.

MM-310

MM-310 overview

MM-310 is an antibody-directed nanotherapeutic that encapsulates a newly engineered form of the highly potent chemotherapy docetaxel as a prodrug in an EphA2 targeted liposome. In preclinical studies, MM-310 demonstrated increased antitumor activity in multiple models compared to free docetaxel. In the preclinical studies, EphA2-targeted liposomes delivered the cytotoxic to the tumor while minimizing exposure to healthy tissues. MM-310 is designed to result in prolonged exposure of the active drug at the tumor site and in preclinical studies had a significantly longer half-life than free docetaxel. In a sampling of approximately 200 tumors, EphA2 was found to be expressed in tumor cells, myofibroblasts and/or tumor-associated blood vessels. EphA2 overall prevalence was found to range from 50% to 100% across multiple indications. In cell models, a high level of specificity was observed in the MM-310 EphA2 targeted liposome, with a more than 100-fold increase in liposome cell association when compared to non-targeted liposomes.

Our three-pronged drug development strategy informs our approach to our MM-310 program:

Understand the problem. Conventional ADCs, which typically incorporate an ultra-high potency drug conjugated to a targeting antibody and which do not utilize liposomes to encapsulate the payload, can be highly effective therapies but are often accompanied by significant toxicities that limit tolerable dosage levels and duration of use. Other potential limitations of conventional ADCs include the need for direct conjugation of the drug to the antibody, which requires subsequent cleavage of the bond to release the drug, and the uptake of the conventional ADC into normal tissue due to both the small size of the ADC and the presence of the accessible target receptor on normal tissue. Docetaxel, the payload for MM-310, is a highly effective and well validated cancer chemotherapy with a conventional potency range, but it is often accompanied by significant toxicity that limits its dosage levels and duration of use. Our hypothesis is that a more sustained release of the drug should result in lower plasma levels and extended exposure at the tumor, and thus less toxicity and improved efficacy. We also believe that EphA2 is an attractive target due to the fact that it is expressed at a very high level on and internalized by cancer cells.

Design a specific solution. MM-310 is an antibody-directed nanotherapeutic that is designed to improve the therapeutic window of the active drug by incorporating it in the form of a drug precursor encapsulated in a nanoliposome to ensure a slower and more sustained release of the drug. The small size of the nanotherapeutic may allow it to take advantage of the leaky vasculature of the tumor through the permeability and retention effect and potentially deliver docetaxel more preferentially, while restricting distribution in normal tissues. The nanoliposome utilizes antibodies to the EphA2 receptor, a receptor often over-expressed in solid tumors, to help target more of the chemotherapy payload to the tumor site.

Test the solution in a homogenous patient population. After identifying the maximum tolerated dose and the drug's safety profile in humans, future clinical trials will test the drug in tumor types that over-express the EphA2 receptors.

MM-310 Phase 1 clinical trial

In March 2017, we initiated a Phase 1 clinical trial of MM-310 to evaluate its safety and preliminary efficacy in patients with solid tumors and to identify the maximum tolerated dose. In the first part of the trial, MM-310 will be assessed as a monotherapy until a maximum tolerated dose is established. After a maximum tolerated dose is established, an expansion cohort and MM-310 in combination with other therapies will be assessed. We expect to report safety data and the maximum tolerated dose from this trial in the second half of 2018.

MM-310 diagnostic development

We expect to utilize a validated test to prospectively select patients with high EphA2 receptor expression in the expansion cohort of our Phase 1 clinical trial of MM-310.

Preclinical Product Candidates

We are developing preclinical product candidates for a range of solid tumor indications. We have six preclinical programs, which focus on three areas of expertise: disruption of growth factor pathways, disruption of cellular proliferation and repair, and immuno-oncology.

Manufacturing

We do not have any manufacturing facilities or personnel. We currently rely, and expect to continue to rely, on contract manufacturing organizations, or CMOs, to manufacture our product candidates in order to meet our operational objectives for clinical testing, as well as for commercial manufacture if our product candidates receive marketing approval. We also currently outsource, and expect to continue to outsource, our fill finish, packaging, labeling and distribution activities.

We currently have manufacturing agreements with Samsung Biologics Co., Ltd., or Samsung, for the manufacture of MM-121 and the performance of associated quality related services and with Ipsen for the manufacture of MM-310 and the performance of certain quality related services. We do not currently have arrangements in place for redundant supply or manufacturing agreements for our other product candidates. To the extent we approach commercialization for any product candidates, we expect that we would identify and qualify additional manufacturers to provide the active pharmaceutical ingredient and fill finish services as a part of such commercialization plans.

We are developing and testing diagnostic assays for predictive biomarkers in an internal laboratory and through collaborations with third-parties. Upon completion of the development of the diagnostic tests, we plan to evaluate external as well as internal options for manufacturing and commercialization of the tests. We have partnered with Leica for the development of a companion diagnostic for our MM-121 program.

Sources and Availability of Raw Materials

We currently rely on single source suppliers for certain raw materials that we use for our antibody and nanoliposome manufacturing processes. We purchase these materials from our suppliers on a purchase order basis and do not have long-term supply agreements in place.

Competition

The biotechnology and pharmaceutical industries are characterized by rapidly advancing technologies, intense competition and a strong emphasis on proprietary products. While we believe that our integrated research, development experience and scientific knowledge provide us with competitive advantages, we face potential competition from many different sources, including major pharmaceutical, specialty pharmaceutical and biotechnology companies, academic institutions and governmental agencies and public and private research institutions. Any product candidates that we successfully develop and commercialize will compete with existing therapies and new therapies that may become available in the future.

Many of our competitors have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved products than we do. Mergers and acquisitions in the pharmaceutical, biotechnology and diagnostic industries may result in even more resources being concentrated among a smaller number of our competitors. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs. Smaller or early stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies.

The key competitive factors affecting the success of all of our product candidates, if approved, are likely to be their efficacy, safety, convenience, price, the effectiveness of diagnostics in guiding the use of related therapeutics, the level of generic competition and the availability of reimbursement from government and other third-party payors.

Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer, more effective, have fewer or less severe side effects, are more convenient or are less expensive than any products that we may develop. Our competitors also may obtain FDA or other regulatory approval for their products more rapidly than we may obtain approval for ours. In addition, our ability to compete may be affected because in many cases insurers or other third-party payors seek to encourage the use of generic products. There are many generic products currently on the market for the indications that we are pursuing, and additional products are expected to become available on a generic basis over the coming years. If our product candidates are approved, we expect that they will be priced at a significant premium over competitive generic products.

The initial focus of our business is to develop therapeutics and diagnostics for the treatment of solid tumor cancers. Cancer is the second most common cause of death in the United States, exceeded only by heart disease. There are a variety of available drug therapies marketed for solid tumors. Although there has been considerable progress over the past few decades in the treatment of solid tumors and the currently marketed therapies provide benefits to many patients, generally these therapies all are limited to some extent in their efficacy and frequency of adverse events, and none of them are successful in treating all patients. As a result, the level of morbidity and mortality from solid tumor cancers remains high. In many cases, these drugs are administered in combination to enhance efficacy. Some of these drugs are branded and subject to patent protection, and others are available on a generic basis. Many of these approved drugs are well established therapies and are widely accepted by physicians, patients and third-party payors.

The following table sets forth information about the solid tumor cancer indications we are studying in our Phase 2 clinical trials of MM-121 and MM-141. The U.S. estimated annual incidence is based on information from the American Cancer Society, *Cancer Fact & Figures 2018*.

Tumor Type	**U.S. Annual Incidence**	**Selected Marketed Therapies**
Breast	268,670	trastuzumab (Herceptin®); docetaxel (Taxotere®); paclitaxel (Taxol®, Abraxane®); capecitabine (Xeloda®); tamoxifen (Nolvadex®, Soltamox®); anastrazole (Arimidex®); letrozole (Femara®); exemestane (Aromasin®); fulvestrant (Faslodex®); ado-trastuzumab emtansine (Kadcyla®); pertuzumab (Perjeta®); lapatinib (Tykerb®); everolimus (Afinitor®); eribulin mesylate (Halaven®); palbociclib (Ibrance®); ribociclib (Kisqali®); abemaciclib (Verzenio®)
Lung and bronchus	234,030	ceritinib (Zykadia®); crizotinib (Xalkori®); docetaxel (Taxotere); gemcitabine (Gemzar®); pemetrexed (Alimta®); gefitinib (Iressa®); afatinib (Gilotrif®); alectinib (Alecensa®); brigatinib (Alunbrig®); osimertinib (Tagrisso®); necitumumab (Portrazza®); erlotinib (Tarceva®); bevacizumab (Avastin®); paclitaxel (Taxol, Abraxane); nivolumab (Opdivo®); pembrolizumab (Keytruda®); atezolizumab (Tecentriq®); trametinib (Mekinist®); dabrafenib (Tafinlar®); ramucirumab (Cyramza®)
Pancreatic	55,440	nab-paclitaxel (Abraxane); gemcitabine (Gemzar); erlotinib (Tarceva); oxaliplatin (Eloxatin®); irinotecan liposome (ONIVYDE®)

We are also accepting for inclusion in our Phase 1 clinical trial of MM-310 patients with additional solid tumor cancer indications, including prostate and ovarian cancers.

In addition to the marketed therapies for solid tumors listed in the table above, there are a number of products in late stage clinical development to treat solid tumors. These products in development may provide efficacy, safety, convenience and other benefits that are not provided by currently marketed therapies. As a result, they may provide significant competition for any of our product candidates for which we obtain marketing approval.

Collaboration and License Agreements

We are party to certain collaboration and license agreements. We consider the following agreements to be material to our business.

Ipsen

On April 3, 2017, we completed the asset sale with Ipsen. Pursuant to the Asset Purchase and Sale Agreement, dated as of January 7, 2017, or the asset sale agreement, between us and Ipsen, Ipsen acquired our right, title and interest in the commercial business. Pursuant to the asset sale agreement, we received $575.0 million in cash, plus a working capital adjustment of $5.7 million, and are eligible to receive up to $450.0 million in additional regulatory approval-based milestone payments. Ipsen has agreed pursuant to the asset sale agreement to use commercially reasonable efforts to develop ONIVYDE in connection with obtaining the regulatory approval by the FDA of ONIVYDE for certain indications. We also retained the right to receive net milestone payments that may become payable for the ex-U.S. development and commercialization of ONIVYDE for up to $33.0 million pursuant to a license and collaboration agreement, which we refer to as the Baxalta agreement, with Baxalta Incorporated, Baxalta US Inc. and Baxalta GmbH, collectively Baxalta. We entered into the Baxalta agreement in 2014, and on April 3, 2017, the Baxalta agreement was assigned to Ipsen in connection with the completion of the sale of the commercial business.

In connection with the asset sale, we entered into a transition services agreement with Ipsen, pursuant to which we and Ipsen provide certain services to each other for a period of 24 months, including Ipsen's agreement to manufacture MM-310 and to perform certain quality related services in accordance with a manufacturing services agreement. Additionally, we entered into a sublease agreement with Ipsen under which Ipsen is subleasing approximately 70,237 square feet of our leased space in Cambridge, Massachusetts through the end of our lease term on June 30, 2019.

Dyax

In January 2007, we entered into an amended and restated collaboration agreement with Dyax Corp., or Dyax, which superseded a prior collaboration agreement with Dyax that we entered into in December 2005. Under this collaboration agreement, Dyax used its proprietary phage display technology to identify antibodies that bind to targets of interest to us as therapeutics or diagnostics. Further, Dyax has granted to us a worldwide, non-exclusive, royalty free right to use and make any and all of the antibodies identified by Dyax for certain research purposes. In order to clinically develop or commercialize any such antibody, however, we must obtain an additional product license from Dyax on a target-by-target basis. We have the option to obtain one or more product licenses on terms set forth in the collaboration agreement, subject to limitations on the availability of each such product license under an agreement between Dyax and Cambridge Antibody Technologies, which has merged with MedImmune, LLC and is now owned by AstraZeneca PLC. In January 2016, Dyax was acquired by Shire plc.

As consideration for the grant of the initial research license, we paid Dyax a research fee based on the total estimated full time equivalent researchers that were required to conduct the research plan and a fee for achieving certain technical milestones. If we elect to obtain a product license with respect to any therapeutic or diagnostic target, we are required to pay to Dyax an additional upfront license fee for the applicable antibody. We also may be required to make additional maximum aggregate development and regulatory milestone payments of $16.2 million for therapeutic products and maximum aggregate regulatory milestone payments of $1.0 million for diagnostic products directed to selected targets. In addition, Dyax is entitled to mid single digit royalties based on net sales of products covered by any product license that we obtain from Dyax. Our obligation to pay royalties to Dyax continues on a product-by-product and country-by-country basis until the later of a specified number of years after the first commercial sale of the product in such country and the expiration of the patent rights covering the product in such country. MM-121 and a component of MM-141 were identified under this agreement, and we have obtained the required target licenses from Dyax by exercising our product license options and paying the applicable license fees. We are obligated to use commercially reasonable efforts to develop and commercialize the antibodies for which we obtain a commercial license.

This agreement will remain in effect, unless terminated earlier, for so long as we or any of our affiliates or sublicensees continue to develop or commercialize products that remain royalty-bearing under the agreement. Either party may terminate the agreement in the event of an uncured material breach by the other party. We also may terminate the agreement in its entirety or on a product-by-product basis at any time upon 90 days' prior written notice.

Intellectual Property

Our success will significantly depend on our ability to obtain and maintain patent and other proprietary protection for our commercially important technology, inventions and know-how, defend and enforce our patents, preserve the confidentiality of our trade secrets, establish and protect our commercial brands and operate without infringing the valid and enforceable patents and proprietary rights of third parties. To accomplish this, we rely on a combination of intellectual property rights, including patents, trade secrets, copyrights and trademarks, as well as regulatory exclusivity and contractual protections. We aggressively strive to protect the proprietary technology that we believe is important to our business, including seeking and maintaining patents intended to cover our products and compositions, their methods of use and processes for their manufacture, as well as our diagnostic and drug discovery technologies and any other inventions that are commercially important to the development of our business. In some circumstances, we also rely on trade secrets to protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection, such as our proprietary network modeling programs and large scale protein and liposome production methods.

We also rely on trademark protection of our corporate brand. We are the owner of multiple federal trademark registrations in the United States and outside the United States. In addition, we have multiple additional pending trademark registration applications in the United States and other countries covering the MERRIMACK® word mark and related logos in trademark classes relevant to our products and services.

We seek to protect our proprietary technology and processes, in part, by confidentiality agreements with our employees, consultants, scientific advisors and contractors. We require each of our employees, consultants and advisors to execute a confidentiality and inventions assignment agreement before beginning their employment, consulting or advisory relationship with us. These agreements generally provide that the individual must keep confidential and not disclose to other parties any confidential information developed or learned by the individual during the course of their relationship with us except in limited circumstances. These agreements also generally provide that we will own all inventions conceived by the individual in the course of rendering services to us. We also seek to preserve the integrity and confidentiality of our data and trade secrets by maintaining physical security of our premises and physical and electronic security of our information technology systems. While we have confidence in these individuals, organizations and systems, agreements or security measures may be breached, and we may not have adequate remedies for any breach. In addition, our trade secrets may otherwise become known or be independently discovered by competitors. To the extent that our consultants, contractors or collaborators use intellectual property owned by others in their work for us, disputes may arise as to the rights in related or resulting know-how and inventions.

Our commercial success will depend in part on obtaining and maintaining patent protection and trade secret protection of the use, formulation, manufacture and composition of our products and product candidates, as well as successfully asserting and/or defending these patents against third-party challenges. Our ability to protect our products and product candidates from unauthorized making, using, selling, offering to sell or importing by third parties is dependent on the extent to which we have rights under valid and enforceable patents that cover these activities.

As of January 31, 2018, we owned or controlled a total of 29 issued U.S. patents and 165 corresponding issued foreign patents, in addition to 67 pending U.S. patent applications and 156 pending patent applications in the rest of the world. We intend to continue to protect our proprietary technology with additional filings as appropriate. We do not have patents or patent applications in every jurisdiction where there is a potential commercial market for our product candidates. We continually evaluate our patent portfolio and patent strategy and believe our owned and licensed patents and patent applications, as well as applicable periods of regulatory exclusivity available after new product approval, provide us with a competitive advantage; however, if markets where we do not have patents or patent applications become commercially important, our business may be adversely affected.

The latest patent expiration dates for issued patents covering the composition or use of each of our most advanced product candidates as of January 31, 2018 are summarized below. As described in more detail below, the expiration dates in the table below refer to the latest-expiring granted patent covering the product, product candidate, technology or use thereof in the United States, and one or more countries outside of the United States, but do not account for any patent term extension or extended exclusivity terms, such as pediatric extensions, that may be available in the United States and certain foreign jurisdictions.

Product Candidate	**Latest Year of Expiration of Current Patent Protection in the United States**	**Latest Year of Expiration of Current Patent Protection outside the United States**
MM-121	2034	2031
MM-141	2032	2032
MM-310	2031	2031

The term of individual patents depends upon the legal term for patents in the countries in which they are obtained. In most countries, including the United States, the patent term is 20 years from the earliest filing date of a non-provisional patent application.

In the United States, a patent's term may be lengthened by patent term adjustment, which compensates a patentee for administrative delays by the U.S. Patent and Trademark Office in examining and granting a patent, or may be shortened if a patent is terminally disclaimed over an earlier filed patent. In the future, if and when our product candidates receive approval by the FDA or foreign regulatory authorities, we expect to apply for patent term extensions on issued patents covering those products, depending upon the length of the clinical trials for each drug and other factors, including those involved in the filing of a new drug application, or NDA, or a biologics license application, or BLA. The Drug Price Competition and Patent Term Restoration Act of 1984, or the Hatch-Waxman Act, permits a patent restoration term of up to five years as compensation for patent term lost during product development and the FDA regulatory review process, provided the total patent term restoration cannot extend the remaining term of a patent beyond a total of 14 years from the product's approval date. The patent term restoration period is generally calculated as one-half the time between the effective date of an investigational new drug application, or IND, and the submission date of an NDA, plus the time between the submission date of an NDA and the FDA's approval of that application. Only one patent applicable to each approved drug is eligible for the extension and the application for extension must be made prior to expiration of the patent. The U.S. Patent and Trademark Office, in consultation with the FDA, reviews and approves the application for any patent term extension or restoration.

Similar provisions are available in Europe and other foreign jurisdictions to extend the term of a patent that covers an approved drug. The stated patent exclusivity dates for patent exclusivity outside of the United States may also be eligible for further extension, and/or regulatory market and/or data exclusivity in certain countries, upon product approval in individual countries for various reasons, including supplemental protection certificate(s) after product approval in eligible countries outside the United States, and/or conducting certain investigations of pediatric exclusivity or use of products covered by the applicable patent.

MM-121 (seribantumab)

We own issued patents in the United States, Europe, Japan and fifteen other countries covering the MM-121 composition through at least 2028, not including additional exclusivity available after product approval from patent term extension, supplemental protection certificates and/or pediatric exclusivity. In addition, we own a granted patent in the United States covering treatment of heregulin positive lung cancers with certain drug combinations through 2034, granted patents in the United States, Europe, Japan and ten other countries covering treatment of patients with certain forms of breast cancer through at least 2031, and multiple pending patent applications in the United States, Europe and other countries covering various related methods of use, including the treatment of patients with heregulin positive forms of cancer (through 2034, if issued), treatment of patients with heregulin positive NSCLC (through 2036, if issued), treatment of patients with certain forms of breast cancer (through 2031 or 2032, if issued) and/or related diagnostic tests and methods (through 2029, if issued).

MM-141 (istiratumab)

We own issued patents in the United States, Europe, Japan and four other countries, and pending patent applications in six additional countries, covering the MM-141 composition through at least 2032, not including additional exclusivity available after product approval from patent term extension, supplemental protection certificates and/or pediatric exclusivity. In addition, we own multiple pending patent applications in the United States and Europe covering methods of treating pancreatic cancer with MM-141 (through 2035, if issued).

MM-310

We have an exclusive license to patent filings covering the MM-310 composition through at least 2037 (if issued) from the University of California. In addition, we own multiple pending patent filings covering the MM-310 liposome composition, companion diagnostic technology for MM-310 and therapeutic uses of MM-310 through at least 2037 (if issued). The expiration dates above do not include any additional exclusivity available after product approval from patent term extension, supplemental protection certificates and/or pediatric exclusivity.

Government Regulation

Government authorities in the United States, at the federal, state and local level, and in other countries extensively regulate, among other things, the research, development, testing, manufacture, including any manufacturing changes, packaging, storage, recordkeeping, labeling, advertising, promotion, distribution, marketing, post-approval monitoring and reporting, import and export of pharmaceutical products, biological products and medical devices, such as those we are developing.

United States drug and biological product approval process

In the United States, the FDA approves new drug products under the Federal Food, Drug, and Cosmetic Act, or FDCA, while new biologic products are licensed for marketing under the Public Health Service Act, or PHSA. Both drugs and biologics are regulated under the FDCA and implementing regulations. The process of obtaining regulatory approvals and the subsequent compliance with appropriate federal, state, local and foreign statutes and regulations requires the expenditure of substantial time and financial resources. Failure to comply with the applicable United States requirements at any time during the product development process, approval process or after approval may subject an applicant to a variety of administrative or judicial actions, including, among other things, the FDA's refusal to approve pending applications, withdrawal of an approval, imposition of a clinical hold, issuance of untitled or warning letters, product recalls, product seizures, total or partial suspension of production or distribution injunctions, fines, refusals of government contracts, restitution, disgorgement of profits, civil penalties and criminal prosecution.

Generally, the process required by the FDA before a drug or biological product may be marketed in the United States involves the following:

- completion of preclinical laboratory tests, animal studies and formulation studies in compliance with the FDA's good laboratory practice, or GLP, regulations;
- submission to the FDA of an IND, which must become effective before human clinical trials may begin;
- approval by an independent institutional review board, or IRB, at each clinical site before each trial may be initiated;
- performance of adequate and well-controlled human clinical trials in accordance with good clinical practices, or GCP, to establish the safety and efficacy of the proposed drug product and the safety, potency and purity of a candidate biologic product for each indication;
- submission to the FDA of an NDA or an abbreviated new drug application, or ANDA, for a new drug product or BLA for a biological product, as applicable;
- satisfactory completion of an FDA advisory committee review, if applicable;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities at which the product is produced to assess compliance with cGMP requirements and to assure that the facilities, methods and controls are adequate to preserve the drug's identity, strength, quality and purity;
- FDA review and approval of the NDA or BLA; and
- compliance with any post-approval requirements, including the potential requirement to implement a Risk Evaluation and Mitigation Strategy program and the potential requirement to conduct post-approval studies.

We expect that all of our clinical product candidates will be subject to review as biological products under BLA standards. Although MM-310 contains both drug and biological components, we believe that this combination product would be subject to review as a biological product, pursuant to a BLA.

Preclinical studies and the IND Process

Preclinical studies include laboratory evaluation of product chemistry and formulation, as well as *in vitro* and animal studies to assess the potential for adverse events and in some cases to establish a rationale for therapeutic use. The conduct of preclinical studies is subject to federal regulations and requirements, including GLP regulations. An IND sponsor must submit the results of the preclinical tests, together with manufacturing information, analytical data, any available clinical data or literature and a proposed protocol for clinical studies, among other things, to the FDA as part of an IND. An IND is an exemption from the FDCA that allows an unapproved product candidate to be shipped in interstate commerce for use in an investigational clinical trial and is a request for FDA authorization to administer such investigational product to humans. Such authorization must be secured prior to interstate shipment and administration of any product candidate that is not the subject of an approved application. Some long-term preclinical testing, such as animal tests of reproductive adverse events and carcinogenicity, may continue after the IND is submitted. An IND automatically becomes effective 30 days after receipt by the FDA, unless before that time the FDA raises concerns or questions related to one or more proposed clinical trials and places the trial on clinical hold. In such a case, the IND sponsor and the FDA must resolve any outstanding concerns before the clinical trial can begin. As a result, submission of an IND may not necessarily result in the FDA allowing clinical trials to commence.

Clinical trials

Clinical trials involve the administration of the investigational new drug to human subjects – healthy volunteers or patients – under the supervision of qualified investigators in accordance with GCP requirements, which include, among other things, the requirement that all research subjects provide their informed consent in writing before their participation in any clinical trial. Clinical trials are conducted under written study protocols detailing, among other things, the objectives of the study, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated. A protocol for each clinical trial and any subsequent protocol amendments must be submitted to the FDA as part of the IND. In addition, an IRB at each institution participating in the clinical trial must review and approve the plan for any clinical trial before it commences at that institution, and the IRB must conduct continuing review and reapprove the study at least annually. The IRB must review and approve, among other things, the study protocol and informed consent information to be provided to study subjects. An IRB may also require the clinical trial at the site to be halted, either temporarily or permanently, for failure to comply with the IRB's requirements, or may impose other conditions. For clinical trials involving an IND, an IRB must operate in compliance with FDA regulations. Additionally, some trials are overseen by an independent group of qualified experts organized by the trial sponsor, known as a data safety monitoring board, or DSMB. This group provides authorization as to whether or not a trial may move forward at designated check points based on access that only the DSMB maintains to available data from the study.

Human clinical trials are typically conducted in three sequential phases, which may overlap or be combined:

- *Phase 1*: The investigational drug or biological product is initially introduced into healthy human subjects or patients with the target disease or condition and tested for safety, side effects associated with increasing doses, pharmacological action, absorption, metabolism, distribution, excretion and, if possible, to gain an early indication of its effectiveness.
- *Phase 2*: The investigational drug or biological product is administered to a limited patient population to identify common adverse effects and safety risks, to preliminarily evaluate the efficacy of the product for specific targeted diseases and to determine dosage tolerance and optimal dosage.
- *Phase 3*: The investigational drug or biological product is administered to an expanded patient population in adequate and well-controlled clinical trials, typically at geographically dispersed clinical trial sites, to generate sufficient data to statistically confirm the efficacy and safety of the product for approval, to permit the FDA to evaluate the overall risk-benefit profile of the product and to provide adequate information for the labeling of the product.

Progress reports detailing the results of clinical trials involving an IND must be submitted at least annually to the FDA and more frequently if serious adverse events occur. Phase 1, Phase 2 and Phase 3 clinical trials may not be completed successfully within any specified period, or at all. Furthermore, the FDA or the sponsor may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution if the clinical trial is not being conducted in accordance with the IRB's requirements or if the drug or biologic product has been associated with unexpected serious harm to patients.

In some cases, the FDA may approve an application for a product candidate but require the sponsor to conduct additional clinical trials to further assess the product candidate's safety and effectiveness after approval. Such post-approval trials are typically referred to as Phase 4 clinical trials. These studies are used to gain additional experience from the treatment of a larger number of patients in the intended treatment group and to further document a clinical benefit in the case of drugs approved under accelerated approval regulations.

Disclosure of clinical trial information

Sponsors of applicable clinical trials of FDA regulated products, including drugs, are required to register and disclose certain clinical trial information. Information related to the product, patient population, phase of investigation, study sites and investigators, and other aspects of the clinical trial is then made public on the ClinicalTrials.gov website as part of the registration. Sponsors are also obligated to disclose the results of their clinical trials after completion. Disclosure of the results of these trials can be delayed until the new product or new indication being studied has been approved. Competitors may use this publicly available information to gain knowledge regarding the progress of development programs.

Marketing approval

Assuming successful completion of the required clinical testing, the results of the preclinical and clinical studies, together with detailed information relating to the product's pharmacology chemistry, manufacture, controls and proposed labeling, among other things, are submitted to the FDA as part of an NDA or BLA requesting approval to market the product for one or more indications. FDA approval of the NDA or BLA is required before marketing of the product may begin in the United States. Under federal law, the submission of most NDAs and BLAs is subject to a substantial application user fee, currently $2,421,495 for an application requiring clinical data for fiscal year 2018, and the sponsor of an approved NDA or BLA is also subject to annual product or program fees, currently $304,162 per program. These fees may be increased or decreased annually.

The FDA conducts a preliminary review of all NDAs and BLAs within the first 60 days after receipt before accepting them for filing based on the agency's threshold determination that they are sufficiently complete to permit substantive review. The FDA may request additional information rather than accept an NDA or BLA for filing. In this event, the application must be resubmitted with the additional information, which would also be subject to review before the FDA accepts it for filing. Once the submission is accepted for filing, the FDA begins an in-depth substantive review. The FDA has agreed to specified performance goals in the review of NDAs and BLAs. Most such applications for non-priority products are reviewed within ten to twelve months after filing, and most applications for priority review products, that is, drugs and biologics that the FDA determines represent a significant improvement over existing therapy, are reviewed in six to eight months after filing. The review process may be extended by the FDA for three additional months to consider certain late-submitted information or clarification regarding information already provided in the submission. The FDA may also refer applications for novel drugs or biological products or products that 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. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions.

Before approving an NDA or BLA, the FDA typically will 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 requirements and adequate to assure consistent production of the product within required specifications. In addition, before approving an NDA or BLA, the FDA will typically inspect one or more clinical sites to assure compliance with GCP and integrity of the clinical data submitted.

The testing and approval process requires substantial time, effort and financial resources, and each may take many years to complete. Data obtained from clinical activities are not always conclusive and may be susceptible to varying interpretations, which could delay, limit or prevent regulatory approval. We may encounter difficulties or unanticipated costs in our efforts to develop our product candidates and secure necessary governmental approvals, which could delay or preclude us from marketing our products.

After the FDA's evaluation of the NDA or BLA and inspection of the manufacturing facilities, the FDA may issue an approval letter or a complete response letter. An approval letter authorizes commercial marketing of the drug or biological product with specific prescribing information for specific indications. A complete response letter generally outlines the deficiencies in the submission and may require substantial additional testing or information in order for the FDA to reconsider the application. If and when those deficiencies have been addressed to the FDA's satisfaction in a resubmission of the NDA, the FDA will issue an approval letter. The FDA has committed to reviewing such resubmissions in two or six months depending on the type of information included. Even with submission of this additional information, the FDA ultimately may decide that the application does not satisfy the regulatory criteria for approval.

Even if the FDA approves a product, the agency may limit the approved indications for use for the product, require that contraindications, warnings or precautions be included in the product labeling, require that post-approval studies be conducted to further assess a drug's safety after approval, require testing and surveillance programs to monitor the product after commercialization, or impose other conditions, including distribution restrictions through a Risk Evaluation and Mitigation Strategy or other risk management mechanisms, which can materially affect the potential market and profitability of the product. The FDA may prevent or limit further marketing of a product based on the results of post-market studies or surveillance programs. After approval, some types of changes to the approved product, such as changes in indications, manufacturing changes and labeling, are subject to further testing requirements and FDA review and approval.

Fast track designation

The FDA is required to facilitate the development and expedite the review of drugs and biologics that are intended for the treatment of a serious or life-threatening disease or condition for which there is no effective treatment and which demonstrate the potential to address unmet medical needs for the condition. Under the fast track program, the sponsor of a new drug or biologic candidate may request the FDA to designate the product for a specific indication as a fast track product concurrent with or after the filing of the IND for the product candidate. The FDA must determine if the product candidate qualifies for fast track designation within 60 days after receipt of the sponsor's request.

In addition to other benefits, such as the ability to have more frequent interactions with the FDA, the FDA may initiate review of sections of a fast track product's NDA or BLA before the application is complete. This rolling review is available if the applicant provides and the FDA approves a schedule for the submission of the remaining information and the applicant pays applicable user fees. However, the FDA's time period goal for reviewing a fast track application does not begin until the last section of the NDA or BLA is submitted. In addition, the fast track designation may be withdrawn by the FDA if the FDA believes that the designation is no longer supported by data emerging in the clinical trial process.

Priority review

Under FDA priority review guidelines, a product candidate may be eligible for review within a six to eight month time frame from the time a complete application is accepted for filing. Products regulated by the FDA's Center for Drug Evaluation and Research, or CDER, are eligible for priority review if they provide a significant improvement compared to marketed products in the treatment, diagnosis or prevention of a disease. Products regulated by the FDA's Center for Biologics Evaluation and Research are eligible for priority review if they provide a significant improvement in the safety or effectiveness of the treatment, diagnosis or prevention of a serious or life-threatening disease. A fast track designated product candidate would ordinarily meet the FDA's criteria for priority review.

Accelerated approval

Under the FDA's accelerated approval regulations, the FDA may approve a drug or biologic for a serious or life-threatening illness that provides meaningful therapeutic benefit to patients over existing treatments based on a surrogate endpoint that is reasonably likely to predict clinical benefit. In clinical trials, a surrogate endpoint is a measurement of laboratory or clinical signs of a disease or condition that substitutes for a direct measurement of how a patient feels, functions or survives. Surrogate endpoints can often be measured more easily or more rapidly than clinical endpoints. A product candidate approved on this basis is subject to rigorous post-marketing compliance requirements, including the completion of Phase 4 or post-approval clinical trials to confirm the effect on the clinical endpoint. Failure to conduct required post-approval studies, or confirm a clinical benefit during post-marketing studies, would allow the FDA to withdraw the drug from the market on an expedited basis. All promotional materials for drug candidates approved under accelerated regulations are subject to prior review by the FDA.

Breakthrough therapy designation

The FDA is also required to expedite the development and review of the application for approval of drugs that are intended to treat a serious or life-threatening disease or condition where preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints. Under the breakthrough therapy program, the sponsor of a new drug candidate may request that the FDA designate the drug candidate for a specific indication as a breakthrough therapy concurrent with, or after, the filing of the IND for the drug candidate. The FDA must determine if the drug candidate qualifies for breakthrough therapy designation within 60 days of receipt of the sponsor's request.

Orphan drugs

Under the Orphan Drug Act, the FDA may grant orphan drug designation to drugs or biologics intended to treat a rare disease or condition, which is generally defined as a disease or condition that affects fewer than 200,000 individuals in the United States. Orphan drug designation must be requested before submitting an NDA or BLA. After the FDA grants orphan drug designation, the generic identity of the drug or biologic and its potential orphan use are disclosed publicly by the FDA. Orphan drug designation does not convey any advantage in, or shorten the duration of, the regulatory review and approval process. The first NDA or BLA applicant to receive FDA approval for a particular active ingredient to treat a particular disease with FDA orphan drug designation is entitled to a seven-year exclusive marketing period in the United States for that product, for that indication. During the seven-year exclusivity period, the FDA may not approve any other applications to market the same drug or biologic for the same orphan indication, except in limited circumstances, such as a showing of clinical superiority to the product with orphan drug exclusivity in that it is shown to be safer, more effective or makes a major contribution to patient care. This is the case despite an earlier court opinion holding that the Orphan Drug Act unambiguously required the FDA to recognize orphan exclusivity regardless of a showing of clinical superiority. Orphan drug exclusivity does not prevent the FDA from approving a different drug or biologic for the same disease or condition, or the same drug or biologic for a different disease or condition. Among the other benefits of orphan drug designation are tax credits for certain research and a waiver of the NDA or BLA application user fee.

Pediatric information and exclusivity

Under the Pediatric Research Equity Act of 2003, an NDA, BLA or supplement to an NDA or BLA must contain data from pediatric studies that are adequate to assess the safety and effectiveness of the drug or biological product for the claimed indications in all relevant pediatric subpopulations, and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. The FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults, or full or partial waivers from the pediatric data requirements. Under the Food and Drug Administration Safety and Innovation Act, or FDASIA, the FDA has additional authority to take action against manufacturers not adhering to pediatric study requirements. Unless otherwise required by regulation, the pediatric data requirements do not apply to products with orphan drug designation.

Pediatric exclusivity is another type of non-patent exclusivity in the United States and, if granted, provides for the attachment of an additional six months of marketing protection to the term of any existing regulatory exclusivity or patent protection, including the non-patent and orphan exclusivity. This six month exclusivity may be granted if an application sponsor submits pediatric data that fairly respond to a written request from the FDA for such data. The data do not need to show the product to be effective in the pediatric population studied; rather, if the clinical trial is deemed to fairly respond to the FDA's request, the additional protection is granted.

The Hatch-Waxman Act

Abbreviated new drug applications

In seeking approval for a drug through an NDA, applicants are required to list with the FDA each patent that claims to cover the applicant's product. Upon approval of a drug, each of the patents listed in the application for the drug is then published in the FDA's Approved Drug Products with Therapeutic Equivalence Evaluations, commonly known as the Orange Book. Drugs listed in the Orange Book can, in turn, be cited by potential competitors in support of approval of an ANDA. Generally, an ANDA provides for marketing of a drug product that has the same active ingredients in the same strengths and dosage form as the listed drug and has been shown through bioequivalence testing to be therapeutically equivalent to the listed drug. Other than the requirement for bioequivalence testing, ANDA applicants are not required to conduct or submit results of preclinical or clinical tests to prove the safety or effectiveness of their drug product. Drugs approved in this way are commonly referred to as "generic equivalents" to the listed drug, and can often be substituted by pharmacists under prescriptions written for the original listed drug.

The ANDA applicant is required to certify to the FDA concerning any patents listed for the approved product in the FDA's Orange Book. Specifically, the applicant must certify that:

- the required patent information has not been filed;
- the listed patent has expired;
- the listed patent has not expired, but will expire on a particular date and approval is sought after patent expiration; or
- the listed patent is invalid or will not be infringed by the new product.

A certification that the new product will not infringe the already approved product's listed patents or that such patents are invalid is called a Paragraph IV certification. If the ANDA applicant does not challenge the listed patents, the ANDA will not be approved until all the listed patents claiming the referenced product have expired.

If the ANDA applicant has provided a Paragraph IV certification to the FDA, the applicant must also send notice of the Paragraph IV certification to the NDA and patent holders once the ANDA has been accepted for filing by the FDA. The NDA and patent holders may then initiate a patent infringement lawsuit in response to the notice of the Paragraph IV certification. The filing of a patent infringement lawsuit within 45 days after the receipt of a Paragraph IV certification automatically prevents the FDA from approving the ANDA until the earlier of a 30 month period, expiration of the patent, settlement of the lawsuit or a decision in the infringement case that the patent involved is deemed invalid or not infringed.

The ANDA also will not be approved until any applicable 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. Federal law provides a period of five years following approval of a drug containing no previously approved active ingredients during which ANDAs for generic versions of those drugs cannot be received by the FDA, except that the application may be submitted in four years if it contains a Paragraph IV certification. If there is no listed patent in the Orange Book, there may not be a Paragraph IV certification, and thus, no ANDA may be filed before the expiration of the exclusivity period. Federal law provides for a period of three years of exclusivity following approval of a listed drug that contains previously approved active ingredients but is approved in a new dosage form, route of administration or combination, or for a new use, the approval of which was required to be supported by new clinical trials conducted by or for the sponsor, during which the FDA cannot grant effective approval of an ANDA based on that listed drug.

The FDA must establish a priority review track for certain generic drugs, requiring the FDA to review a drug application within eight (8) months for a drug that has three (3) or fewer approved drugs listed in the Orange Book and is no longer protected by any patent or regulatory exclusivities, or is on the FDA's drug shortage list. The FDA must also expedite review of ''competitor generic therapies'' or drugs with inadequate generic competition, including holding meetings with or providing advice to the drug sponsor prior to submission of the application.

Patent term extension

After NDA approval, owners of relevant drug patents may apply for up to a five year patent term extension. The allowable patent term extension is calculated as half of the drug's testing phase, based on the time between IND application and submission of the NDA, and all of the review phase, based on the time between the NDA submission and approval up to a maximum of five years. The time can be shortened if the FDA determines that the applicant did not pursue approval with due diligence. The total patent term after the extension may not exceed 14 years.

For patents that might expire during the application phase, the patent owner may request an interim patent term extension. An interim patent term extension increases the patent term by one year and may be renewed up to four times. For each interim patent term extension granted, the post-approval patent term extension is reduced by one year. The director of the U.S. Patent and Trademark Office must determine that approval of the drug covered by the patent for which a patent term extension is being sought is likely. Interim patent term extensions are not available for a drug for which an NDA has not been submitted.

Section 505(b)(2) new drug applications

Most drug products obtain FDA marketing approval pursuant to an NDA or an ANDA. A third alternative is a special type of NDA, commonly referred to as a Section 505(b)(2) NDA, which enables the applicant to rely, in part, on the FDA's previous approval of a similar product, or published literature, in support of its application.

Section 505(b)(2) NDAs often provide an alternate path to FDA approval for new or improved formulations or new uses of previously approved products. Section 505(b)(2) 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. If the Section 505(b)(2) applicant can establish that reliance on the FDA's previous approval is scientifically appropriate, it may eliminate the need to conduct certain preclinical or clinical studies of the new product. The FDA may also require companies to perform additional studies or measurements to support the change from the approved product. The FDA may then approve the new product 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 the Section 505(b)(2) applicant is relying on studies conducted for an already approved product, the applicant is required to certify to the FDA concerning any patents listed for the approved product in the Orange Book to the same extent that an ANDA applicant would. As a result, approval of a Section 505(b)(2) NDA can be stalled until all the listed patents claiming the referenced product have expired, 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, and, in the case of a Paragraph IV certification and subsequent patent infringement suit, until the earlier of a 30 month period, settlement of the lawsuit or a decision in the infringement case that the patent involved is deemed invalid or not infringed.

Combination products

A combination product is a product comprised of (i) two or more regulated components (i.e., drug/device, biologic/device, drug/biologic or drug/device/biologic) that are physically, chemically, or otherwise combined or mixed and produced as a single entity; (ii) two or more separate products packaged together in a single package or as a unit and comprised of drug and device products, device and biological products, or biological and drug products; (iii) a drug, device, or biological product packaged separately that according to its investigational plan or proposed labeling is intended for use only with an approved individually specified drug, device, or biological product where both are required to achieve the intended use, indication, or effect and where, upon approval of the proposed product, the labeling of the approved product would need to be changed (e.g., to reflect a change in intended use, dosage form, strength, route of administration, or significant change in dose); or (iv) any investigational drug, device, or biological product packaged separately that according to its proposed labeling is for use only with another individually specified investigational drug, device, or biological product where both are required to achieve the intended use, indication, or effect.

The FDA is divided into various branches, or Centers, by product type. Different Centers typically review drug, biologic or device applications. In order to review an application for a combination product, the FDA must decide which Center should be responsible for the review. FDA regulations require that the FDA determine the combination product's primary mode of action, or PMOA, which is the single mode of a combination product that provides the most important therapeutic action of the combination product. The Center that regulates that portion of the product that generates the PMOA or that has expertise in the relevant therapeutic area becomes the lead evaluator. If there are two independent modes of action, neither of which is subordinate to the other, the FDA makes a determination as to which Center to assign the product based on consistency with other combination products raising similar types of safety and effectiveness questions or to the Center with the most expertise in evaluating the most significant safety and effectiveness questions raised by the combination product. When evaluating an application, a lead Center may consult other Centers but still retain complete reviewing authority, or it may collaborate with another Center, by which the lead Center assigns review of a specific section of the application to another Center, delegating its review authority for that section. Typically, the FDA requires a single marketing application submitted to the Center selected to be the lead evaluator, although the agency has the discretion to require separate applications to more than one Center. One reason to submit multiple evaluations is if the applicant wishes to receive some benefit that accrues only from approval under a particular type of application, like new drug product exclusivity. If multiple applications are submitted, each application may be evaluated by a different lead Center.

Biosimilars law

The Biologics Price Competition and Innovation Act of 2009, or BPCIA, amended the PHSA to create a new licensure framework for biosimilar products, which could ultimately subject our biological products to competition. Under the BPCIA, a manufacturer may submit an application for licensure of a biologic product that is "biosimilar to" or "interchangeable with" a referenced, branded biologic product. Previously, there had been no licensure pathway for such biosimilar or interchangeable products. For purposes of the BPCIA, a reference product is defined as the single biological product licensed under a full BLA against which a biological product is evaluated in an application submitted under a follow-on BLA. Biosimilarity sufficient to reference a prior FDA-approved product requires that there be no differences in conditions of use, route of administration, dosage form, and strength, and no clinically meaningful differences between the biological product and the reference product in terms of safety, purity, and potency. Biosimilarity must be shown through analytical studies, animal studies, and at least one clinical trial, absent a waiver by the Secretary of the U.S. Department of Health & Human Services. A biosimilar product may be deemed interchangeable with a prior approved product if it meets the higher hurdle of demonstrating that it can be expected to produce the same clinical results as the reference product and, for products administered multiple times, the biologic and the reference biologic may be switched after one has been previously administered without increasing safety risks or risks of diminished efficacy relative to exclusive use of the reference biologic.

The BPCIA also created a 12-year period of reference product exclusivity, which can be extended to 12½ years with pediatric exclusivity. The 12-year exclusivity period begins on the date of first licensure of the reference product under the PHSA and during which the licensure of a follow-on application for a biosimilar or interchangeable product cannot be made effective. During the first four years (or four and one-half years with pediatric exclusivity) of the 12-year period, an application for a biosimilar or interchangeable version of the reference product cannot be submitted to the FDA.

The BPCIA includes limits on obtaining 12-year reference product exclusivity for certain changes or modifications to the reference product. A separate 12-year reference product exclusivity period does not apply to:

- a BLA supplement for the product that is the reference product;
- a subsequent BLA filed by the same reference product sponsor or manufacturer (or a licensor, predecessor in interest, or other related entity) for a change (not including a modification to the structure of the biological product) that results in a new indication, route of administration, dosing schedule, dosage form, delivery system, delivery device or strength; or
- a modification to the structure of the biological product that does not result in a change in safety, purity or potency.

The FDA has not yet issued proposed regulations setting forth its interpretation of the BPCIA's provisions but has issued guidance documents and draft guidance documents related to BPCIA implementation concerning biosimilarity and interchangeability, BLA submission requirements, exclusivity, clinical pharmacology, statistics, labeling and naming. As of January 1, 2018, the FDA has approved nine biosimilar products for use in the United States. No interchangeable biosimilars have been approved.

In addition to creating a 12-year period of reference product exclusivity, the BPCIA clarifies the interaction of that exclusivity with orphan drug exclusivity, such that the licensure of a biosimilar or interchangeable version of a reference product that was designated and approved as an orphan drug may only occur after the later of the expiration of any applicable seven-year orphan drug exclusivity or the 12-year reference product exclusivity (or seven and one-half years and 12½ years with pediatric exclusivity).

Like pediatric exclusivity applicable to drug products approved under the FDCA, pediatric exclusivity applicable to biological reference products is subject to an exception. Pediatric exclusivity will not apply to either the 12-year reference product or the seven-year orphan drug exclusivity periods if the FDA determines later than nine months prior to the expiration of such period that the study reports a BLA sponsor submitted in response to a written request for pediatric studies met the terms of that request.

Our investigational biological products, if approved, could be considered reference products entitled to 12-year exclusivity. Even if our products are considered to be reference products eligible for exclusivity, another company could market a competing version of any of our biological products if the FDA approves a full BLA for such product containing the sponsor's own preclinical data and data from adequate and well-controlled clinical trials to demonstrate the safety, purity and potency of their product.

The BPCIA also sets forth a complex mechanism for resolving patent disputes that involves a step-wise exchange of information prior to the initiation of a patent infringement lawsuit against a biosimilar or interchangeable product sponsor. Unlike the Hatch-Waxman Act, the BPCIA provides no automatic stay on approval of a biosimilar or interchangeable product application.

Overview of FDA regulation of companion diagnostics

We are developing *in vitro* diagnostics for use in selecting the patients that we believe will respond to our cancer therapeutics.

The FDA published final guidance in July 2014 that addresses issues critical to developing *in vitro* companion diagnostics. The guidance provides that *in vitro* companion diagnostics that are essential for the safe and effective use of a corresponding therapeutic product must be approved contemporaneously with that therapeutic in most circumstances. Based on the guidance and the FDA's past treatment of companion diagnostics, we believe that the FDA will likely require one or more of our *in vitro* diagnostics to obtain premarket approval, or PMA, in conjunction with approval of the associated therapeutic, which will involve coordination of review by CDER and by the FDA's Center for Devices and Radiological Health Office of In Vitro Diagnostics and Radiological Health.

Diagnostic tests determined by the FDA to be useful, but not essential, for the safe and effective use of a corresponding therapeutic product are also subject to the same medical device pathways, but their clearance or approval would not be subject to a coordinated review of the diagnostic test and the therapeutic product.

The FDA classifies medical devices into one of three classes. Devices deemed to pose lower risk are placed in either Class I or II, which requires the manufacturer to submit to the FDA a premarket notification requesting permission for commercial distribution. Some low risk devices are exempt from this requirement. Devices deemed by the FDA to pose the greatest risk, such as life-sustaining, life-supporting or implantable devices, or devices deemed not substantially equivalent to a previously cleared 510(k) device, are placed in Class III, requiring a PMA. A medical device, including an *in vitro* diagnostic, or IVD, to be commercially distributed in the United States must receive either 510(k) clearance or PMA (or be a Class I exempt device that does not require pre-market review) from the FDA prior to marketing. The FDA has previously required *in vitro* companion diagnostics intended to select the patients who will respond to the product candidate to obtain a PMA simultaneously with approval of the product candidate.

510(k) clearance pathway

If any of the diagnostic products under development were determined by FDA not to be essential to the safe and effective prescription of a corresponding therapeutic product, it is possible that the diagnostic test could require 510(k) clearance. The FDA's 510(k) clearance pathway usually takes from three to twelve months, but it can take significantly longer. The FDA may require additional information, including clinical data, to make a determination regarding substantial equivalence.

After a device receives 510(k) clearance, any modification that could significantly affect its safety or effectiveness, or that would constitute a new or major change in its intended use, would require a new 510(k) clearance or, depending on the modification, a PMA. The FDA requires each manufacturer to determine whether the proposed change requires submission of a 510(k) notice or a PMA, but the FDA can review any such decision and can disagree with a manufacturer's determination. If the FDA disagrees with a manufacturer's determination, the FDA can require the manufacturer to cease marketing and/or recall the modified device until 510(k) clearance or a PMA is obtained. If the FDA requires us to seek 510(k) clearance or a PMA for any modifications to a previously cleared product, we may be required to cease marketing or recall the modified device until we obtain this clearance or approval. Also, in these circumstances, we may be subject to significant regulatory fines or penalties.

PMA pathway

Devices deemed by the FDA to pose the greatest risk, such as life-sustaining, life supporting or implantable devices, or devices deemed not substantially equivalent to a previously 510(k) cleared device or a preamendment Class III device for which PMA applications have not been called, are placed in Class III requiring PMA. The PMA pathway requires proof of the safety and effectiveness of the device to the FDA's satisfaction. The PMA pathway generally takes from one to three years or even longer from submission of the application. Most companion diagnostic tests have been classified as Class III devices subject to the PMA pathway.

A PMA application for an IVD must provide extensive preclinical and clinical trial data. Preclinical data for an IVD includes many different tests, including how reproducible the results are when the same sample is tested multiple times by multiple users at multiple laboratories. The clinical data need to establish that the test is sufficiently safe, effective and reliable in the intended use population. In addition, the FDA must be convinced that a device has clinical utility, meaning that an IVD provides information that is clinically meaningful. A biomarker's clinical significance may be obvious, or the applicant may be able to rely upon published literature or submit data to show clinical utility.

A PMA application also must provide information about the device and its components regarding, among other things, device design, manufacturing and labeling. PMA applications are subject to an application fee; for fiscal year 2018, the standard fee for review of a PMA is $310,764 and the small business fee for review of a PMA is $77,691.

As part of the PMA review, the FDA will typically inspect the manufacturer's facilities for compliance with Quality System Regulation, or QSR, requirements, which impose elaborate design control, testing, manufacturing, control, documentation and other quality assurance procedures.

Upon submission, the FDA determines if the PMA application is sufficiently complete to permit a substantive review, and, if so, the FDA accepts the application for filing. The FDA then commences an in-depth review of the PMA application. The entire process typically takes one to three years, but may take longer. The review time is often significantly extended as a result of the FDA asking for more information or clarification of information already provided. The FDA also may respond with a not approvable determination based on deficiencies in the application and require additional clinical trials that are often expensive and time-consuming and can substantially delay approval. During the review period, an FDA advisory committee, typically a panel of clinicians, likely will be convened to review the application and recommend to the FDA whether, or upon what conditions, the device should be approved. Although the FDA is not bound by the advisory panel decision, the panel's recommendation is important to the FDA's overall decision making process.

If the FDA's evaluation of the PMA application is favorable, the FDA typically issues an approvable letter requiring the applicant's agreement to specific conditions, such as changes in labeling, or specific additional information, such as submission of final labeling, in order to secure final approval of the PMA. If the FDA concludes that the applicable criteria have been met, the FDA will issue a PMA for the approved indications, which can be more limited than those originally sought by the manufacturer. The PMA can include post-approval conditions that the FDA believes necessary to ensure the safety and effectiveness of the device, including, among other things, restrictions on labeling, promotion, sale and distribution. Failure to comply with the conditions of approval can result in material adverse enforcement action, including the loss or withdrawal of the approval.

Even after approval of a PMA, a new PMA or PMA supplement may be required in the event of a modification to the device, its labeling or its manufacturing process. Supplements to a PMA often require the submission of the same type of information required for an original PMA, except that the supplement is generally limited to the information needed to support the proposed change from the product covered by the original PMA.

Clinical trials

A clinical trial is almost always required to support a PMA application. All clinical trials of investigational devices must be conducted in compliance with the FDA's requirements. If an investigational device could pose a significant risk to patients pursuant to FDA regulations, the FDA must approve an Investigational Device Exemption, or IDE, application prior to initiation of investigational use. IVD trials usually do not require an IDE, as the FDA does not judge them to be a significant risk because the results do not affect the patients in the study. However, for a trial where the IVD result directs the therapeutic care of patients with cancer (companion diagnostics), we believe that the FDA would consider the investigation to present significant risk and require an IDE.

An IDE application must be supported by appropriate data, such as laboratory test results, showing that it is safe to test the device in humans and that the testing protocol is scientifically sound. The FDA typically grants IDE approval for a specified number of patients. A nonsignificant risk device does not require FDA approval of an IDE. Both significant risk and nonsignificant risk investigational devices require approval from IRBs at the study centers where the device will be used.

During the trial, the sponsor must comply with the FDA's IDE requirements for investigator selection, trial monitoring, reporting and record keeping. The investigators must obtain patient informed consent, rigorously follow the investigational plan and study protocol, control the disposition of investigational devices and comply with all reporting and record keeping requirements. Prior to granting PMA, the FDA typically inspects the records relating to the conduct of the study and the clinical data supporting the PMA application for compliance with applicable requirements.

Although the QSR does not fully apply to investigational devices, the requirement for controls on design and development does apply. The sponsor also must manufacture the investigational device in conformity with the quality controls described in the IDE application and any conditions of IDE approval that the FDA may impose with respect to manufacturing.

Post-market

After a device is on the market, numerous regulatory requirements apply. These requirements include: the QSR, labeling regulations, the FDA's general prohibition against promoting products for unapproved or "off label" uses, the Medical Device Reporting regulation, which requires that manufacturers report to the FDA if their device may have caused or contributed to a death or serious injury or malfunctioned in a way that would likely cause or contribute to a death or serious injury if it were to recur, and the Reports of Corrections and Removals regulation, which requires manufacturers to report recalls and field actions to the FDA if initiated to reduce a risk to health posed by the device or to remedy a violation of the FDCA.

The FDA enforces these requirements by inspection and market surveillance. If the FDA finds a violation, it can institute a wide variety of enforcement actions, ranging from a public warning letter to more severe sanctions such as: fines, injunctions and civil penalties; recall or seizure of products; operating restrictions, partial suspension or total shutdown of production; refusing requests for PMA of new products; withdrawing PMAs already granted; and criminal prosecution.

Other regulatory requirements

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

The FDA may impose a number of post-approval requirements as a condition of approval of an NDA or BLA. For example, the FDA may require post-marketing testing, including Phase 4 clinical trials, and surveillance to further assess and monitor the product's safety and effectiveness after commercialization. Regulatory approval of oncology products often requires that patients in clinical trials be followed for long periods to determine the overall survival benefit of the drug or biologic.

In addition, drug and biologic manufacturers and other entities involved in the manufacture and distribution of approved drugs and biological products are required to register their establishments with the FDA and state agencies, and are subject to periodic unannounced inspections by the FDA and these state agencies for compliance with cGMP requirements. The FDA was also granted new inspection authorities under FDASIA. Changes to the manufacturing process are strictly regulated and often require prior FDA approval before being implemented. FDA regulations also require investigation and correction of any deviations from cGMP and impose reporting and documentation requirements upon us and any third-party manufacturers that we may decide to use. Accordingly, manufacturers must continue to expend time, money and effort in the areas of production and quality control to maintain cGMP compliance.

Once an approval is granted, the FDA may withdraw the approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the approved labeling to add new safety information, imposition of post-market studies or clinical trials to assess new safety risks or imposition of distribution or other restrictions under a Risk Evaluation and Mitigation Strategy program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product, complete withdrawal of the product from the market or product recalls;
- fines, untitled and 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 license approvals;
- product seizure or detention, or refusal to permit the import or export of products; or
- consent decrees, injunctions or the imposition of civil or criminal prosecution.

The FDA strictly regulates marketing, labeling, advertising and promotion of products that are placed on the market. Drugs and biologics may be promoted only 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. If a company is found to have promoted off-label uses, it may become subject to adverse public relations and administrative and judicial enforcement by the FDA, the Department of Justice or the Office of the Inspector General of the Department of Health and Human Services, as well as state authorities. This could subject a company to a range of penalties that could have a significant commercial impact, including civil and criminal fines and agreements that materially restrict the manner in which a company promotes or distributes drug products.

Additional provisions

Anti-kickback and false claims laws

In addition to FDA restrictions on marketing of pharmaceutical products, pharmaceutical companies that participate in federal healthcare programs like Medicare or Medicaid are subject to various U.S. federal and state laws that may restrict certain marketing practices. These laws include but are not limited to anti-kickback statutes and false claims statutes. The federal anti-kickback statute prohibits, among other things, knowingly and willfully offering, paying, soliciting or receiving remuneration to induce or in return for purchasing, leasing, ordering or arranging for the purchase, lease or order of any healthcare item or service reimbursable under Medicare, Medicaid or other federally financed healthcare programs. The Patient Protection and Affordable Care Act as amended by the Health Care Education and Reconciliation Act of 2010, collectively the Health Care Reform Laws, amended the intent element of the anti-kickback statute such that liability under the statute can be proved even if a person or entity does not have actual knowledge of the statute or specific intent to violate it. This statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand and prescribers, purchasers and formulary managers on the other. Violations of the anti-kickback statute are punishable by imprisonment, criminal fines, civil monetary penalties and exclusion from participation in federal healthcare programs. Although there are a number of statutory exemptions and regulatory safe harbors protecting certain common activities from prosecution or other regulatory sanctions, the exemptions and safe harbors are drawn narrowly, and practices that involve remuneration intended to induce prescribing, purchases or recommendations may be subject to scrutiny if they do not qualify for an exemption or safe harbor. In addition to the federal anti-kickback statute, the federal Health Insurance Portability and Accountability Act of 1996, as amended by the Health Information Technology for Economic and Clinical Health Act, or HIPAA, makes it a crime to knowingly and willfully execute or attempt to execute a scheme to defraud any healthcare benefit program

The federal civil False Claims Act prohibits any person from knowingly presenting, or causing to be presented, a false claim for payment to the federal government, or knowingly making, or causing to be made, a false statement to have a false claim paid. Government enforcement agencies and private whistleblowers have initiated investigations or brought private lawsuits against pharmaceutical companies for a variety of allegedly improper promotional or marketing activities, such as allegedly inflating drug prices they report to pricing services, which in turn were used by the government to set Medicare and Medicaid reimbursement rates, for allegedly providing free product to customers with the expectation that the customers would bill federal programs for the product, or for engaging in promotion for “off-label” uses. Additionally, the Health Care Reform Laws amended the federal False Claims Act such that a violation of the federal anti-kickback statute can serve as a basis for liability under the False Claims Act. In addition to the federal civil False Claims Act, the federal false statements statute prohibits, among other things, knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services.

The majority of states also have statutes or regulations similar to the federal anti-kickback statute and/or False Claims Act, which apply to items and services reimbursed under Medicaid and other state programs, or, in several states, apply regardless of the payor. In addition, the federal transparency law under the Health Care Reform Laws, known as the Open Payments program, requires manufacturers of drugs, devices, biologics and medical supplies reimbursable under Medicare or Medicaid to report to the Department of Health and Human Services information related to payments and other transfers of value to physicians and teaching hospitals, as well as physician ownership and investment interests, and provides for public reporting of the data reported by manufacturers.

Government price reporting

We would be required to report certain price data and pay certain rebates to the U.S. government as a condition of participation in federal healthcare programs. Medicaid is jointly administered by federal and state governments for the benefit of low income and certain disabled beneficiaries. Under the Medicaid Drug Rebate Program, we would be required to pay a certain rebate for each unit of product reimbursed by the state Medicaid programs.

Data protection

We are subject to data protection laws and regulations (i.e., laws and regulations that address privacy and data security). The legislative and regulatory landscape for data protection continues to evolve, and in recent years there has been an increasing focus on privacy and data security issues. In the United States, numerous federal and state laws and regulations, including state data breach notification laws, state health information privacy laws and federal and state consumer protection laws govern the collection, use, disclosure and protection of health-related and other personal information. Failure to comply with data protection laws and regulations could result in government enforcement actions (which could include civil or criminal penalties), private litigation and/or adverse publicity and could negatively affect our operating results and business. In addition, we may obtain health information from third parties (e.g., healthcare providers who prescribe our products) that are subject to privacy and security requirements under HIPAA. We could be subject to criminal penalties if we knowingly obtain or disclose individually identifiable health information in a manner that is not authorized or permitted.

Foreign regulation

In order to market any therapeutic or diagnostic product outside of the United States, we need to comply with numerous and varying regulatory requirements of other countries regarding safety and efficacy and governing, among other things, clinical trials, marketing authorization, commercial sales and distribution of our products. Whether or not we obtain FDA approval for a product, we need to obtain the necessary approvals by the comparable regulatory authorities of foreign countries before we can commence clinical trials or marketing of the product in those countries. The approval process varies from country to country and can involve additional product testing and additional administrative review periods. The time required to obtain approval in other countries might differ from and be longer than that required to obtain FDA approval. 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 negatively impact the regulatory process in others.

The European Medicines Agency, or EMA, grants orphan medicinal product designation to promote the development of products that may offer therapeutic benefits for life-threatening or chronically debilitating conditions affecting not more than five in 10,000 people in the European Union. In addition, orphan medicinal product designation can be granted if the drug is intended for a life threatening, seriously debilitating or serious and chronic condition and without incentives it is unlikely that sales of the drug in the European Union would be sufficient to justify developing the drug. Orphan medicinal product designation is only available if there is no other satisfactory method approved in the European Union of diagnosing, preventing or treating the condition, or if such a method exists, the proposed orphan medicinal product will be of significant benefit to patients. Orphan medicinal product designation provides opportunities for free protocol assistance and fee reductions for access to the centralized regulatory procedures. Orphan medicinal product designation also provides ten years of market exclusivity following drug approval. The exclusivity period may be reduced to six years if the designation criteria are no longer met, including where it is shown that the product is sufficiently profitable not to justify maintenance of market exclusivity.

Clinical Trial Approval

Pursuant to the currently applicable Clinical Trials Directive 2001/20/EC and the Directive 2005/28/EC on GCP, a system for the approval of clinical trials in the European Union has been implemented through national legislation of the member states. Under this system, an applicant must obtain approval from the competent national authority of a European Union member state in which the clinical trial is to be conducted, or in multiple member states if the clinical trial is to be conducted in a number of member states. Furthermore, the applicant may only start a clinical trial at a specific study site after the competent ethics committee has issued a favorable opinion. The clinical trial application must be accompanied by an investigational medicinal product dossier with supporting information prescribed by Directive 2001/20/EC and Directive 2005/28/EC and corresponding national laws of the member states and further detailed in applicable guidance documents.

In April 2014, the European Union adopted a new Clinical Trials Regulation (EU) No. 536/2014, which is set to replace the current Clinical Trials Directive 2001/20/EC. The new Clinical Trials Regulation will become directly applicable to and binding in all European Union Member States without the need for any national implementing legislation. The new Clinical Trials Regulation (EU) No. 536/2014 will become applicable no earlier than 2019. It will overhaul the current system of approvals for clinical trials in the European Union and is aimed specifically at simplifying and streamlining the approval of clinical trials in the European Union.

Conditional Marketing Authorization

In the European Union, the EMA supports the development of medicines that address unmet medical needs of patients. In the interest of public health, applicants may be granted a conditional marketing authorization for such medicines where the benefit of immediate availability outweighs the risk of less comprehensive data than normally required, based on the scope and criteria defined in legislation and guidelines.

Medicines for human use are eligible if they belong to at least one of these categories:

- aimed at treating, preventing or diagnosing seriously debilitating or life-threatening diseases;
- intended for use in emergency situations (also less comprehensive pharmaceutical and non-clinical data may be accepted for such products);
- designated as orphan medicines.

Conditional marketing authorization may be granted if the CHMP finds that all the following requirements are met:

- the benefit-risk balance of the product is positive;
- it is likely that the applicant will be able to provide comprehensive data;
- unmet medical needs will be fulfilled;
- the benefit to public health of the medicinal product's immediate availability on the market outweighs the risks due to need for further data.

Brexit and the Regulatory Framework in the United Kingdom

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

Foreign Corrupt Practices Act

Various federal and foreign laws govern our international business practices with respect to payments to government officials. Those laws include the U.S. Foreign Corrupt Practices Act, or FCPA, which prohibits U.S. companies and their representatives from paying, offering to pay, promising or authorizing the payment of anything of value to any foreign government official, government staff member, political party or political candidate for the purpose of obtaining or retaining business or to otherwise obtain favorable treatment or influence a person working in an official capacity. In many countries, the healthcare professionals we may interact with may meet the FCPA's definition of a foreign government official. The FCPA also requires public companies to make and keep books and records that accurately and fairly reflect their transactions and to devise and maintain an adequate system of internal accounting controls.

We are subject also to the U.K. Bribery Act 2010, or Bribery Act, which proscribes giving and receiving bribes in the public and private sectors, bribing a foreign public official, and failing to have adequate procedures to prevent employees and other agents from giving bribes. U.S. companies that conduct business in the United Kingdom generally will be subject to the Bribery Act. Penalties under the Bribery Act include potentially unlimited fines for companies and criminal sanctions for corporate officers under certain circumstances. Other countries have enacted similar anti-corruption laws and/or regulations.

21st Century Cures Act and new FDA regulations

In December 2016, Congress passed the 21st Century Cures Act, or the Cures Act. This law is intended to enable the acceleration of the discovery, development and delivery of 21st century cures, among other things. Provisions in that law, such as those applying to precision medicine, technical updates to clinical trial databases and advancing new drug therapies, could apply directly or indirectly to our activities. At this point, however, it is not clear how that law will be implemented and what effect it may have on our business.

In addition to new legislation, FDA regulations and policies are often revised or interpreted by the agency in ways that may significantly affect our business and our products. It is impossible to predict whether further legislative changes will be enacted or whether FDA regulations, guidance, policies or interpretations changed or what the effect of such changes, if any, may be.

Healthcare reform

A primary trend in the U.S. healthcare industry and elsewhere is cost containment. There have been a number of federal and state proposals during the last few years regarding the pricing of pharmaceutical and biopharmaceutical products, limiting coverage and reimbursement for drugs and other medical products, government control and other changes to the healthcare system in the United States. By way of example, the U.S. and state governments continue to propose and pass legislation designed to reduce the cost of healthcare. In March 2010, the U.S. Congress enacted the Affordable Care Act, or ACA, which, among other things, includes changes to the coverage and payment for products under government healthcare programs.

Since enactment of the ACA, there have been numerous legal challenges and legislative actions to repeal and replace provisions of the law. For example, with enactment of the Tax Cuts and Jobs Act of 2017, which was signed by President Trump on December 22, 2017, the U.S. Congress repealed the "individual mandate." The repeal of this provision, which requires most Americans to carry a minimal level of health insurance, will become effective in 2019. According to the U.S. Congressional Budget Office, the repeal of the individual mandate will cause 13 million fewer Americans to be insured in 2027, and premiums in insurance markets may rise.

Further, there have been several recent U.S. congressional inquiries and proposed federal and proposed and enacted state legislation designed to, among other things, bring more transparency to drug pricing, review the relationship between pricing and manufacturer patient programs, reduce the costs of drugs under Medicare and reform government program reimbursement methodologies for drug products. At the federal level, the U.S. Congress and the Trump administration have each indicated that it will continue to seek new legislative and/or administrative measures to control drug costs. At the state level, individual states are increasingly aggressive in passing legislation and implementing regulations designed to control pharmaceutical and biological product pricing.

Pharmaceutical coverage, pricing and reimbursement

The containment of healthcare costs has become a priority of federal, state and foreign governments, and the prices of drugs have been a focus in this effort. The U.S. government, state legislatures and foreign governments have shown significant interest in implementing cost containment programs to limit the growth of government-paid healthcare costs, including price controls, restrictions on reimbursement and requirements for substitution of generic products for branded prescription drugs. Adoption of such controls and measures, and tightening of restrictive policies in jurisdictions with existing controls and measures, could limit payments for any drug products for which we obtain regulatory approval and could adversely affect our net revenue and results.

Beyond the United States, pricing and reimbursement schemes vary widely from country to country. Some countries provide that drug products may be marketed only after a reimbursement price has been agreed. Some countries may require the completion of additional studies that compare the cost-effectiveness of a particular product candidate to currently available therapies. For example, the European Union provides options for its member states to restrict the range of drug products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. European Union member states may approve a specific price for a drug product or may instead adopt a system of direct or indirect controls on the profitability of the company placing the drug product on the market. Other member states allow companies to fix their own prices for drug products, but monitor and control company profits. The downward pressure on healthcare costs in general, particularly prescription drugs, has become very intense. As a result, increasingly high barriers are being erected to the entry of new products. In addition, in some countries, cross-border imports from low-priced markets exert competitive pressure that may reduce pricing within a country. There can be no assurance that any country that has price controls or reimbursement limitations for drug products will allow favorable reimbursement and pricing arrangements for any of our products.

Employees

As of January 31, 2018, we had 72 full-time employees, of whom 48 are engaged in research and development. None of our employees is represented by a labor union or covered by collective bargaining agreements.

We consider our relationship with our employees to be good.

Segment, Geographic and Financial Information

Operating segments are defined as components of an enterprise engaging in business activities for which discrete financial information is available and regularly reviewed by the chief operating decision maker in deciding how to allocate resources and in assessing performance. We view our operations and manage our business in one operating segment and we operate in only one geographic region (the United States).

Financial information about (1) our net product revenue and other revenues, net loss per share available to common stockholders and our total assets is provided in our consolidated financial statements included in this Annual Report on Form 10-K and (2) our research and development expenses in each of the last three fiscal years is provided in Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations.

Information about our dependence on limited amounts of customers is provided in Note 1, “Nature of the Business and Summary of Significant Accounting Policies – Concentration of Credit Risk” in the accompanying notes to the consolidated financial statements.

In August 2010, we acquired a controlling financial interest in Silver Creek Pharmaceuticals Inc., or Silver Creek. At such time we had the ability to direct the activities of Silver Creek that most significantly impacted Silver Creek’s economic performance through our ownership percentage and through the board of director seats we controlled, and as such Silver Creek was consolidated in our financial statements. In the third quarter of 2017, Silver Creek completed its Series C preferred stock financing, which reduced our ownership percentage of Silver Creek below 50% and resulted in us no longer controlling the Silver Creek board of directors, and as a result Silver Creek was deconsolidated from our financial statements. Information about the deconsolidation of Silver Creek from our financial statements is provided in Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations.

In September 2017, we filed an amendment to our certificate of incorporation to effect a one-for-ten reverse stock split of our issued and outstanding common stock, or the reverse split, and on September 6, 2017, the reverse split was effective for trading purposes. Additional information about the reverse split is provided in Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations.

Our Corporate Information

We were originally incorporated in the Commonwealth of Massachusetts in 1993 and reincorporated under the laws of the State of Delaware in October 2010. Our principal executive offices are located at One Kendall Square, Suite B7201, Cambridge, MA 02139, and our telephone number is (617) 441-1000.

Information Available on the Internet

We maintain a website with the address www.merrimack.com. We are not including the information contained on our website as a part of, or incorporating it by reference into, this Annual Report on Form 10-K. Our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and all amendments to those reports, are available to you free of charge through the “SEC Filings” link in the “Investors” section of our website as soon as reasonably practicable after those materials have been electronically filed with, or furnished to, the Securities and Exchange Commission, or the SEC. We also make available on our website our corporate governance guidelines, the charters for our audit committee, corporate governance and nominating committee, organization and compensation committee and executive committee, and our code of business conduct and ethics, which applies to our directors, officers and employees, and such information is available in print and free of charge to any of our stockholders who requests it. In addition, we intend to disclose on our website any amendments to, or waivers from, our code of business conduct and ethics that are required to be publicly disclosed pursuant to rules of the SEC.

Item 1A. Risk Factors

The following risk factors and other information included in this Annual Report on Form 10-K should be carefully considered. The risks and uncertainties described below are not the only ones we face. Additional risks and uncertainties not presently known to us or that we presently deem less significant may also impair our business operations. Please see page 2 of this Annual Report on Form 10-K for a discussion of some of the forward-looking statements that are qualified by these risk factors. If any of the following risks occur, our business, financial condition, results of operations and future growth prospects could be materially and adversely affected.

Risks Related to the Sale of the Commercial Business to Ipsen

Because the commercial business represented all of our revenues for fiscal year 2016 and the three months ended March 31, 2017, our business following the sale of the commercial business is substantially different than it was prior to such sale.

As a result of the completion of the asset sale with Ipsen, Ipsen acquired our right, title and interest in the commercial business. The commercial business represented all of our revenues for the fiscal year 2016 and the three months ended March 31, 2017. Following the asset sale, we retained only the pipeline business. Our results of operations and financial condition may be materially affected if we fail to grow the pipeline business, if we are unable to raise additional capital when needed to run the pipeline business, if we must incur significant costs in order to raise additional capital to run the pipeline business or if we are unable to successfully develop and commercialize our remaining product candidates.

We are, and in the future may be, subject to securities litigation, which is expensive and could divert our attention.

We have been, and may in the future be, subject to securities class action litigation in connection with the asset sale. Securities litigation against us could result in substantial costs and divert our management's attention, which could seriously harm our business. For instance, a putative stockholder class action suit was filed by a purported stockholder of ours in the Superior Court of Massachusetts for the County of Middlesex against us and our directors. The case was captioned *Robert Garfield v. Merrimack Pharmaceuticals Inc., et al.*, or the Garfield Action. The Garfield Action complaint alleged that our directors breached their fiduciary duties by entering into the asset sale agreement and that the definitive proxy statement relating to the asset sale contained inadequate disclosures and omissions. Although we believed that the Garfield Action was without merit, to avoid the risk of the litigation delaying or adversely affecting the asset sale and to minimize the expense of defending the litigation related to the asset sale, we agreed to make supplemental disclosures related to the asset sale and to pay the plaintiff's counsel $375,000 in attorney's fees in connection with the resolution of the Garfield Action. As a result, the plaintiff concluded that the claims in the Garfield Action were mooted, and the Garfield Action was dismissed with prejudice. Nonetheless, there can be no guarantee that there will not be additional securities class action litigation in connection with the asset sale.

There can be no guarantee that Ipsen will comply with its obligation to use commercially reasonable efforts in connection with the development of ONIVYDE or that the milestones set forth in the Baxalta agreement will be achieved.

Ipsen has agreed to use commercially reasonable efforts to develop ONIVYDE in connection with obtaining the regulatory approval by the FDA of ONIVYDE for certain indications. Although the results of this approval process may enable Ipsen to achieve the milestones necessary for us to receive the contingent payments under the asset sale agreement, there is no guarantee that Ipsen will take the steps set forth in the asset sale agreement and that such development will lead to the successful approval of ONIVYDE for such additional indications. Therefore, there can be no guarantees that any of the milestones set forth in the asset sale agreement will be achieved and that we will receive any future contingent payments.

Additionally, although the asset sale agreement entitles us to receive certain net milestone payments of up to $33.0 million that may become payable under the Baxalta agreement, achievement of such milestones and payment of any or all of the $33.0 million is not guaranteed.

Ipsen did not assume any of the excluded liabilities under the asset sale agreement.

Pursuant to the asset sale agreement, Ipsen assumed only certain specified liabilities set forth in the asset sale agreement and did not assume all of the liabilities associated with the commercial business. Certain liabilities remain with us post-closing. While we believe that we have adequately accrued for these liabilities or are adequately insured against certain of the risks associated with such excluded liabilities, there can be no assurances that additional expenditures will not be incurred in resolving any such liabilities.

The asset sale agreement may expose us to contingent liabilities.

We have agreed to indemnify Ipsen for certain breaches of representations, warranties or covenants made by us in the asset sale agreement and for certain specified existing litigation. We have agreed that if we cannot pay our indemnification obligations, Ipsen will have set-off rights against any future contingent payments. Significant indemnification claims by Ipsen could further materially and adversely affect our financial condition and/or significantly reduce any future contingent payments.

Risks Related to Our Financial Position and Need for Additional Capital

We have incurred significant losses since our inception. We expect to incur operating losses for the foreseeable future and may never achieve or maintain profitability.

Since inception, we have incurred significant operating losses. Our net loss from continuing operations before income tax benefit was $118.4 million for the year ended December 31, 2017, $169.5 million for the year ended December 31, 2016 and $162.8 million for the year ended December 31, 2015. As of December 31, 2017, we had an accumulated deficit of $482.8 million. To date, we have financed our operations primarily through private placements of convertible preferred stock, collaborations, public offerings of our securities, secured debt financings, sales of ONIVYDE and the asset sale of ONIVYDE. We have devoted substantially all of our efforts to research and development, including clinical trials and recently to commercialization of our first product, ONIVYDE, which was sold to Ipsen. We have not completed development of or commercialized any other product candidates or diagnostics other than ONIVYDE. We expect to continue to incur significant expenses and increasing operating losses for at least the next several years. We anticipate that our expenses will increase substantially as we:

- initiate or continue clinical trials of our most advanced product candidates;
- continue the research and development of our other product candidates;
- seek to discover additional product candidates;
- seek regulatory approvals for our product candidates that successfully complete clinical trials; and
- continue to provide the operational, financial and management information systems and personnel to support our product development.

To become and remain profitable, we must succeed in developing and commercializing products with significant market potential. This will require us to be successful in a range of challenging activities, including discovering product candidates, completing preclinical testing and clinical trials of our product candidates, obtaining regulatory approval for these product candidates and manufacturing, marketing and selling or partnering those products for which we may seek and receive regulatory approval. We may never succeed in these activities and may never generate revenues that are significant or large enough to achieve profitability. Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable would depress the value of our company and could impair our ability to raise capital, expand our business, diversify our product offerings or continue our operations. A decline in the value of our company could also cause our stockholders to lose all or part of their investment.

We will need substantial additional funding. If we are unable to raise capital when needed, we would be forced to delay, reduce or eliminate our product development programs or commercialization efforts.

We will need substantial additional funding in connection with our continuing operations. We expect to continue to incur significant research and development expenses in connection with our ongoing activities, particularly as we continue the research, development and clinical trials of, and seek regulatory approval for, our product candidates. If we are unable to raise capital when needed or on attractive terms, we would be forced to delay, reduce or eliminate our research and development programs or commercialization efforts.

Upon the closing of the asset sale with Ipsen, which occurred on April 3, 2017, we received a $575.0 million upfront cash payment from Ipsen, subject to the working capital adjustment. We used these proceeds to redeem the 2022 notes, including payment of the $175.0 million outstanding aggregate principal amount, interest through the redemption date and an additional make-whole premium payment of approximately $20.1 million, and our board of directors declared a special cash dividend of $140.0 million, which was payable on May 26, 2017 to stockholders of record as of the close of business on May 17, 2017. Additionally, if certain milestones under the Baxalta agreement are met, we currently expect to receive up to an aggregate of $33.0 million in net milestone payments in future periods. As a result of the cash received from the consummation of the asset sale, we believe that at our currently forecasted spending rates, our existing financial resources, together with the net milestone payments we expect to receive under the Baxalta agreement, assuming certain milestones under such agreement are met, will be sufficient to fund our planned operations into the second half of 2019. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect. Because of the numerous risks and uncertainties associated with the development and commercialization of our product candidates, and the extent to which we may utilize collaborations with third parties to participate in their development and commercialization, we are unable to estimate the amounts of increased capital outlays and operating expenditures associated with our current and anticipated clinical trials. Our future capital requirements will depend on many factors, including:

- the progress and results of the clinical trials of our most advanced product candidates;
- our ability to establish and maintain additional collaborations on favorable terms, and the success of any such future collaborations;
- the timing and amount of potential milestone payments related to ONIVYDE that we may receive from Ipsen and Baxalta;
- the scope, progress, results and costs of preclinical development, laboratory testing and clinical trials for our product candidates;
- the costs, timing and outcome of regulatory review of our current and future product candidates;
- the costs of preparing, filing and prosecuting patent applications and maintaining, enforcing and defending intellectual property-related claims; and
- the extent to which we acquire or invest in businesses, products and technologies.

Conducting preclinical testing and clinical trials is a time-consuming, expensive and uncertain process that takes years to complete, and we may never generate the necessary data required to obtain regulatory approval and, even if regulatory approval is obtained, achieve product sales of any of our product candidates. In addition, any of our product candidates, even if approved, may not achieve commercial success. If we fail to generate sufficient revenues from collaborations or the commercialization of any of our product candidates, we will need to continue to rely on additional financing to achieve our business objectives.

Raising additional capital may cause dilution to our existing stockholders, restrict our operations or require us to relinquish rights to our technologies or product candidates.

We do not have any committed external source of funds. Sources of funds may not be available or, if available, may not be available on terms satisfactory to us and could result in significant stockholder dilution.

Until such time, if ever, as we can generate sufficient product revenues, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaborations, licensing arrangements and other marketing and distribution arrangements. We also could engage in discussions with third parties regarding partnerships, joint ventures, combinations or divestitures of one or more of our businesses as we seek to further the development of our research programs, improve our cash position and maximize stockholder value. There can be no assurance as to the timing, terms or consummation of any financing, collaboration, licensing arrangement or other marketing and distribution arrangement, partnership, joint venture, combination or divestiture.

On December 15, 2017, we filed a registration statement on Form S-3 with the SEC to allow the issuance of our securities from time to time in one or more offerings of up to $150,000,000 in aggregate dollar amount. This registration statement was declared effective by the SEC on January 5, 2018. To the extent that we raise additional capital through the sale of equity or convertible debt securities, the ownership interest of our existing common stockholders will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our stockholders. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends, and these covenants may also require us to attain certain levels of financial performance and we may not be able to do so; any such failure may result in the acceleration of such debt and the foreclosure by our creditors on the collateral we used to secure the debt. The debt issued in a debt financing would also be senior to our outstanding shares of capital stock upon our liquidation. Significant indebtedness and the pledge of our assets as collateral in the future could limit our ability to obtain additional debt financing. If we raise additional funds through marketing and distribution arrangements or other collaborations, strategic alliances or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or product candidates or to grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce or terminate our product development or commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

Future indebtedness may limit cash flow available to invest in the ongoing needs of our business.

We have had in the past, and may in the future have, a significant amount of indebtedness. In July 2013, we issued $125.0 million aggregate principal amount of 4.50% convertible notes due 2020, or convertible notes. In December 2015, we issued $175.0 million aggregate principal amount of 11.50% senior secured notes due 2022, or 2022 notes. Although we used a portion of the proceeds from the asset sale to fully extinguish the 2022 notes, and we extinguished all but $56,000 of the aggregate remaining principal amount of the convertible notes in connection with the settlement of the litigation described in Item 3, "Legal Proceedings" below and a related cash tender offer to purchase the convertible notes that we completed on November 10, 2017, we could in the future incur additional indebtedness.

Substantial debt combined with our other financial obligations and contractual commitments could have significant adverse consequences, including:

- requiring us to dedicate a substantial portion of cash flow from operations to the payment of interest on, and principal of, our debt, which will reduce the amounts available to fund working capital, capital expenditures, product development efforts and other general corporate purposes;
- increasing our vulnerability to adverse changes in general economic, industry and market conditions;
- obligating us to restrictive covenants that may reduce our ability to take certain corporate actions or obtain further debt or equity financing;
- limiting our flexibility in planning for, or reacting to, changes in our business and the industry in which we compete; and
- placing us at a competitive disadvantage compared to our competitors that have less debt or better debt servicing options.

To the extent we seek funds from external sources in the future, such funds may not be available on acceptable terms, if at all. In addition, a failure to comply with the covenants under any future debt instruments could result in an event of default under those instruments, and such debt instruments could require covenants and pledges of our assets as collateral which could limit our ability to obtain other debt financing.

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

On December 22, 2017, President Trump signed into law new legislation that significantly revises the Internal Revenue Code of 1986, as amended. The newly enacted federal income tax law, among other things, contains significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for net interest expense to 30% of adjusted earnings (except for certain small businesses), limitation of the deduction for net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks, in each case, for losses arising in taxable years beginning after December 31, 2017 (though any such net operating losses may be carried forward indefinitely), one time taxation of offshore earnings at reduced rates regardless of whether they are repatriated, elimination of U.S. tax on foreign earnings (subject to certain important exceptions), immediate deductions for certain new investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits. Notwithstanding the reduction in the corporate income tax rate, the overall impact of the new federal tax law is uncertain and our business and financial condition could be adversely affected. In addition, it is uncertain how various states will respond to the newly enacted federal tax law. The impact of this tax reform on holders of our common stock is also uncertain and could be adverse. We urge our stockholders to consult with their legal and tax advisors with respect to this legislation and the potential tax consequences of investing in or holding our common stock.

We might not be able to utilize a significant portion of our net operating loss carryforwards and research and development tax credit carryforwards.

As of December 31, 2017, we had federal net operating loss carryforwards of $138.1 million, which begin to expire in 2034, and state net operating loss carryforwards of $223.4 million, which begin to expire in 2028. As of December 31, 2017, we also had federal research and development tax credit carryforwards of $28.8 million and state research and development tax credit carryforwards $18.7 million, which begin to expire in 2022 and 2026, respectively. These net operating loss and tax credit carryforwards could expire unused and be unavailable to offset our future income tax liabilities. Under the newly enacted federal income tax law, federal net operating losses incurred in 2018 and in future years may be carried forward indefinitely, but the deductibility of such federal net operating losses is limited. It is uncertain how various states will respond to the newly enacted federal tax law. If our ability to use our historical net operating loss and tax credit carryforwards is materially limited, it would harm our future operating results by effectively increasing our future tax obligations.

Our investments are subject to risks that could result in losses.

We have invested and plan to continue to invest our cash in a variety of financial instruments, principally securities issued by the U.S. government and its agencies, investment grade corporate bonds, including commercial paper, and money market instruments. All of these investments are subject to credit, liquidity, market and interest rate risk. Such risks, including the failure or severe financial distress of the financial institutions that hold our cash, cash equivalents and investments, may result in a loss of liquidity, impairment to our investments, realization of substantial future losses, or a complete loss of the investments in the long-term, which may have a material adverse effect on our business, results of operations, liquidity and financial condition. In order to manage the risk to our investments, we maintain an investment policy that, among other things, limits the amount that we may invest in any one issue or any single issuer and requires us to only invest in high credit quality securities, but there can be no guarantee that our investments will not result in losses.

A decrease in the carrying value of our equity holdings in Silver Creek could adversely affect our balance sheet.

In August 2010, we acquired 12,000,000 shares of Series A preferred stock of Silver Creek in exchange for our grant to Silver Creek of technology licenses. As these shares represented a controlling financial interest, we consolidated Silver Creek in our consolidated financial statements. In the third quarter of 2017, Silver Creek completed its Series C preferred stock financing, which reduced our ownership percentage of Silver Creek below 50% and resulted in us deconsolidating Silver Creek from our consolidated financial statements. As a result of the deconsolidation, we now account for our investment in Silver Creek under the equity method of accounting. The carrying value of our shares of Series A preferred stock of Silver Creek was $10.6 million at December 31, 2017. There can be no guarantee that the value of our investment in Silver Creek will not realize a substantial future loss or complete loss of value, which would in turn adversely affect our balance sheet.

Risks Related to the Development and Commercialization of Our Product Candidates

We depend heavily on the success of our clinical stage product candidates. All of our product candidates are in preclinical and clinical development. Clinical trials of our product candidates may not be successful. If we are unable to successfully commercialize our product candidates, or experience significant delays in doing so, our business will be materially harmed.

We invest a significant portion of our efforts and financial resources in the development of our clinical stage product candidates for the treatment of various types of cancer. All of our product candidates are still in preclinical and clinical development. Our ability to generate meaningful product revenues will depend heavily on the successful development of our product candidates. The success of our product candidates, which include both our product candidates and companion diagnostic candidates, will depend on several factors, including the following:

- successful enrollment in, and completion of, preclinical studies and clinical trials;
- receipt of marketing approvals from the FDA and similar regulatory authorities outside the United States for our product candidates, including our diagnostics;
- establishing commercial manufacturing capabilities, which we anticipate doing primarily through arrangements with third-party manufacturers;
- launching commercial sales of any approved products, whether alone or in collaboration with others;
- acceptance of any approved products by patients, the medical community and third-party payors;
- effectively competing with other therapies;
- a continued acceptable safety profile of any products following approval; and
- qualifying for, maintaining, enforcing and defending intellectual property rights and claims.

If we do not achieve one or more of these factors in a timely manner or at all, we could experience significant delays or an inability to successfully develop our product candidates, which would materially harm our business.

For example, in connection with our strategic review of our pipeline which was completed in January 2017, we amended several of our clinical trials, such as our SHERLOC and CARRIE clinical trials, resulting in changes to their power, design and timing, and also discontinued several trials, including our Phase 2 clinical trial of MM-302.

If clinical trials of our product candidates fail to demonstrate safety and efficacy to the satisfaction of the FDA or similar regulatory authorities outside the United States or do not otherwise produce positive results, we may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development and commercialization of our product candidates.

We may never receive approval to commercialize our product candidates in the United States or other jurisdictions. Before obtaining regulatory approval for the sale of our product candidates, we must conduct extensive clinical trials to demonstrate the safety and efficacy of our product candidates in humans. Clinical testing is expensive, difficult to design and implement, can take many years to complete and is uncertain as to outcome. A failure of one or more of our clinical trials can occur at any stage of testing. The outcome of preclinical testing and early clinical trials may not be predictive of the success of later clinical trials, and successful interim results of a clinical trial do not necessarily predict successful final results.

We may experience numerous unexpected events during, or as a result of, clinical trials that could delay or prevent our ability to receive regulatory approval or commercialize our product candidates, including:

- regulators or institutional review boards may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;
- clinical trials of our product candidates may produce negative or inconclusive results, and we may decide, or regulators may require us, to conduct additional clinical trials or abandon product development programs;
- the number of patients required for clinical trials of our product candidates may be larger than we anticipate, enrollment in these clinical trials may be insufficient or slower than we anticipate or patients may drop out of these clinical trials at a higher rate than we anticipate;
- our third-party contractors may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;
- we might have to suspend or terminate clinical trials of our product candidates for various reasons, including a finding of a lack of clinical response or a finding that the patients are being exposed to unacceptable health risks;
- regulators or institutional review boards may require that we or our investigators suspend or terminate clinical research for various reasons, including noncompliance with regulatory requirements;
- the cost of clinical trials of our product candidates may be greater than we anticipate;
- the supply or quality of our product candidates, companion diagnostics or other materials necessary to conduct clinical trials of our product candidates may be insufficient or inadequate or prohibitively expensive; and
- our product candidates may have undesirable side effects or other unexpected characteristics, causing us or our investigators to suspend or terminate the trials.

For example, in December 2016, we decided to discontinue our Phase 2 clinical trial of MM-302 in combination with trastuzumab in patients with ErbB2 (HER2) positive, locally advanced or metastatic breast cancer based on an opinion from the Data Safety Monitoring Board that continuing the clinical trial would be unlikely to demonstrate benefit over the comparator treatments. Additionally, the previous Phase 2 clinical trials of MM-121 in unselected patient populations with NSCLC, ovarian cancer and breast cancer did not meet their primary endpoints.

Preclinical and clinical data may not be predictive of the success of later clinical trials, and are often susceptible to varying interpretations and analyses. Many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their products.

If we are required to conduct additional clinical trials or other testing of our product candidates beyond those that we currently contemplate, if we are unable to successfully complete clinical trials of our product candidates or other testing, if the results of these trials or tests are not positive or are only modestly positive or if there are safety concerns, we may:

- be delayed in obtaining marketing approval for our product candidates;
- not obtain marketing approval at all;
- obtain approval for indications that are not as broad as intended;
- have the product removed from the market after obtaining marketing approval;
- be subject to additional post-marketing testing requirements;

- be subject to restrictions on how the product is distributed or used; or
- be unable to obtain reimbursement for use of the product.

Delays in testing or approvals may result in increases to our product development costs. We do not know whether any clinical trials will begin as planned, will need to be restructured or will be completed on schedule, or at all.

Significant clinical trial delays also could shorten any periods during which we may have the exclusive right to commercialize our product candidates or allow our competitors to bring products to market before we do and impair our ability to commercialize our product candidates and may harm our business and results of operations.

If serious adverse or undesirable side effects are identified during the development of our product candidates or following their approval and commercialization, we may need to modify or abandon our development or marketing of such product or product candidate.

All of our product candidates are still in preclinical or clinical development and their risk of failure is high. It is impossible to predict when or if any of our product candidates will prove effective or safe in humans or will receive regulatory approval, and it is impossible to ensure that safety or efficacy issues will not arise following regulatory approval. Currently marketed therapies for solid tumors are generally limited to some extent by their toxicity. Use of our product candidates as monotherapies in clinical trials also has resulted in adverse events consistent in nature with other marketed therapies. When used in combination with other marketed or investigational therapies, our product candidates may exacerbate adverse events associated with the other therapy. If our products or product candidates, either alone or in combination with other therapies, result in undesirable side effects or have characteristics that are unexpected, we may need to modify or abandon their development or marketing.

If we experience delays in the enrollment of patients in our clinical trials, our receipt of necessary regulatory approvals could be delayed or prevented.

We may not be able to initiate or continue clinical trials for our product candidates if we are unable to locate and enroll a sufficient number of eligible patients to participate in these trials to obtain a statistically significant result as required by the FDA or other regulatory authorities. In addition, many of our competitors have ongoing clinical trials for product candidates that could be competitive with our product candidates. Patients who would otherwise be eligible for our clinical trials may instead enroll in clinical trials of our competitors' product candidates or rely upon treatment with existing therapies that may preclude them from eligibility for our clinical trials.

Enrollment delays in our clinical trials may result in increased development costs for our product candidates, which would cause the value of the company to decline and limit our ability to obtain additional financing. Our inability to enroll a sufficient number of patients for any of our current or future clinical trials would result in significant delays or may require us to abandon one or more clinical trials altogether.

In general, we forecast enrollment for our clinical trials based on experience from previous clinical trials and monitor enrollment to be able to make adjustments to clinical trials when appropriate, including as a result of slower than expected enrollment that we experience from time to time in our clinical trials. It is possible that slow enrollment could require us to make adjustments to our clinical trials. If these adjustments do not overcome problems with slow enrollment, we could experience significant delays or abandon the applicable clinical trial altogether.

If we are unable to successfully develop companion diagnostics for our product candidates, or experience significant delays in doing so, we may not realize the full commercial potential of our product candidates.

An important component of our business strategy is to develop, either alone or together with third parties, companion diagnostics for each of our product candidates. There has been limited success to date industry-wide in developing companion diagnostics. To be successful, we will need to address a number of scientific, technical, regulatory and logistical challenges.

All of our companion diagnostic candidates are in preclinical or clinical development. We have limited experience in the development of companion diagnostics and may not be successful in developing appropriate diagnostics to pair with any of our product candidates that receive marketing approval. The FDA and similar regulatory authorities outside the United States are generally expected to regulate *in vitro* companion diagnostics as medical devices and to require separate regulatory approval prior to commercialization. Given our limited experience in developing diagnostics, we expect to rely in part on third parties for their design, development and manufacture. If we, or any third parties that we engage to assist us, are unable to successfully develop companion diagnostics for our product candidates, or experience delays in doing so, the development of our product candidates may be adversely affected, our product candidates may not receive marketing approval and we may not realize the full commercial potential of any product candidates that receive marketing approval. As a result, our business would be harmed, possibly materially.

Any of our product candidates that receive regulatory approval may fail to achieve the degree of market acceptance by physicians, patients, healthcare payors and others in the medical community necessary for commercial success.

Even if any of our product candidates receive marketing approval, they may nonetheless not gain sufficient market acceptance by physicians, patients, healthcare payors and others in the medical community. If these products do not achieve an adequate level of acceptance, we may not generate significant product revenues and we may not become profitable. The degree of market acceptance of our product candidates, if approved for commercial sale, will depend on a number of factors that may be uncertain or subjective, including:

- the prevalence and severity of any side effects;
- efficacy and potential advantages or disadvantages compared to alternative treatments;
- the price we charge for our product candidates;
- convenience and ease of administration compared to alternative treatments;
- the willingness of the target patient population to try new therapies and of physicians to prescribe these therapies;
- our ability to successfully develop companion diagnostics that effectively identify patient populations likely to benefit from treatment with our product candidates;
- the strength of marketing and distribution support; and
- sufficient third-party coverage or reimbursement.

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

The development and commercialization of new therapeutic and diagnostic products is highly competitive. We face competition with respect to our current product candidates, and will face competition with respect to any products that we may seek to develop or commercialize in the future, from major pharmaceutical companies, specialty pharmaceutical companies and biotechnology companies worldwide. Several large pharmaceutical and biotechnology companies currently market and sell products for the treatment of the solid tumor indications for which we are developing our product candidates. Potential competitors also include academic institutions, government agencies and other public and private research organizations that conduct research, seek patent protection and establish collaborative arrangements for research, development, manufacturing and commercialization. Many of these competitors are attempting to develop therapeutics for our target indications.

We are developing our product candidates for the treatment of solid tumors. There are a variety of available therapies marketed for solid tumors. In many cases, these drugs are administered in combination to enhance efficacy. Some of these drugs are branded and subject to patent protection, and others are available on a generic basis. Many of these approved drugs are well established therapies and are widely accepted by physicians, patients and third-party payors. This may make it difficult for us to achieve our business strategy of replacing existing therapies with our product candidates.

There are also a number of products in late stage clinical development to treat solid tumors. Our competitors may develop products that are more effective, safer, more convenient or less costly than any that we are developing or that would render our product candidates obsolete or non-competitive. Our competitors may also obtain FDA or other regulatory approval for their products more rapidly than we may obtain approval for ours. In addition, our ability to compete may be affected because in many cases insurers or other third-party payors seek to encourage the use of generic products. There are many generic products currently on the market for the indications that we are pursuing, and additional products are expected to become available on a generic basis over the coming years.

Many of our competitors have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing approved products than we do. Mergers and acquisitions in the pharmaceutical, biotechnology and diagnostic industries may result in even more resources being concentrated among a smaller number of our competitors. Smaller or early stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These third parties compete with us in recruiting and retaining qualified scientific and management personnel, establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs.

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

The regulations that govern marketing approvals, pricing and reimbursement for new therapeutic and diagnostic products vary widely from country to country. Some countries require approval of the sale price of a product before it can be marketed. In many countries, the pricing review period begins after marketing or product licensing approval is granted. In some foreign markets, prescription pharmaceutical pricing remains subject to continuing governmental control even after initial approval is granted. As a result, we might obtain regulatory approval for a product in a particular country, but then be subject to price regulations that delay our commercial launch of the product and negatively impact the revenues we are able to generate from the sale of the product in that country. Adverse pricing limitations may hinder our ability to recoup our investment in one or more product candidates, even if our product candidates obtain regulatory approval.

Our ability to commercialize any approved products successfully also will depend in part on the extent to which coverage and reimbursement for these products and related treatments will be available from third-party payors, including government payors such as Medicare and Medicaid, private health insurers and managed care organizations. There have been, and we expect there will continue to be, legislative and regulatory proposals to change the healthcare system in ways that could impact our ability to sell our products profitably. A primary trend in the U.S. healthcare industry and elsewhere is cost containment. The federal government, state legislatures and foreign governments have shown significant interest in implementing cost containment programs to limit the growth of government-paid healthcare costs, including price controls, restrictions on reimbursement and requirements for substitution of generic products for branded prescription drugs. Adoption of such controls and measures, and tightening of restrictive policies in jurisdictions with existing controls and measures, could limit payments for pharmaceuticals and the other product candidates that we are developing and could have a material adverse effect our net revenue and results.

Third-party payors decide which drugs they will pay for and establish reimbursement and co-pay levels. The growing emphasis on managed care in the United States has increased and we expect will continue to increase the pressure on drug pricing. Third-party payors are increasingly challenging the prices charged for medical products and services and examining the medical necessity and cost-effectiveness of medical products and services, in addition to their safety and efficacy. If these third-party payors do not consider our products to be cost-effective compared to other available therapies, they may not cover our products after approval as a benefit under their plans or, if they do, the level of payment may not be sufficient to allow us to sell our products at a profit. In order to secure coverage and reimbursement for any product that might be approved for sale, we may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of the product, in addition to the costs required to obtain FDA or other comparable regulatory approvals. Even with clinical trials, our product candidates may be considered less safe, less effective or less cost-effective than other products, and third-party payors may not provide coverage and reimbursement for our products or any of our product candidates that we commercialize, in whole or in part.

The process for determining whether a payor will provide coverage for a drug product may be separate from the process for setting the price or reimbursement rate that the payor will pay for the drug product once coverage is approved. Third-party payors may limit coverage to specific drug products on a formulary, which might not include all of the approved drugs for a particular indication, and a payor’s decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved.

We cannot be sure that reimbursement will be available for any product that we commercialize and, if reimbursement is available, what the level of reimbursement will be. Reimbursement may impact the demand for, or the price of, any product for which we obtain marketing approval. Third-party reimbursement may not be sufficient to enable us to maintain price levels high enough to realize an appropriate return on our investment in product development. Obtaining reimbursement for our products may be particularly difficult because of the higher prices often associated with products administered under the supervision of a physician. In addition, coverage policies, third-party reimbursement rates and drug pricing regulation may change at any time. Thus, even if favorable coverage and reimbursement status is attained for one or more products for which we receive regulatory approval, less favorable coverage policies and reimbursement rates may be implemented in the future. The marketability of any products for which we receive regulatory approval for commercial sale may also suffer if the government and third-party payors fail to provide adequate coverage and reimbursement. If reimbursement is not available or is available only to limited levels, we may not be able to successfully commercialize any product candidate that we successfully develop.

Moreover, there may be significant delays in obtaining reimbursement for any approved products, and coverage may be more limited than the purposes for which the product is approved by the FDA or regulatory authorities in other countries. Eligibility for reimbursement does not imply that any product will be paid for in all cases or at a rate that covers our costs, including research, development, manufacture, sale and distribution. Interim payments for new products, if applicable, may also not be sufficient to cover our costs and may not be made permanent. Payment rates may vary according to the use of the product and the clinical setting in which it is used, may be based on payments allowed for lower cost products that are already reimbursed, and may be incorporated into existing payments for other services. Net prices for products may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future weakening of laws that presently restrict imports of products from countries where they may be sold at lower prices than in the United States. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own reimbursement policies. Our inability to promptly obtain coverage and appropriate payment rates from both government-funded and private payors for new products that we develop could therefore have a material adverse effect on our operating results, our ability to raise capital needed to commercialize products, and our overall financial condition.

Product liability lawsuits against us could cause us to incur substantial liabilities and to limit commercialization of any products that we may develop.

We face an inherent risk of product liability exposure related to the testing of our product candidates in human clinical trials and an even greater risk related to the commercial sale of any products that we may develop. If we cannot successfully defend ourselves against claims that any of our product candidates caused injuries, we will incur substantial liabilities. Regardless of merit or eventual outcome, liability claims may result in:

- decreased demand for the products or product candidates that we may develop;
- injury to our reputation and significant negative media attention;
- withdrawal of patients from clinical trials;
- significant costs to defend the related litigation;
- substantial monetary awards to patients;
- loss of revenue; and
- the inability to commercialize any products that we may develop.

We currently hold $10.0 million in product liability insurance coverage, which may not be adequate to cover all liabilities that we may incur. Insurance coverage is increasingly expensive. We may not be able to maintain insurance coverage at a reasonable cost or in an amount adequate to satisfy any or every liability that may arise.

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

Because we have limited financial and managerial resources, we focus on research programs and product candidates for specific indications. As a result, we may forego or delay pursuit of opportunities with other product candidates or other indications that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial products or profitable market opportunities. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable products.

We also may not be successful in our efforts to identify or discover new or additional product candidates beyond our current preclinical and clinical product candidates. Research programs to identify new product candidates require substantial technical, financial and human resources. These research programs may initially show promise in identifying potential product candidates, yet fail to yield product candidates for clinical development.

If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through collaboration, licensing or other royalty arrangements in cases in which it would have otherwise been more advantageous for us to retain sole development and commercialization rights.

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

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our operations involve the use of hazardous and flammable materials, including chemicals and radioactive and biological materials. Our operations also produce hazardous waste products. We generally contract with third parties for the disposal of these materials and wastes. We also store certain low level radioactive waste at our facilities until the materials can be properly disposed of. We cannot eliminate the risk of contamination or injury from these materials. In the event of contamination or injury resulting from our use of hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. We also could incur significant costs associated with civil or criminal fines and penalties.

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

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

Fluctuations in foreign currency exchange rates could substantially increase the costs of our clinical trial programs.

A significant portion of our clinical trial activities are conducted outside of the United States, and associated costs may be incurred in the local currency of the country in which the trial is being conducted, which costs could be subject to fluctuations in foreign exchange rates. At present, we do not engage in hedging transactions to protect against uncertainty in future exchange rates between particular foreign currencies and the U.S. dollar. A decline in the value of the U.S. dollar against currencies in geographies in which we conduct clinical trials could have a negative impact on our research and development costs. We cannot predict the impact of foreign currency fluctuations, and foreign currency fluctuations in the future may adversely affect our development costs.

Risks Related to Our Dependence on Third Parties

We may depend on collaborations with third parties for the development and commercialization of our product candidates. If those collaborations are not successful, we may not be able to capitalize on the market potential of these product candidates.

Depending on our capital requirements, development and commercialization costs, need for additional therapeutic expertise and other factors, it is possible that we will enter into additional development and commercialization arrangements with respect to either oncology product candidates or product candidates in other therapeutic areas.

Our potential collaborators for any distribution, marketing, licensing or broader collaboration arrangements include large and mid-size pharmaceutical companies, regional and national pharmaceutical companies and biotechnology companies. We will have limited control over the amount and timing of resources that our collaborators dedicate to the development or commercialization of our product candidates. Our ability to generate revenues from these arrangements will depend on our collaborators’ abilities to successfully perform the functions assigned to them in these arrangements.

Collaborations involving our product candidates pose the following risks to us:

- collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations;
- collaborators may not pursue development and commercialization of our product candidates or may elect not to continue or renew development or commercialization programs based on clinical trial results, changes in their strategic focus or available funding, or external factors such as an acquisition that diverts resources or creates competing priorities;
- collaborators may delay clinical trials, provide insufficient funding for a clinical trial program, stop a clinical trial or abandon a product candidate, repeat or conduct new clinical trials or require a new formulation of a product candidate for clinical testing;
- collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our products or product candidates if the collaborators believe that competitive products are more likely to be successfully developed or can be commercialized under terms that are more economically attractive;
- a collaborator with marketing and distribution rights to one or more products may not commit sufficient resources to their marketing and distribution;
- collaborators may not properly maintain or defend our intellectual property rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our proprietary information or expose us to potential litigation;
- disputes may arise between us and the collaborators that result in the delay or termination of the research, development or commercialization of our product candidates or that result in costly litigation or arbitration that diverts management attention and resources; and

- collaborations may be terminated, such as the termination of our license and collaboration agreement with Sanofi effective December 17, 2014, and, if terminated, may result in a need for additional capital to pursue further development or commercialization of the applicable product candidates.

Collaboration agreements may not lead to development or commercialization of product candidates in the most efficient manner or at all. In addition, there have been a significant number of recent business combinations among large pharmaceutical companies that have resulted in a reduced number of potential future collaborators. If a present or future collaborator of ours were to be involved in a business combination, the continued pursuit and emphasis on our product development or commercialization program could be delayed, diminished or terminated.

For instance, although it is not a collaboration agreement, Ipsen has agreed pursuant to the asset sale agreement to use commercially reasonable efforts to develop ONIVYDE in connection with obtaining the regulatory approval by the FDA of ONIVYDE for certain indications. Although the results of this approval process may enable Ipsen to achieve the milestones necessary for us to receive the contingent payments under the asset sale agreement, there is no guarantee that Ipsen will take the steps set forth in the asset sale agreement and that such development will lead to the successful approval of ONIVYDE for such additional indications. Therefore, there can be no guarantees that any of the milestones set forth in the asset sale agreement will be achieved and that we will receive any future contingent payments. Similarly, although the asset sale agreement entitles us to receive certain net milestone payments of up to $33.0 million under the Baxalta agreement, achievement of such milestones and payment of any or all of the $33.0 million is not guaranteed.

If we are not able to establish additional collaborations, we may have to alter our development plans.

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

We face significant competition in seeking appropriate collaborators. Collaborations are complex and time-consuming to negotiate and document. We may also be restricted under existing collaboration agreements from entering into agreements on certain terms with other potential collaborators. We may not be able to negotiate collaborations on acceptable terms, or at all. If that were to occur, we may have to curtail the development of a particular product candidate, reduce or delay its development program or one or more of our other development programs, delay its potential commercialization or reduce the scope of our sales or marketing activities, or increase our expenditures and undertake development or commercialization activities at our own expense. If we elect to increase our expenditures to fund development or commercialization activities on our own, we may need to obtain additional capital, which may not be available to us on acceptable terms or at all. If we do not have sufficient funds, we will not be able to bring our product candidates to market and generate product revenue.

We rely on third parties to conduct our clinical trials, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials.

We do not independently conduct clinical trials of our product candidates. We rely on third parties, such as contract research organizations, clinical data management organizations, medical institutions and clinical investigators, to perform this function. Our reliance on these third parties for clinical development activities reduces our control over these activities but does not relieve us of our responsibilities. We remain responsible for ensuring that each of our clinical trials is conducted in accordance with the general investigational plan and protocols for the trial. Moreover, the FDA and other international regulatory agencies require us to comply with standards, commonly referred to as good clinical practices, for conducting, recording and reporting the results of clinical trials to assure that adverse event data are reported within required timeframes, that data and reported results are credible and accurate and that the rights, integrity and confidentiality of patients in clinical trials are protected. Furthermore, these third parties may also have relationships with other entities, some of which may be our competitors. If these third parties do not successfully carry out their contractual duties, meet expected deadlines or conduct our clinical trials in accordance with regulatory requirements or our stated protocols, we will not be able to obtain, or may be delayed in obtaining, regulatory approvals for our product candidates and will not be able to, or may be delayed in our efforts to, successfully commercialize our product candidates.

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

We also intend to utilize companion diagnostics in several of our current and planned clinical trials, including our current clinical trials of MM-121, MM-141 and MM-310, to preselect patients who will receive specified treatment regimens. We will rely on third party laboratories to test patient samples in connection with such companion diagnostics. Any failure on the part of these laboratories to properly perform such testing could jeopardize those clinical trials and delay or prevent the approval of the associated product candidate.

Risks Related to the Manufacturing of Our Product Candidates

We rely on third parties for the production of our product candidates. This increases the risk that we will not have sufficient quantities of our product candidates at an acceptable cost or on an acceptable schedule, which could delay, prevent or impair our development or commercialization efforts.

We rely on third-party manufacturers for most of the aspects of the production of our product candidates, including the production of bulk drug substance and fill finish and labeling activities. Reliance on third-party manufacturers entails risks, including:

- reliance on the third party for regulatory compliance and quality assurance;
- the possible breach of the manufacturing agreement by the third party; and
- the possible termination or nonrenewal of the agreement by the third party at a time that is costly or inconvenient for us.

Third-party manufacturers may not be able to comply with current good manufacturing practices, or cGMP, or Quality System Regulation, or QSR, or similar regulatory requirements outside the United States. Our failure, or the failure of our third-party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us, including fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of products, operating restrictions and criminal prosecutions, any of which could significantly and adversely affect supplies of our product candidates.

For instance, in 2010, a former fill finish third-party contractor that we used to fill and package MM-121 experienced FDA inspection issues with its quality control processes that resulted in a formal warning letter from the FDA. As a result, we pulled some MM-121 from clinical trial sites and replaced it with MM-121 that was filled by a different contractor. This restocking resulted in a few patients missing one or two doses of MM-121. It is possible that we could experience similar issues with other contractors.

Furthermore, our products may compete with the products of other companies for access to manufacturing facilities. Because there are a limited number of manufacturers that operate under cGMP or QSR regulations and that might be capable of manufacturing for us at an appropriate scale, we may not have access to such manufacturers.

In connection with the asset sale, we entered into a transition services agreement with Ipsen, pursuant to which we and Ipsen are providing certain services to each other for a period of 24 months, including Ipsen’s agreement to manufacture MM-310 pursuant to a manufacturing services agreement. We are also party to a manufacturing agreement with Samsung for the manufacture of MM-121 and performance of associated quality related services. Although we are discussing arrangements with other third parties for our other product candidates, we do not currently have agreements for such arrangements in place and may be unable to conclude such agreements or to do so on acceptable terms.

We also rely on certain single suppliers for certain materials that we use for the manufacture of our product candidates. We purchase these materials from our suppliers on a purchase order basis and do not have long-term supply agreements in place. Any performance failure or refusal to supply on the part of our existing or future suppliers could delay clinical development, marketing approval or commercialization of our products. If our current suppliers cannot perform as agreed, we may be required to replace one or more of these suppliers. Although we believe that there may be a number of potential long-term replacements to each supplier, we may incur added costs and delays in identifying and qualifying any such replacements.

We also rely upon third-party manufacturers to provide us with necessary reagents and instruments to develop, test and manufacture our *in vitro* diagnostics.

Our dependence upon others for the manufacture of our product candidates and companion diagnostics may adversely affect our future profit margins and our ability to commercialize any products that receive regulatory approval on a timely and competitive basis.

Risks Related to Our Intellectual Property

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

We are a party to a number of intellectual property license agreements with third parties, including with respect to MM-121, MM-141 and MM-310, and expect to enter into additional license agreements in the future. Our existing license agreements impose, and we expect that our future license agreements will 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 these agreements, in which event we might not be able to develop and market any product that is covered by these agreements. Termination of these licenses or reduction or elimination of our licensed rights may result in our having to negotiate new or reinstated licenses with less favorable terms. The occurrence of such events could materially harm our business.

If we are unable to obtain and maintain patent protection for our technology and products, or if our licensors are unable to obtain and maintain patent protection for the technology or products that we license from them, our competitors could develop and commercialize technology and products similar or identical to ours, and our ability to successfully commercialize our technology and products may be adversely affected.

Our success depends in large part on our and our licensors' ability to obtain and maintain patent protection in the United States and other countries with respect to our proprietary technology and products. In some circumstances, we may not have the right to control the preparation, filing and prosecution of patent applications, or to maintain the patents, covering technology or products that we license from third parties. Therefore, we cannot be certain that these patents and applications will be prosecuted and enforced in a manner consistent with the best interests of our business. In addition, if third parties who license patents to us fail to maintain such patents, or lose rights to those patents, the rights we have licensed may be reduced or eliminated.

We have sought to protect our proprietary position by filing patent applications in the United States and abroad related to our novel technologies and products that are important to our business. This process is expensive and time-consuming, and we may not be able to file and prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. It is also possible that we will fail to identify patentable aspects of our research and development output before it is too late to obtain patent protection.

The patent position of biotechnology and pharmaceutical companies generally is highly uncertain, involves complex legal and factual questions and has in recent years been the subject of much litigation. As a result, the issuance, scope, validity, enforceability and commercial value of our and our licensors' patent rights are highly uncertain. Our and our licensors' pending and future patent applications may not result in patents being issued that protect our technology or products or that effectively prevent others from commercializing competitive technologies and products. Changes in either the patent laws or interpretation of the patent laws in the United States and other countries may diminish the value of our patents or narrow the scope of our patent protection. The laws of foreign countries may not protect our rights to the same extent as the laws of the United States. Publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we or our licensors were the first to make the inventions claimed in our owned and licensed patents or pending patent applications, or that we or our licensors were the first to file for patent protection of such inventions. Assuming the other requirements for patentability are met, the first to file a patent application is entitled to the patent. Under the America Invents Act enacted in 2011, the United States moved to this first to file system in 2013 from the previous system under which the first to make the claimed invention was entitled to the patent. We may become involved in opposition, interference or derivation proceedings challenging our patent rights or the patent rights of others. An adverse determination in any such proceeding could reduce the scope of, or invalidate, our patent rights, allow third parties to commercialize our technology or products and compete directly with us, without payment to us, or result in our inability to manufacture or commercialize products without infringing third-party patent rights.

Even if our owned and licensed patent applications issue as patents, they may not issue in a form that will provide us with any meaningful protection, prevent competitors from competing with us or otherwise provide us with any competitive advantage. Our competitors may be able to circumvent our owned or licensed patents by developing similar or alternative technologies or products in a non-infringing manner. The issuance of a patent is not conclusive as to its scope, validity or enforceability, and our owned and licensed patents may be challenged in the courts or patent offices in the United States and abroad. Such challenges may result in patent claims being narrowed, invalidated or held unenforceable, which could limit our ability to stop or prevent us from stopping others from using or commercializing similar or identical technology and products, or limit the duration of the patent protection of our technology and products. Given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting such candidates might expire before or shortly after such candidates are commercialized. As a result, our owned and licensed patent portfolio may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours.

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

Competitors may infringe our patents. To counter infringement or unauthorized use, we may be required to initiate infringement lawsuits, which can be expensive and time-consuming. In addition, in an infringement proceeding, a court may decide that a patent of ours is invalid or unenforceable, or may refuse to stop the other party from using the technology at issue on the grounds that our patents do not cover the technology in question. An adverse result in any litigation proceeding could put one or more of our patents at risk of being invalidated or interpreted narrowly. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation.

Third parties may initiate legal proceedings alleging that we are infringing their intellectual property rights, the outcome of which would be uncertain and could have a material adverse effect on the success of our business.

Our commercial success depends upon our ability and the ability of our collaborators to develop, manufacture, market and sell our products and product candidates and use our proprietary technologies without infringing the enforceable proprietary rights of third parties. We may become party to, or threatened with, future adversarial proceedings or litigation regarding intellectual property rights with respect to our products and technology, including interference or derivation proceedings before the U.S. Patent and Trademark Office. Third parties may assert infringement claims against us based on existing patents or patents that may be granted in the future. If we are found to infringe a third party's intellectual property rights, we could be required to obtain a license from such third party to continue developing and marketing our products and technology. However, we may not be able to obtain any required license on commercially reasonable terms or at all. Even if we were able to obtain a license, it could be non-exclusive, thereby giving our competitors access to the same technologies licensed to us. We could be forced, including by court order, to cease commercializing the infringing technology or product. In addition, we could be found liable for monetary damages. A finding of infringement could prevent us from commercializing our product candidates or force us to cease some of our business operations, which could materially harm our business. Claims that we have misappropriated the confidential information or trade secrets of third parties can have a similar negative impact on our business.

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

Many of our employees were previously employed at universities or other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that our employees do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or these employees have used or disclosed intellectual property, including trade secrets or other proprietary information, of any such employee's former employer. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management.

Intellectual property litigation could cause us to spend substantial resources and distract our personnel from their normal responsibilities.

Even if resolved in our favor, litigation or other legal proceedings relating to intellectual property claims may cause us to incur significant expenses, and could distract our technical and management personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Such litigation or proceedings could substantially increase our operating losses and reduce our resources available for development activities. We may not have sufficient financial or other resources to adequately conduct such litigation or proceedings. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their substantially greater financial resources. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace.

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

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

We may not be able to obtain, maintain or protect proprietary rights necessary for the continued development and commercialization of our products, product candidates and research technologies, including as a result of challenges from companies who seek to sell generic or biosimilar versions of our products after expiration of any regulatory exclusivity but prior to the applicable patent expiration.

Our commercial success depends in large part on obtaining and maintaining U.S. and foreign patent protection for our products, our product candidates and our research technologies and successfully enforcing and defending these patents against third-party challenges, including with respect to generic or biosimilar challenges. The validity of our patents in one or more jurisdictions may be challenged by third parties, resulting in our patents being deemed invalid, unenforceable or narrowed in scope, which could compromise the scope or duration of our exclusive rights in the relevant product, product candidate or technology. For example, the validity of a U.S. patent can be challenged in the U.S. Patent and Trademark Office (e.g., through an Inter Partes Review and/or Post Grant Review proceeding) and/or in U.S. federal district court.

In addition, our patents may also be challenged in a federal court in connection with a third party’s abbreviated new drug application, or ANDA, a Section 505(b)(2) new drug application, or NDA, or an abbreviated Biologic License Application, or aBLA, seeking FDA approval to market a generic version or a biosimilar version of our products, resulting in a patent challenge to one or more patents listed in the Orange Book for our product or that protect our biologic product. This patent challenge can result in one or more of those patents for our products being deemed uninfringed, invalid, unenforceable and/or narrowed in scope, which could compromise the scope or duration of our exclusive rights in the relevant product. An ANDA, Section 505(b)(2) NDA or aBLA can be filed after FDA approval of a product and the expiration of any relevant regulatory exclusivity. Other challenges to a patent may be mounted without regard to the date of an FDA approval.

Our patents as issued or as subsequently limited by any litigation might not contain claims that are sufficiently broad to prevent others from circumventing our patent protection and utilizing our technologies. For instance, the issued patents relating to our product candidates may be limited to a particular indication and/or composition and may not cover similar compositions that have similar clinical properties. Consequently, our competitors may independently develop competing products that do not infringe our patents or other intellectual property. Also, our pending patent applications may not issue, and we may not receive any additional patents. We cannot be sure that our patents and patent applications, including our own and those that we have rights to under licenses from third parties, will adequately protect our intellectual property for a number of reasons, including, among other things, the following: (i) the patent positions of pharmaceutical and biotechnology companies can be highly uncertain and involve complex legal and factual questions; (ii) the actual protection afforded by a patent can vary from country to country and may depend upon the type of patent, the scope of its coverage and the availability of legal remedies in the country; (iii) the laws of foreign countries in which we market our products may afford little or no effective protection to our intellectual property, thereby easing our competitors' ability to compete with us in such countries; (iv) intellectual property laws and regulations and legal standards relating to the validity, scope and enforcement of patents covering pharmaceutical and biotechnological inventions are continually developing and changing, both in the United States and in other important markets outside the United States; (v) third parties may challenge, infringe, circumvent or seek to invalidate existing or future patents owned by or licensed to us; and (vi) the coverage claimed in a patent application can be significantly reduced before the patent is issued, and, as a consequence, our and our partners' patent applications may result in patents with narrower coverage than we desire or have planned for.

Risks Related to Regulatory Approval of Our Product Candidates

If we are not able to obtain required regulatory approvals, we will not be able to commercialize our product candidates, and our ability to generate revenue will be materially impaired.

Our product candidates, including our clinical stage product candidates, and the activities associated with their development and commercialization, including their design, testing, manufacture, safety, efficacy, recordkeeping, labeling, storage, approval, advertising, promotion, sale and distribution, import, export, sampling and marketing are subject to comprehensive regulation by the FDA and other regulatory agencies in the United States and by comparable authorities in other countries. Failure to obtain regulatory approval for a product candidate will prevent us from commercializing the product candidate. ONIVYDE was our first and only product candidate to receive regulatory approval, and so we have only limited experience in filing and supporting the applications necessary to gain regulatory approvals. Securing regulatory approval requires the submission of extensive preclinical and clinical data and supporting information to the FDA and other regulatory agencies for each therapeutic indication to establish the product candidate's safety and efficacy. Securing regulatory approval also requires the submission of information about the product manufacturing process to, and inspection of manufacturing facilities by, the FDA or other regulatory agencies. Our product candidates may not be effective, may be only moderately effective or may prove to have undesirable or unintended side effects, toxicities or other characteristics that may preclude our obtaining regulatory approval or prevent or limit commercial use.

The process of obtaining regulatory approvals is expensive, may take many years if additional clinical trials are required, if approval is obtained at all, and can vary substantially based on a variety of factors, including the type, complexity and novelty of the product candidates involved. Changes in regulatory approval policies during the development period, changes in or the enactment of additional statutes or regulations, changes in regulatory review for each submitted product application or approval of other products for the same indication may cause delays in the approval or rejection of an application. Regulatory agencies have substantial discretion in the approval process and may refuse to accept any application or may decide that our data is insufficient for approval and require additional preclinical, clinical or other studies. In addition, varying interpretations of the data obtained from preclinical and clinical testing could delay, limit or prevent regulatory approval of a product candidate. Any regulatory approval we ultimately obtain may be limited or subject to restrictions or post-approval commitments that render the approved product not commercially viable.

If we continue to pursue development of companion diagnostics to identify patients who are likely to benefit from our product candidates, failure to obtain approval for the companion diagnostic may prevent or delay approval of the product candidate.

We are attempting to develop companion diagnostics to identify patients who are likely to benefit from our product candidates. We currently rely on and expect to continue to rely on third parties for much of the development, testing and manufacturing of our companion diagnostics. We will likely rely on such third parties to also obtain any required regulatory approval for and then commercially supply such companion diagnostics. All of our companion diagnostic candidates are in preclinical development or clinical feasibility testing. We have very limited experience in the development of diagnostics and, even with the help of third parties with greater experience, may fail to obtain the required diagnostic product marketing approval, which could prevent or delay approval of the product candidate.

In July 2014, the FDA issued final guidance that stated that if safe and effective use of a therapeutic depends on an *in vitro* diagnostic, then the FDA generally will not approve the therapeutic unless the FDA approves or clears this "*in vitro* companion diagnostic device" at the same time that the FDA approves the therapeutic. The approval or clearance of the *in vitro* diagnostic most likely will occur through the FDA's Center for Devices and Radiological Health Office of In Vitro Diagnostics and Radiological Health. Even with the issuance of the final guidance, the FDA's expectations for *in vitro* companion diagnostics remain unclear in some respects. The FDA's developing expectations will affect our *in vitro* companion diagnostics. In particular, the FDA may limit our ability to use retrospective data, otherwise disagree with our approaches to trial design, biomarker qualification, clinical and analytical validity and clinical utility, or make us repeat aspects of the trial or initiate new trials.

Because our companion diagnostic candidates are at an early stage of development, we cannot yet know what the FDA will require for any of these tests. For our clinical stage product candidates, we are attempting to develop an *in vitro* companion diagnostic that will help identify patients likely to benefit from the therapy. Whether the FDA will consider these *in vitro* diagnostics to be "*in vitro* companion diagnostic devices" that require simultaneous approval or clearance with the therapeutics will depend on whether the FDA views the diagnostics to be essential to the safety and efficacy of these therapeutics.

Based on the FDA's past practice with companion diagnostics, if we are successful in developing a diagnostic for any of our clinical stage product candidates, we would expect that FDA approval of an *in vitro* companion diagnostic would be required for approval and subsequent commercialization of each such product candidate. We are not aware of any currently available diagnostics that, if necessary, would otherwise allow us to proceed with the approval and subsequent commercialization of our product candidates despite a delay in or failure of our attempts to develop diagnostics.

Because we expect to rely on third parties for various aspects of the development, testing and manufacture, as well as for regulatory approval for and commercial supply, of our companion diagnostics, the commercial success of any of our product candidates that require a diagnostic will be tied to and dependent on the continued ability of such third parties to make the diagnostic commercially available on reasonable terms in the relevant geographies.

If we fail to maintain orphan drug designation for MM-121 or MM-141, we will have to rely on other rights and protections.

We obtained orphan drug designation in the United States for MM-121 for the treatment of heregulin positive non-small cell lung cancer and for MM-141 for the treatment of pancreatic cancer. In the United States, under the Orphan Drug Act, the FDA may designate a product as an orphan drug if it is a drug intended to treat a rare disease or condition, which is generally defined as a patient population of fewer than 200,000 individuals in the United States.

In the United States, the company that first obtains FDA approval for a designated orphan drug for the specified rare disease or condition receives orphan drug marketing exclusivity for that drug for that indication for a period of seven years. This orphan drug exclusivity prevents the FDA from approving another application, including a full NDA, to market the same drug for the same orphan indication, except in limited circumstances. For purposes of small molecule drugs, the FDA defines the term “same drug” to mean a drug that contains the same active molecule and that is intended for the same use as the approved orphan drug. Orphan drug exclusivity may be lost if the FDA 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. Additionally, maintenance of the orphan drug designation requires the company holding such designation to continue to actively pursue development in that indication.

Even if we obtain orphan drug exclusivity for a product, that exclusivity may not effectively protect the product from competition because different drugs can be approved for the same condition. Even after an orphan drug is approved, the FDA can subsequently approve the same drug for the same condition if the FDA 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.

On August 3, 2017, Congress passed the FDA Reauthorization Act of 2017, or FDARA. FDARA, among other things, codified the FDA’s pre-existing regulatory interpretation to require that a drug sponsor demonstrate the clinical superiority of an orphan drug that is otherwise the same as a previously approved drug for the same rare disease in order to receive orphan drug exclusivity. The new legislation reverses prior precedent holding that the Orphan Drug Act unambiguously requires that the FDA recognize the orphan exclusivity period regardless of a showing of clinical superiority. The FDA may further reevaluate the Orphan Drug Act and its regulations and policies. We do not know if, when or how the FDA may change the orphan drug regulations and policies in the future, and it is uncertain how any such changes might affect our business. Depending on what changes the FDA may make to its orphan drug regulations and policies, our business could be adversely impacted.

Our product candidates for which we intend to seek approval as biological or drug products may face competition sooner than expected.

With the enactment of the Biologics Price Competition and Innovation Act of 2009, or BPCIA, as part of the Health Care and Education Reconciliation Act of 2010, or the Health Care Reform Laws, an abbreviated pathway for the approval of biosimilar and interchangeable biological products was created. The abbreviated regulatory pathway establishes legal authority for the FDA to review and approve biosimilar biologics, including the possible designation of a biosimilar as “interchangeable” based on their similarity to existing brand product. Under the BPCIA, an application for a biosimilar product cannot be approved by the FDA until twelve years after the original branded product was approved under a biologics license application, or BLA. The BPCIA is complex and has yet to be fully interpreted and implemented by the FDA. As a result, its ultimate impact, implementation and meaning is subject to uncertainty. While it is uncertain when any such processes may be fully adopted by the FDA, any such processes could have a material adverse effect on the future commercial prospects for our biological products.

We believe that any of our products approved as a biological product under a BLA should qualify for the twelve year period of exclusivity. However:

- a potential competitor could seek and obtain approval of its own BLA during our exclusivity period instead of seeking approval of a biosimilar version; and
- the FDA could consider a particular product candidate which contains both drug and biological product components to be a drug subject to review pursuant to an NDA, and therefore eligible for a significantly shorter marketing exclusivity period as provided under the Drug Price Competition and Patent Term Restoration Act of 1984.

Moreover, the extent to which a biosimilar, once approved, will be substituted for any one of our reference products in a way that is similar to traditional generic substitution for non-biological products is not yet clear and will depend on a number of marketplace and regulatory factors that are still developing.

In addition, a drug product approved under an NDA could face generic competition earlier than expected. The enactment of the Generic Drug User Fee Amendments of 2012 as part of the Food and Drug Administration Safety and Innovation Act of 2012 established a user fee program that will generate hundreds of millions of dollars in funding for the FDA’s generic drug review program. Funding from the user fee program, along with performance goals that the FDA negotiated with the generic drug industry, is significantly decreasing the timeframe for FDA review and approval of generic drug applications.

Failure to obtain regulatory approval in international jurisdictions would prevent us from marketing our products abroad.

We intend to market any product for which we obtain marketing approval, either ourselves or with commercialization partners, both within and outside the United States. This may increase the risks described below with respect to our compliance with foreign regulations.

In order to market and sell any approved products in the European Union and many other jurisdictions, we or our commercialization partners must obtain separate regulatory approvals and comply with numerous and varying regulatory requirements. The approval procedure varies among countries and can involve additional testing, including sometimes additional testing in children. The time required to obtain approval in foreign countries may differ substantially from that required to obtain FDA approval. The regulatory approval process outside the United States generally includes all of the risks associated with obtaining FDA approval. In addition, in many countries outside the United States, it is required that the product be approved for reimbursement before the product can be sold in that country. We or our future commercialization partners may not obtain approvals from regulatory authorities outside the United States on a timely basis, if at all. Approval by the FDA does not ensure approval by regulatory authorities in other countries or jurisdictions, and approval by one regulatory authority outside the United States does not ensure approval by regulatory authorities in other countries or jurisdictions or by the FDA. We or our future commercialization partners may not be able to file for regulatory approvals and may not receive necessary approvals to commercialize our products in any market.

Additionally, on June 23, 2016, the electorate in the United Kingdom voted in favor of leaving the European Union, commonly referred to as Brexit. On March 29, 2017, the country formally notified the European Union of its intention to withdraw pursuant to Article 50 of the Lisbon Treaty. Since a significant proportion of the regulatory framework in the United Kingdom is derived from European Union directives and regulations, the referendum could materially impact the regulatory regime with respect to the approval of our product candidates in the United Kingdom or the European Union. Any delay in obtaining, or an inability to obtain, any marketing approvals as a result of Brexit or otherwise would prevent us from commercializing our product candidates in the United Kingdom and/or the European Union and restrict our ability to generate revenue and achieve and sustain profitability. If any of these outcomes occur, we may be forced to restrict or delay efforts to seek regulatory approval in the United Kingdom and/or European Union for our product candidates, which could significantly and materially harm our business.

Any product for which we obtain marketing approval could be subject to restrictions 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 products, when and if any of them are approved.

Any product for which we may obtain marketing approval, along with the manufacturing processes, post-approval clinical data, labeling, advertising and promotional activities for such product, will be subject to continual requirements of and review by the FDA and other regulatory authorities. These requirements include submissions of safety and other post-marketing information and reports, registration and listing requirements, cGMP or QSR requirements relating to quality control, quality assurance and corresponding maintenance of records and documents, requirements regarding the distribution of samples to physicians and recordkeeping. Even if regulatory approval of a product is granted, the approval may be subject to limitations on the indicated uses for which the product may be marketed or to the conditions of approval, or contain requirements for costly post-marketing testing and surveillance to monitor the safety or efficacy of the product. Later discovery of previously unknown problems with our products, manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may result in actions such as:

- restrictions on such products, manufacturers or manufacturing processes;
- restrictions on the marketing of a product;
- restrictions on product distribution;
- requirements to conduct post-marketing clinical trials;
- warning or untitled letters;
- withdrawal of the products from the market;
- refusal to approve pending applications or supplements to approved applications that we submit;
- recall of products;
- fines, restitution or disgorgement of profits or revenue;
- suspension or withdrawal of regulatory approvals;
- refusal to permit the import or export of our products;

- product seizure; or
- injunctions or the imposition of civil or criminal penalties.

The FDA has sweeping inspection authorities to enforce the Federal Food, Drug, and Cosmetic Act. Under the statute, a drug or biologic will be considered adulterated, with possible resulting civil and criminal penalties, if the owner or operator of the establishment where it is made, processed, packed or held delays, denies, limits or refuses inspection. The FDA employs a risk-based inspection schedule to ensure compliance. The law grants the FDA authority to require a drug or biologics manufacturer to provide, in advance or instead of an inspection, and at the manufacturer's expense, any records or other information that the agency may otherwise inspect at the facility. The FDA may also share inspection information with foreign governments under certain circumstances.

The FDA also has broad authority to take action against manufacturers of drugs or biologics that are not adhering to pediatric study requirements, which apply even if the manufacturer is not seeking to market the drug or biologic to pediatric patients. As of April 2013, the FDA must issue non-compliance letters to companies who do not meet the pediatric study requirements. Any company receiving a non-compliance letter would have an opportunity to respond, and the non-compliance letter and company response would become publicly available.

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

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

In March 2010, the ACA was enacted, which includes measures that have significantly changed healthcare financing by both governmental and private insurers. Since enactment of the ACA, there have been numerous legal challenges and legislative actions to repeal and replace provisions of the law, and we expect these to continue. For example, with enactment of the Tax Cuts and Jobs Act of 2017, which was signed by President Trump on December 22, 2017, the U.S. Congress repealed the "individual mandate." The repeal of this provision, which requires most Americans to carry a minimal level of health insurance, will become effective in 2019. According to the U.S. Congressional Budget Office, the repeal of the individual mandate will cause 13 million fewer Americans to be insured in 2027 and premiums in insurance markets may rise. Additionally, on January 22, 2018, President Trump signed a continuing resolution on appropriations for fiscal year 2018 that delayed the implementation of certain ACA-mandated fees, including the so-called "Cadillac" tax on certain high cost employer-sponsored insurance plans, the annual fee imposed on certain health insurance providers based on market share and the medical device excise tax on non-exempt medical devices.

The U.S. Congress may consider other legislation to replace elements of the ACA during the next Congressional session. These healthcare reforms, as well as other healthcare reform measures that may be adopted in the future, may result in additional reductions in Medicare and other healthcare funding, more rigorous coverage criteria, new payment methodologies and additional downward pressure on the price for any approved product and/or the level of reimbursement physicians receive for administering any approved product. Reductions in reimbursement levels may negatively impact the prices or the frequency with which products are prescribed or administered. Any reduction in reimbursement from Medicare or other government programs may result in a similar reduction in payments from private payors.

Further, there have been several recent U.S. congressional inquiries and proposed federal and proposed and enacted state legislation designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, reduce the costs of products under Medicare and reform government program reimbursement methodologies for products. At the federal level, the U.S. Congress and the Trump administration have each indicated that it will continue to seek new legislative and/or administrative measures to control costs. At the state level, individual states are increasingly aggressive in passing legislation and implementing regulations designed to control pharmaceutical and biological product pricing. In addition, regional healthcare authorities and individual hospitals are increasingly using bidding procedures to determine what pharmaceutical products and which suppliers will be included in their prescription product and other healthcare programs. These measures could reduce the ultimate demand for our product candidates, once approved, or put pressure on our product pricing.

Legislative and regulatory proposals have also been made to expand post-approval requirements and restrict sales and promotional activities for pharmaceutical products. We cannot be sure whether additional legislative changes will be enacted, or whether the FDA regulations, guidance or interpretations will be changed, or what the impact of such changes on the marketing approvals of our product candidates, if any, may be. In addition, increased scrutiny by Congress of the FDA's approval process may significantly delay or prevent marketing approval, as well as subject us and any future collaborators to more stringent product labeling and post-marketing testing and other requirements.

Risks Related to Commercialization of Our Product Candidates

The FDA and other regulatory agencies strictly regulate the promotional claims that may be made about prescription products. If we are found to have improperly promoted off-label uses for any product for which we receive marking approval, we may become subject to significant fines and other liability.

The FDA and other regulatory agencies strictly regulate the promotional claims that may be made about prescription products. In particular, a product may not be promoted for uses that are not approved by the FDA or such other regulatory agencies as reflected in the product's approved labeling. If we are found to have promoted for off-label uses, we may become subject to significant government fines and other related liability. For example, the U.S. 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 government has also required companies to enter into complex multi-year corporate integrity agreements and/or non-prosecution agreements that can impose significant restrictions and other burdens on the affected companies.

In addition, incentives under applicable U.S. laws encourage employees and physicians to report violations of rules governing promotional activities for pharmaceutical products. These incentives could lead to so called whistleblower lawsuits as part of which such persons seek to collect a portion of moneys allegedly overbilled to government agencies due to, for example, promotion of pharmaceutical products beyond labeled claims. Such lawsuits, whether with or without merit, are typically time consuming and costly to defend. Such suits may also result in related stockholder lawsuits, which are also costly to defend.

Our relationships with customers and payors will be subject to applicable anti-kickback, fraud and abuse and other healthcare laws and regulations, which could expose us to criminal sanctions, civil penalties, contractual damages, reputational harm and diminished profits and future earnings.

Healthcare providers, physicians and others play a primary role in the recommendation and prescription of products for which we obtain marketing approval. Arrangements with third-party payors and customers may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell and distribute any products for which we obtain marketing approval. Restrictions under applicable federal, state and foreign healthcare laws and regulations include the following:

- the federal healthcare anti-kickback statute prohibits, among other things, knowingly and willfully soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward the purchasing, leasing, ordering or arranging for the purchase, order or recommendation of any item or service reimbursable under Medicare, Medicaid, or other federal healthcare programs. This statute has been interpreted to apply to arrangements between pharmaceutical manufacturers on the one hand and prescribers, purchasers and formulary managers on the other, and violations are punishable by imprisonment, criminal fines, civil monetary penalties and exclusion from participation in federal healthcare programs. Although there are a number of statutory exemptions and regulatory safe harbors protecting certain common activities from prosecution or other regulatory sanctions, the exemptions and safe harbors are drawn narrowly, and practices that involve remuneration intended to induce prescribing, purchases or recommendations may be subject to scrutiny if they do not qualify for an exemption or safe harbor;
- the federal False Claims Act prohibits any person from knowingly presenting, or causing to be presented, a false claim for payment to the federal government, or knowingly making, or causing to be made, a false statement to have a false claim paid. Government enforcement agencies and private whistleblowers have initiated investigations or brought private lawsuits against pharmaceutical companies for a variety of allegedly improper promotional or marketing activities, such as allegedly inflating drug prices they report to pricing services, which in turn were used by the government to set Medicare and Medicaid reimbursement rates; allegedly providing free product to customers with the expectation that the customers would bill federal programs for the product; or engaging in promotion for "off-label" uses. Additionally, the Health Care Reform Laws amended the federal False Claims Act such that a violation of the federal anti-kickback statute can serve as a basis for liability under the False Claims Act;
- the federal Health Insurance Portability and Accountability Act of 1996, as amended by the Health Information Technology for Economic and Clinical Health Act, or HIPAA, makes it a crime to knowingly and willfully execute or attempt to execute a scheme to defraud any healthcare benefit program and also imposes obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of individually identifiable health information;

- the federal false statements statute prohibits, among other things, knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for healthcare benefits, items or services;
- the federal transparency requirements under the Health Care Reform Laws require manufacturers of drugs, devices, biologics and medical supplies reimbursable under Medicare and Medicaid to report to the Department of Health and Human Services information related to payments and other transfers of value to physicians and teaching hospitals, as well as physician ownership and investment interests, and provide for public reporting of the data reported by manufacturers;
- the U.S. Foreign Corrupt Practices Act prohibits U.S. companies and their representatives from paying, offering to pay, promising or authorizing the payment of anything of value to any foreign government official, government staff member, political party or political candidate for the purpose of obtaining or retaining business or to otherwise obtain favorable treatment or influence a person working in an official capacity, and encompasses many healthcare professionals in many countries under the definition of a foreign government official;
- the Bribery Act, which applies to U.S. companies such as ourselves that conduct business in the United Kingdom, proscribes giving and receiving bribes in the public and private sectors, bribing a foreign public official and failing to have adequate procedures to prevent employees and other agents from giving bribes; and
- analogous state laws and regulations, such as state anti-kickback and false claims laws, may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payors, including private insurers. In addition, some state laws require pharmaceutical companies to comply with the pharmaceutical industry’s voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government. Other states require pharmaceutical manufacturers to report information related to payments to physicians and other healthcare providers or marketing expenditures, or prohibit certain marketing-related activities including the provision of gifts, meals or other items to certain healthcare providers.

Efforts to ensure that our business arrangements with third parties comply with applicable healthcare laws and regulations involve substantial costs. It is possible that governmental authorities will conclude that our business practices may not comply with current or future statutes, regulations or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant civil, criminal and administrative penalties, damages, fines, exclusion from government funded healthcare programs, such as Medicare and Medicaid, and the curtailment or restructuring of our operations. If any of the physicians or other providers or entities with whom we do business are found to be not in compliance with applicable laws, they may be subject to criminal, civil or administrative sanctions, including exclusions from government funded healthcare programs. Even if we are not determined to have violated these laws, government investigations into these issues typically require the expenditure of significant resources and generate negative publicity, which could also harm our financial condition. Responding to government investigations or whistleblower lawsuits, defending any claims raised, and any resulting fines, damages, penalties, settlement payments or administrative actions, as well as any related actions brought by stockholders or other third parties, could have a material impact on our reputation, business and financial condition and divert the attention of our management from operating our business.

Our corporate compliance efforts cannot guarantee that we are in compliance with all potentially applicable regulations.

The development, manufacturing, pricing, sales, coverage and reimbursement of our products, together with our general operations, are and will be subject to extensive regulation by federal, state and other authorities within the United States and numerous entities outside of the United States. While we have implemented a corporate compliance program based on what we believe are the current best practices, we cannot provide any assurance that governmental authorities will find that our business practices comply with current or future administrative or judicial interpretations of potentially applicable laws and regulations. If we fail to comply with any of these laws and regulations, we could be subject to a range of regulatory actions, including suspension or termination of clinical trials, the failure to approve a product candidate, restrictions on our products or manufacturing processes, withdrawal of products from the market, significant fines, disqualification or debarment from participation in federally-funded healthcare programs or other sanctions or litigation, any of which events may have a significant adverse impact on our business.

Risks Related to Data Protection and Cybersecurity

Our failure to comply with data protection laws and regulations could lead to government enforcement actions, private litigation and/or adverse publicity and could negatively affect our operating results and business.

We are subject to data protection laws and regulations that address privacy and data security. The legislative and regulatory landscape for data protection continues to evolve, and in recent years there has been an increasing focus on privacy and data security issues. In the United States, numerous federal and state laws and regulations, including state data breach notification laws, state health information privacy laws and federal and state consumer protection laws govern the collection, use, disclosure and protection of health-related and other personal information. Failure to comply with data protection laws and regulations could result in government enforcement actions, which could include civil or criminal penalties, private litigation and/or adverse publicity and could negatively affect our operating results and business. In addition, we may obtain health information from third parties (e.g., healthcare providers who prescribe our products) that are subject to privacy and security requirements under HIPAA. We could be subject to criminal penalties if we knowingly obtain or disclose individually identifiable health information in a manner that is not authorized or permitted.

The collection and use of personal health data in the European Union is governed by the provisions of the Data Protection Directive. This directive imposes several requirements relating to the consent of the individuals to whom the personal data relates, the information provided to the individuals, notification of data processing obligations to the competent national data protection authorities and the security and confidentiality of the personal data. The Data Protection Directive also imposes strict rules on the transfer of personal data out of the European Union to the United States. Failure to comply with the requirements of the Data Protection Directive and the related national data protection laws of the European Union Member States may result in fines and other administrative penalties.

Significant disruptions of information technology systems or security breaches could adversely affect our business.

We are increasingly dependent upon information technology systems, infrastructure and data to operate our business. In the ordinary course of business, we collect, store and transmit large amounts of confidential information (including, among other things, trade secrets or other intellectual property, proprietary business information and personal information). It is critical that we do so in a secure manner to maintain the confidentiality and integrity of such confidential information. We also have outsourced elements of our operations to third parties, and as a result we manage a number of third-party vendors who may or could have access to our confidential information. The size and complexity of our information technology systems, and those of third-party vendors with whom we contract, and the large amounts of confidential information stored on those systems, make such systems vulnerable to service interruptions or to security breaches from inadvertent or intentional actions by our employees, third-party vendors, and/or business partners, or from cyber-attacks by malicious third parties. Cyber-attacks are increasing in their frequency, sophistication and intensity, and have become increasingly difficult to detect. Cyber-attacks could include the deployment of harmful malware, ransomware, denial-of-service attacks, social engineering and other means to affect service reliability and threaten the confidentiality, integrity and availability of information.

Significant disruptions of our information technology systems, or those of our third-party vendors, or security breaches could adversely affect our business operations and/or result in the loss, misappropriation and/or unauthorized access, use or disclosure of, or the prevention of access to, confidential information, including, among other things, trade secrets or other intellectual property, proprietary business information and personal information, and could result in financial, legal, business and reputational harm to us. For example, any such event that leads to unauthorized access, use or disclosure of personal information, including personal information regarding our patients or employees, could harm our reputation, require us to comply with federal and/or state breach notification laws and foreign law equivalents, and otherwise subject us to liability under laws and regulations that protect the privacy and security of personal information. Security breaches and other inappropriate access can be difficult to detect, and any delay in identifying them may lead to increased harm of the type described above. While we have implemented security measures to protect our information technology systems and infrastructure, there can be no assurance that such measures will prevent service interruptions or security breaches that could adversely affect our business.

Risks Related to Employee Matters and Managing Growth

Our future success depends on our ability to retain our key executives and to attract, retain and motivate qualified personnel.

We are highly dependent on the principal members of our executive and scientific teams. Although we have formal employment agreements with each of our executive officers, these agreements do not prevent our executives from terminating their employment with us at any time. We do not maintain “key person” insurance for any of our executives or other employees. The loss of the services of any of these persons could impede the achievement of our research, development and commercialization objectives.

Recruiting and retaining qualified scientific, clinical, manufacturing and sales and marketing personnel will also be critical to our success. We may not be able to attract and retain these personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for similar personnel. We also experience competition for the hiring of scientific and clinical personnel from universities and research institutions. In addition, we rely on consultants and advisors, including scientific and clinical advisors, to assist us in formulating our research and development and commercialization strategy. Our consultants and advisors may be employed by employers other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us.

We have entered into and may continue to enter into or seek to enter into business combinations, acquisitions or divestitures which may be difficult to consummate, disrupt our business, divert management attention or dilute stockholder value.

As part of our business strategy, we may enter into business combinations, acquisitions or divestitures. Although we consummated the asset sale to Ipsen in April 2017, we have limited experience in making acquisitions and divestitures. In addition, acquisitions and divestitures are typically accompanied by a number of risks, including:

- the difficulty of integrating or separating the operations and personnel of the acquired companies or divested product;
- the potential disruption of our ongoing business and distraction of management;
- potential unknown liabilities and expenses;
- the failure to achieve the expected benefits of the combination, acquisition or divestiture;
- the maintenance of acceptable standards, controls, procedures and policies; and
- the impairment of relationships with employees as a result of any integration or separation of management and other personnel.

If we are not successful in completing acquisitions or divestitures that we may pursue in the future, we would be required to reevaluate our business strategy and we may have incurred substantial expenses and devoted significant management time and resources in seeking to complete the acquisitions or divestitures. In addition, with future acquisitions, we could use substantial portions of our available cash as all or a portion of the purchase price or could issue additional securities as consideration for these acquisitions, which could cause our stockholders to suffer significant dilution.

Risks Related to Our Common Stock

Our executive officers, directors and principal stockholders maintain the ability to significantly influence all matters submitted to stockholders for approval.

Our executive officers, directors and stockholders who own more than 5% of our outstanding common stock, in the aggregate, beneficially own a large portion of our capital stock. As a result, if these stockholders were to choose to act together, they would be able to significantly influence all matters submitted to our stockholders for approval, as well as our management and affairs. For example, these persons, if they choose to act together, would significantly influence the election of directors and approval of any merger, consolidation or sale of all or substantially all of our assets. This concentration of voting power could discourage, delay or prevent an acquisition of our company on terms that other stockholders may desire.

Provisions in our corporate charter documents and under Delaware law could make an acquisition of us, which may be beneficial to our stockholders, more difficult and may prevent attempts by our stockholders to replace or remove our current management.

Provisions in our corporate charter and our bylaws may discourage, delay or prevent a merger, acquisition or other change in control of us that stockholders may consider favorable, including transactions in which our stockholders might otherwise receive a premium for their shares. These provisions could also limit the price that investors might be willing to pay in the future for shares of our common stock, thereby depressing the market price of our common stock. In addition, these provisions may frustrate or prevent any attempts by our stockholders to replace or remove our current management by making it more difficult for stockholders to replace members of our board of directors. Because our board of directors is responsible for appointing the members of our management team, these provisions could in turn affect any attempt by our stockholders to replace current members of our management team. Among others, these provisions:

- allow the authorized number of our directors to be changed only by resolution of our board of directors;
- establish advance notice requirements for stockholder proposals that can be acted on at stockholder meetings and nominations to our board of directors;
- require that stockholder actions must be effected at a duly called stockholder meeting and prohibit actions by our stockholders by written consent;
- limit who may call stockholder meetings;

- authorize our board of directors to issue preferred stock without stockholder approval, which could be used to institute a "poison pill" that would work to dilute the stock ownership of a potential hostile acquirer, effectively preventing acquisitions that have not been approved by our board of directors; and
- require the approval of the holders of at least 75% of the votes that all our stockholders would be entitled to cast to amend or repeal certain provisions of our charter or bylaws.

Moreover, because we are incorporated in Delaware, we are governed by the provisions of Section 203 of the Delaware General Corporation Law, which prohibits a person who owns in excess of 15% of our outstanding voting stock from merging or combining with us for a period of three years after the date of the transaction in which the person acquired in excess of 15% of our outstanding voting stock, unless the merger or combination is approved in a prescribed manner.

Our stock price has been and may in the future be volatile, which could cause holders of our common stock to incur substantial losses.

Our stock price has been and in the future may be subject to substantial price volatility. The stock market in general and the market for biotechnology companies in particular have experienced extreme volatility that has often been unrelated to the operating performance of particular companies. As a result of this volatility, our stockholders could incur substantial losses. The market price for our common stock may be influenced by many factors, including:

- the success of competitive products or technologies;
- results of clinical trials of our product candidates or those of our competitors;
- regulatory or legal developments in the United States and other countries;
- developments or disputes concerning patents or other proprietary rights;
- the recruitment or departure of key personnel;
- variations in our financial results or those of companies that are perceived to be similar to us;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors and issuance of new or changed securities analysts' reports or recommendations;
- activism by any single large stockholder or combination of stockholders;
- general economic, industry and market conditions; and
- the other factors described in this "Risk Factors" section.

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

We have not historically declared or paid cash dividends on our common stock. Although our board of directors declared a special cash dividend of $140.0 million, which was payable on May 26, 2017 to stockholders of record as of the close of business on May 17, 2017, we do not currently intend to pay any regular cash dividends in the foreseeable future. In addition, the terms of any future debt agreements may preclude us from paying dividends. As a result, capital appreciation, if any, of our common stock will be the sole source of gain for holders of our common stock for the foreseeable future.

Future sales of shares of our common stock, including by us or our directors and executive officers, or shares issued upon the exercise of currently outstanding options could cause the market price of our common stock to drop significantly, even if our business is doing well.

A substantial portion of our outstanding common stock can be traded without restriction at any time. In addition, a portion of our outstanding common stock is currently restricted as a result of federal securities laws, but can be sold at any time subject to applicable volume limitations. As such, sales of a substantial number of shares of our common stock in the public market could occur at any time. These sales, or the perception in the market that the holders of a large number of shares intend to sell shares, by us or others, could reduce the market price of our common stock. In addition, we have a significant number of shares that are subject to outstanding options. The exercise of these options and the subsequent sale of the underlying common stock could cause a further decline in our stock price. For instance, in April 2016, we issued an aggregate of 1,236,766 shares of our common stock to certain holders of our convertible notes who had agreed to convert an aggregate of $64.2 million of convertible notes. Any such sales also might make it difficult for us to sell equity securities in the future at a time and at a price that we deem appropriate. We cannot predict the size of future issuances or the effect, if any, that any future issuances may have on the market price for our common stock.

Furthermore, on December 15, 2017, we filed a registration statement on Form S-3 with the SEC to allow the issuance of our securities from time to time in one or more offerings of up to $150,000,000 in aggregate dollar amount. This registration statement was declared effective by the SEC on January 5, 2018. Any sale of additional shares of our common stock or other securities could reduce the market price of our common stock.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Our principal facilities consist of approximately 112,300 square feet of research and office space located at One Kendall Square in Cambridge, Massachusetts. The lease on our principal facilities expires in June 2019. In connection with the completion of the asset sale, on April 3, 2017, we entered into a sublease with Ipsen, pursuant to which Ipsen is subleasing approximately 70,237 square feet of space in our Cambridge, Massachusetts facility through the end of the term of the lease in June 2019.

Item 3. Legal Proceedings

On March 15, 2017, the trustee and certain holders of our convertible notes filed a lawsuit filed in the Court of Chancery in the State of Delaware, captioned *Wells Fargo Bank, National Association, Wolverine Flagship Fund Trading Limited, Highbridge International LLC, and Highbridge Tactical Credit & Convertibles Master Fund, L.P. v. Merrimack Pharmaceuticals, Inc.*, or the Delaware Action. The Delaware Action complaint alleged that the sale of the commercial business to Ipsen was a sale of "substantially all" of our assets and therefore constituted a Fundamental Change (as defined in the indenture governing the convertible notes) as of the closing of the asset sale, which would trigger (a) certain obligations under the indenture governing the convertible notes, including an offer to repurchase the convertible notes, and (b) an event of default if Ipsen does not assume the obligations under the indenture and execute a supplemental indenture with respect to the convertible notes. In connection with plaintiffs' withdrawal of a motion for a preliminary injunction, in April 2017, we deposited into an escrow account $60.0 million in proceeds from the asset sale. On October 6, 2017, we entered into the settlement agreement to resolve the Delaware Action. In accordance with the settlement agreement, we paid $32.5 million in cash to the noteholder plaintiffs, which represents $0.90 per each $1.00 of convertible notes held by the noteholder plaintiffs, plus accrued and unpaid interest on the convertible notes held by the noteholder plaintiffs through October 2, 2017. The noteholder plaintiffs collectively held approximately $35.8 million aggregate principal amount of the convertible notes. In addition, we paid a total of $3.8 million in attorneys' fees and expenses to the plaintiffs' attorneys. The noteholder plaintiffs have executed a full release in favor of us for any claims arising out of or related to the Delaware Action or the convertible notes.

On February 28, 2017, the Garfield Action was filed by a purported stockholder of ours in the Superior Court of Massachusetts for the County of Middlesex against us and our directors. The case is captioned *Robert Garfield v. Merrimack Pharmaceuticals Inc., et al*. The Garfield Action complaint alleged that our directors breached their fiduciary duties by entering into the asset sale agreement with Ipsen and that the definitive proxy statement relating to the asset sale contained inadequate disclosures and omissions. Although we believed that the Garfield Action was without merit, to avoid the risk of the litigation delaying or adversely affecting the asset sale and to minimize the expense of defending the litigation related to the asset sale, we agreed to make supplemental disclosures related to the asset sale and to pay the plaintiff's counsel $375,000 in attorney's fees in connection with the resolution of the Garfield Action. As a result, the Garfield Action was dismissed with prejudice.

We are not currently a party to any other material legal proceedings.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

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

Our common stock is publicly traded on the Nasdaq Global Market under the symbol "MACK". The following table sets forth, for the quarterly periods indicated, the high and low sales prices of our common stock as reported on the Nasdaq Global Market for each quarter in the years ended December 31, 2016 and 2017.

	High	Low
Year Ended December 31, 2016		
First Quarter	$ 89.10	$ 50.20
Second Quarter	$ 90.20	$ 52.80
Third Quarter	$ 66.20	$ 43.90
Fourth Quarter	$ 67.90	$ 40.30
Year Ended December 31, 2017		
First Quarter	$ 48.60	$ 28.30
Second Quarter	$ 39.90	$ 11.30
Third Quarter	$ 15.40	$ 11.43
Fourth Quarter	$ 15.39	$ 10.04

Holders

As of January 31, 2018, there were approximately 124 holders of record of our common stock. This number does not include beneficial owners whose shares are held by nominees in street name.

Dividends

Although our board of directors declared a special cash dividend of $140.0 million, which was payable on May 26, 2017 to stockholders of record as of the close of business on May 17, 2017, we do not currently intend to pay any regular cash dividends in the foreseeable future, nor have we ever declared or paid any other cash dividends on our common stock.

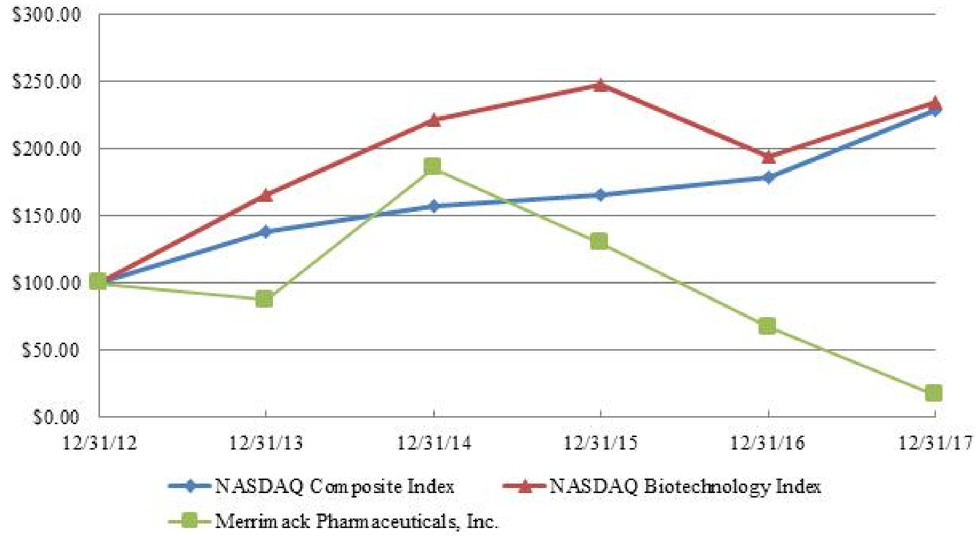
Corporate Performance Graph

The following performance graph and related information shall not be deemed to be "soliciting material" or to be "filed" with the SEC for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or the Exchange Act, nor shall such information be incorporated by reference into any future filing under the Exchange Act or Securities Act of 1933, as amended, or the Securities Act, except to the extent that we specifically incorporate it by reference into such filing.

The following graph compares the performance of our common stock to the Nasdaq Composite Index and to the Nasdaq Biotechnology Index from December 31, 2012 through December 31, 2017. The comparison assumes $100 was invested after the market closed on December 31, 2012 in our common stock and in each of the foregoing indices. The stock price performance included in this graph is not necessarily indicative of future stock price performance.

COMPARISON CUMULATIVE TOTAL RETURN

Among the Nasdaq Composite Index, the Nasdaq Biotechnology Index and Merrimack Pharmaceuticals, Inc.



Item 6. Selected Financial Data

You should read the following selected consolidated financial data together with our consolidated financial statements and the related notes appearing at the end of this Annual Report on Form 10-K and the "Management's Discussion and Analysis of Financial Condition and Results of Operations" section of this Annual Report on Form 10-K. We have derived the consolidated statements of operations data for the years ended December 31, 2017, 2016 and 2015 and the consolidated balance sheet data as of December 31, 2017 and 2016 from our audited consolidated financial statements included in this Annual Report on Form 10-K. We have derived the consolidated statement of operations data for the year ended December 31, 2014 and the consolidated balance sheet data as of December 31, 2015 from our audited consolidated financial statements not included in this Annual Report on Form 10-K. We have derived the consolidated statement of operations data for the year ended December 31, 2013 and the consolidated balance sheet data as of December 31, 2014 and 2013 from our unaudited consolidated financial statements not included in this Annual Report on Form 10-K. This data has been updated to account for the commercial business as a discontinued operation and to retroactively reflect the one-for-ten reverse stock split of our issued and outstanding common stock effected in September 2017. Our historical results for any prior period are not necessarily indicative of results to be expected in any future period.

	Years Ended December 31,				
(in thousands, except per share amounts)	**2017**	**2016**	**2015**	**2014**	**2013**
Consolidated Statements of Operations Data					
Collaboration revenues	$ —	$ —	$ —	$ 92,296	$ 47,786
Costs and expenses:					
Research and development expenses	67,314	109,565	121,033	103,310	116,929
General and administrative expenses	28,452	32,052	24,048	18,766	18,629
Restructuring expenses	—	5,710	—	—	—
Total costs and expenses	95,766	147,327	145,081	122,076	135,558
Loss from operations continuing operations	(95,766)	(147,327)	(145,081)	(29,780)	(87,772)
Other income and expenses:					
Interest income	895	276	99	114	166
Interest expense (1)	(34,650)	(22,449)	(18,769)	(18,230)	(10,938)
Gain on deconsolidation of Silver Creek Pharmaceuticals, Inc.	10,848	—	—	—	—
Gain on sale of asset	1,703	—	—	—	—
Other (expense) income, net	(1,433)	(8)	917	813	627
Net loss from continuing operations before income tax benefit	(118,403)	(169,508)	(162,834)	(47,083)	(97,917)
Income tax benefit	42,399	13,224	11,215	—	—
Net loss from continuing operations	(76,004)	(156,284)	(151,619)	(47,083)	(97,917)
Discontinued operations:					
Income (loss) from discontinued operations, net of tax	546,872	2,766	3,832	(36,476)	(32,768)
Net income (loss)	470,868	(153,518)	(147,787)	(83,559)	(130,685)
Net (loss) income attributable to non-controlling interest	(1,160)	(1,778)	170	(268)	240
Net income (loss) attributable to Merrimack Pharmaceuticals, Inc.	$ 472,028	$ (151,740)	$ (147,957)	$ (83,291)	$ (130,925)
Amounts attributable to Merrimack Pharmaceuticals, Inc.:					
Net loss from continuing operations	$ (74,844)	$ (154,506)	$ (151,789)	$ (46,815)	$ (98,157)
Income (loss) from discontinued operations, net of tax	546,872	2,766	3,832	(36,476)	(32,768)
Net income (loss) attributable to Merrimack Pharmaceuticals, Inc.	$ 472,028	$ (151,740)	$ (147,957)	$ (83,291)	$ (130,925)
Basic and dilutive net income (loss) per common share					
Net loss from continuing operations	$ (5.66)	$ (12.33)	$ (13.63)	$ (4.49)	$ (9.93)
Net income (loss) from discontinued operations, net of tax	41.33	0.22	0.34	(3.49)	(3.31)
Net income (loss) per share	$ 35.67	$ (12.11)	$ (13.29)	$ (7.98)	$ (13.24)
Weighted-average common shares used in per share calculations—basic and diluted (2)	13,232	12,533	11,136	10,441	9,892

(1) In July 2013, we issued $125.0 million aggregate principal amount of 4.50% convertible notes due 2020, or convertible notes, in an underwritten public offering. In November and December 2012, we borrowed an aggregate principal amount of $40.0 million under a loan agreement with Hercules Technology Growth Capital, Inc., or Hercules. These loans with Hercules were repaid in full in December 2015. In

December 2015, we issued $175.0 million aggregate principal amount of 11.50% senior secured notes due 2022, or 2022 notes, through a private placement. On April 13, 2016, we entered into separate, privately-negotiated conversion agreements with certain holders of the convertible notes. The execution of the conversion agreements resulted in the conversion of an aggregate principal amount of $64.2 million of convertible notes. In addition, we recognized a one-time $14.6 million non-cash loss on extinguishment during the second quarter of 2016. This loss on extinguishment was recorded as a component of interest expense. Transaction costs incurred with third parties directly related to the conversion were allocated to the liability and equity components, resulting in additional interest expense recognized of $0.2 million during the second quarter of 2016. In April 2017, in connection with the completion of the sale, or the asset sale, to Ipsen S.A., or Ipsen, of all of our right, title and interest in the non-cash assets, equipment, inventory, contracts and intellectual property primarily related to or used in our business operations and activities involving or relating to developing, manufacturing and commercializing ONIVYDE, our first commercial product, and MM-436, or the commercial business, we fully redeemed the 2022 notes, and as a result of the early repayment of the 2022 notes, a loss on extinguishment of $25.0 million was recognized as a component of interest expense. The $25.0 million loss on extinguishment included a $20.1 million prepayment penalty and $4.9 million of amortization expense recognized for the remaining debt discount at settlement as a result of the early repayment. In October and November 2017, we paid approximately $59.1 million, including $0.7 million for accrued and unpaid interest and $3.8 million of transaction costs, to purchase all of the remaining $60.8 million aggregate principal amount of outstanding convertible notes. We paid, in cash, an amount equal to $900 per $1,000 principal amount of convertible notes purchased, plus accrued and unpaid interest to, but not including, the date of purchase. A loss on extinguishment was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for the year ended December 31, 2017. The $0.3 million loss on extinguishment represents the difference between the total settlement consideration transferred to the holders that was attributed to the liability component of the convertible notes, based on the fair value of that component at the time of settlement, and the net carrying value of the liability. The remaining settlement consideration transferred was allocated to the reacquisition of the embedded conversion option and recognized as a $4.2 million reduction of additional paid-in capital. Transaction costs incurred with third parties related to the conversion were allocated to the liability and equity components and resulted in an additional $3.5 million of interest expense and a $0.3 million reduction on additional paid-in capital.

(2) In July 2013, we closed an underwritten public offering of common stock, which resulted in the sale of approximately 0.6 million shares of common stock. In July 2015, we entered into an agreement to sell shares of our common stock through an “at the market offering” program. We concluded sales under this program in September 2015, having sold approximately 0.4 million shares of common stock.

	December 31,				
(in thousands)	**2017**	**2016**	**2015**	**2014**	**2013**
Consolidated Balance Sheet Data					
Cash and cash equivalents	$ 93,441	$ 21,524	$ 185,606	$ 35,688	$ 65,086
Marketable securities	—	—	—	88,340	90,116
Equity method investment (1)	10,551	—	—	—	—
Assets held for sale	—	42,430	21,436	12,268	9,641
Total assets	117,326	81,483	234,880	158,506	192,233
Loans payable (2)	—	—	—	39,550	39,082
4.50% convertible notes (3)	—	46,950	88,495	80,452	72,409
11.50% senior secured notes (4)	—	169,911	169,160	—	—
Deferred revenue	—	—	—	—	73,392
Liabilities held for sale	—	83,211	116,677	109,946	12,075
Total liabilities	21,042	334,142	418,569	260,577	235,361
Non-controlling interest	—	(1,539)	239	69	337
Total stockholders’ equity (deficit)	96,284	(251,120)	(183,928)	(102,140)	(43,465)

(1) In August 2010, we acquired a controlling financial interest in Silver Creek. At such time, we had the ability to direct the activities of Silver Creek that most significantly impacted Silver Creek’s economic performance through our ownership percentage and through the board of director seats we controlled. As such, we consolidated Silver Creek. In the third quarter of 2017, Silver Creek completed its Series C preferred stock financing, which reduced our ownership percentage in Silver Creek below 50% and resulted in us no longer controlling the Silver Creek board of directors. We determined that we no longer qualified as the primary beneficiary of Silver Creek since we do not control the board of directors and do not direct the activities that have the most significant impact on Silver Creek’s economic performance. As a result, we deconsolidated Silver Creek from our financial statements on July 13, 2017. Starting on July 14, 2017, we accounted for our investment in Silver Creek under the equity method of accounting as we have the ability to exercise significant influence over Silver Creek. The carrying value of our investment in Silver Creek was $10.6 million at December 31, 2017.

(2) In November and December 2012, we borrowed an aggregate principal amount of $40.0 million under a loan agreement with Hercules. These loans were repaid in full in December 2015.

(3) In July 2013, we sold an aggregate of 0.6 million shares of our common stock at a price to the public of $50.00 per share and issued $125.0 million aggregate principal amount of convertible notes in concurrent underwritten public offerings, in which we received aggregate net proceeds of approximately $147.3 million, after deducting underwriting discounts and commissions and offering expenses payable by us. On April 13, 2016, we entered into separate, privately-negotiated conversion agreements with certain holders of the convertible notes. The execution of the conversion agreements resulted in the conversion of an aggregate principal amount of $64.2 million of convertible notes and the issuance of 1,236,766 shares of our common stock. In October and November 2017, we paid approximately $59.1 million, including $0.7 million for accrued and unpaid interest and $3.8 million of transaction costs, to purchase all of the remaining $60.8 million aggregate principal amount of outstanding convertible notes. We paid, in cash, an amount equal to $900 per $1,000 principal amount of convertible notes

purchased, plus accrued and unpaid interest to, but not including, the date of purchase. A loss on extinguishment was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for the year ended December 31, 2017. The $0.3 million loss on extinguishment represents the difference between the total settlement consideration transferred to the holders that was attributed to the liability component of the convertible notes, based on the fair value of that component at the time of settlement, and the net carrying value of the liability. The remaining settlement consideration transferred was allocated to the reacquisition of the embedded conversion option and recognized as a $4.2 million reduction of additional paid-in capital. Transaction costs incurred with third parties related to the conversion were allocated to the liability and equity components and resulted in an additional $3.5 million of interest expense and a $0.3 million reduction on additional paid-in capital.

(4) In December 2015, we closed a private placement of $175.0 million aggregate principal amount of 2022 notes and received net proceeds of approximately $168.5 million, after deducting private placement and offering expenses payable by us. In April 2017, in connection with the completion of the asset sale, we fully redeemed the 2022 notes and as a result of the early repayment of the 2022 notes, a loss on extinguishment of $25.0 million was recognized as a component of interest expense. The $25.0 million loss on extinguishment included a $20.1 million prepayment penalty and $4.9 million of amortization expense recognized for the remaining debt discount at settlement as a result of the early repayment.

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

The following discussion of our financial condition and results of operations should be read in conjunction with our financial statements and the notes to those financial statements appearing elsewhere in this Annual Report on Form 10-K. This discussion contains forward-looking statements that involve significant risks and uncertainties. As a result of many factors, such as those set forth in Part I, Item 1A. Risk Factors of this Annual Report on Form 10-K, which are incorporated herein by reference, our actual results may differ materially from those anticipated in these forward-looking statements.

Overview

We are a clinical stage biopharmaceutical company based in Cambridge, Massachusetts that is outthinking cancer by targeting biomarker-defined cancers. Our vision is to ensure that cancer patients and their families live fulfilling lives. Our mission is to transform cancer care through the smart design and development of targeted solutions based on a deep understanding of cancer pathways and biological markers. All of our development programs, including four clinical trials and six candidates in preclinical development, fit into our strategy of (1) understanding the biological problems we are trying to solve, (2) designing specific solutions against the problems we are trying to solve and (3) developing those solutions for biomarker-selected patients. This three-pronged strategy seeks to ensure optimal patient outcomes.

On April 3, 2017, we began operating as a refocused research and clinical development company in connection with the completion of our previously announced transaction, or the asset sale, with Ipsen S.A., or Ipsen. Pursuant to the Asset Purchase and Sale Agreement, dated as of January 7, 2017, or the asset sale agreement, between us and Ipsen, Ipsen acquired our right, title and interest in the non-cash assets, equipment, inventory, contracts and intellectual property primarily related to or used in our business operations and activities involving or relating to developing, manufacturing and commercializing ONIVYDE, our first commercial product, and MM-436, or the commercial business. We received $575.0 million in cash, plus a working capital adjustment of $5.7 million, and are eligible to receive up to $450.0 million in additional regulatory approval-based milestone payments. We also retained the right to receive net milestone payments that may become payable for the ex-U.S. development and commercialization of ONIVYDE for up to $33.0 million pursuant to a license and collaboration agreement, which we refer to as the Baxalta agreement, with Baxalta Incorporated, Baxalta US Inc. and Baxalta GmbH, collectively Baxalta. We entered into the Baxalta agreement in 2014, and on April 3, 2017, the Baxalta agreement was assigned to Ipsen in connection with the completion of the asset sale. As a result of the asset sale, the commercial business is accounted for as a discontinued operation for all periods presented.

Our non-commercial assets, including our clinical and preclinical development programs, were not included in the asset sale and remain assets of ours. Our clinical programs are as follows:

- **MM-121 (seribantumab)**: MM-121 is a fully human monoclonal antibody that binds to the ErbB3 (HER3) receptor and targets heregulin positive cancers. There are two active development programs for MM-121, each in a Phase 2 clinical trial. We are currently conducting the global, open-label, biomarker-selected, Phase 2 randomized SHERLOC clinical trial, evaluating MM-121 in combination with docetaxel in patients with heregulin positive non-small cell lung cancer, or NSCLC. We are also conducting the global, double-blinded, placebo-controlled, biomarker-selected, Phase 2 randomized SHERBOC clinical trial evaluating MM-121 in combination with fulvestrant in patients with heregulin positive, hormone receptor positive, ErbB2 (HER2) negative, metastatic breast cancer;
- **MM-141 (istiratumab)**: MM-141 is a fully human tetravalent bispecific antibody designed to block tumor survival signals by targeting receptor complexes containing the insulin-like growth factor 1, or IGF-1, receptor and ErbB3 (HER3) cell surface receptor. We are currently conducting and have completed enrollment of the global, double-blinded, placebo-

controlled, Phase 2 randomized CARRIE clinical trial evaluating MM-141 in combination with nab-paclitaxel and gemcitabine in patients with previously untreated metastatic pancreatic cancer with high serum levels of free IGF-1; and

- **MM-310**: MM-310 is an antibody-directed nanotherapeutic that targets the ephrin receptor A2, or EphA2, receptor and contains a novel prodrug of the highly potent chemotherapy docetaxel. The EphA2 receptor is highly expressed in most solid tumor types, such as prostate, ovarian, bladder, gastric, pancreatic and lung cancers. We initiated a Phase 1 clinical trial to evaluate safety and preliminary activity of MM-310 and to identify the maximum tolerated dose in the first quarter of 2017.

We have devoted substantially all of our resources to our drug discovery and development efforts, including conducting clinical trials for our product candidates, protecting our intellectual property and providing general and administrative support for these operations. We currently have no products approved for sale and all of our revenue to date has been collaboration revenue and through sales of ONIVYDE and, to date, we have financed our operations primarily through private placements of convertible preferred stock, collaborations, public offerings of our securities, secured debt financings, sales of ONIVYDE and the asset sale.

On April 13, 2016, we entered into separate, privately-negotiated conversion agreements, or the conversion agreements, with certain holders of our 4.50% convertible notes due 2020, or the convertible notes. The execution of the conversion agreements resulted in the conversion of an aggregate principal amount of $64.2 million of convertible notes and the issuance of 1,236,766 shares of our common stock. In connection with a lawsuit filed by the trustee and certain holders of the convertible notes in the Court of Chancery in the State of Delaware, captioned *Wells Fargo Bank, National Association, Wolverine Flagship Fund Trading Limited, Highbridge International LLC, and Highbridge Tactical Credit & Convertibles Master Fund, L.P. v. Merrimack Pharmaceuticals, Inc.*, or the Delaware Action, in April 2017, we deposited $60.0 million in proceeds from the asset sale into an escrow account to provide security to the plaintiffs for their claims in the Delaware Action. In October and November 2017, we settled the Delaware Action and redeemed all outstanding convertible notes as described below. See Note 11, “Borrowings,” in the accompanying notes to the consolidated financial statements for additional information.

On October 3, 2016, we announced a 22% reduction in headcount as part of a major corporate restructuring with the objective of prioritizing our research and development on a focused set of systems biology-derived oncology products and strengthening our financial runway. On this same date, we also announced the resignation of Robert Mulroy, our former President and Chief Executive Officer. See Note 12, “Restructuring Activities,” in the accompanying notes to the consolidated financial statements for additional information. In connection with this corporate restructuring, we also initiated a strategic review of our pipeline, including a clinical and financial prioritization of our programs. This strategic review was concluded in January 2017, as described in more detail below.

On November 8, 2016, we entered into a Loan and Security Agreement, or the credit agreement, with BioPharma Credit Investments IV Sub, LP, or Pharmakon, pursuant to which a credit facility of an aggregate principal amount of at least $15.0 million and up to $25.0 million was available to us. The credit facility was originally available at any time through March 15, 2017 upon our request and upon compliance with certain funding conditions. On April 7, 2017, the credit agreement expired.

In connection with the asset sale we completed on January 7, 2017, Ipsen also agreed to sublease 70,237 square feet of our manufacturing facility. In addition, at the closing of the asset sale, we and Ipsen entered into an intellectual property license agreement pursuant to which Ipsen granted us an exclusive license with respect to the portion of the transferred patents relating to certain liposomal technology and a non-exclusive license to the remainder of the transferred patents, in both cases for use outside of the field in which the commercial business will operate. In turn, we granted Ipsen a non-exclusive license with respect to the remaining patents owned by us at the closing of the asset sale for use in the field in which the commercial business will operate.

On January 8, 2017, we announced a planned reduction in our headcount by approximately 30% in connection with the closing of the asset sale and the completion of our strategic pipeline review, and upon the closing of the asset sale, we had approximately 80 employees.

On January 16, 2017, we announced the hiring of Richard Peters, M.D., Ph.D., as our new President and Chief Executive Officer, effective as of February 6, 2017. Dr. Peters was also elected as a member of our board of directors. We entered into an employment agreement with Dr. Peters commencing on February 6, 2017 whereby Dr. Peters will receive an annual base salary of $700,000 and is eligible for an annual bonus of up to 65% of his base salary. Dr. Peters also received a one-time signing bonus of $900,000 and an option to purchase 200,000 shares of our common stock with an exercise price per share equal to the fair market value of our common stock on the date of grant. The option vests over four years, with 25% having vested on February 6, 2018 and the remainder vesting in equal quarterly installments over the following three years.

On August 11, 2017, our stockholders approved an amendment to our certificate of incorporation to effect a one-for-ten reverse stock split of our issued and outstanding common stock, or the reverse split. On September 5, 2017, we filed an amendment to our certificate of incorporation to effect the reverse split, and on September 6, 2017, the reverse split was effective for trading purposes. As a result of the reverse split, every ten shares of common stock issued and outstanding was converted into one share of common stock, reducing the number of issued and outstanding shares of common stock from approximately 132.8 million shares to approximately 13.28 million shares. No fractional shares were issued in connection with the reverse split. The amendment to the certificate of incorporation also proportionately reduced the number of authorized shares of common stock from 200 million to 20 million. The reverse split did not change the par value of the common stock. The reverse split did not change the number of authorized shares or par value of our preferred stock, of which there are no shares issued or outstanding. All outstanding stock options and convertible notes entitling their holders to purchase shares of common stock or acquire shares of common stock upon conversion, as the case may be, were adjusted as a result of the reverse split, as required by the terms of these securities. As a result, all share and per share amounts have been adjusted retroactively to reflect the reverse split for all periods presented.

In October and November 2017, we paid approximately $59.1 million, including $0.7 million for accrued and unpaid interest and $3.8 million of transaction costs, to purchase all of the remaining $60.8 million aggregate principal amount of outstanding convertible notes. The Company paid, in cash, an amount equal to $900 per $1,000 principal amount of convertible notes purchased, plus accrued and unpaid interest to, but not including, the date of purchase. A loss on extinguishment was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for the year ended December 31, 2017. The $0.3 million loss on extinguishment represents the difference between the total settlement consideration transferred to the holders that was attributed to the liability component of the convertible notes, based on the fair value of that component at the time of settlement, and the net carrying value of the liability. The remaining settlement consideration transferred was allocated to the reacquisition of the embedded conversion option and recognized as a $4.2 million reduction of additional paid-in capital. Transaction costs incurred with third parties related to the conversion were allocated to the liability and equity components and resulted in an additional $3.5 million of interest expense and a $0.3 million reduction on additional paid-in capital.

As of December 31, 2017, we had unrestricted cash and cash equivalents of $93.4 million. On April 3, 2017, we closed the asset sale with Ipsen and received a $575.0 million upfront cash payment, plus a working capital adjustment of $5.7 million. We used a portion of the cash payment to redeem the $175.0 million outstanding aggregate principal amount of 11.50% senior secured notes due 2022, or the 2022 notes, which also required an additional make-whole premium payment of approximately $20.1 million, and deposited $60.0 million into an escrow account in response to a lawsuit filed by the trustee and certain holders of convertible notes. We also distributed $140.0 million of the upfront cash payment in the form of a special cash dividend to stockholders in May 2017. As a result of the cash received from the consummation of the asset sale, we believe that at our currently forecasted spending rates, our existing financial resources, together with the net milestone payments we expect to receive under the Baxalta agreement, assuming certain milestones under such agreement are met, will be sufficient to fund our planned operations into the second half of 2019.

We have never been profitable and, as of December 31, 2017, we had an accumulated deficit of $482.8 million. Our net loss from continuing operations was $76.0 million for the year ended December 31, 2017, $156.3 million for the year ended December 31, 2016 and $151.6 million for the year ended December 31, 2015. We expect to continue to incur significant expenses and operating losses for at least the next several years. We expect to continue to incur significant research and development expenses in connection with our ongoing activities, particularly as we continue the research, development and clinical trials of our product candidates, including multiple simultaneous clinical trials for certain product candidates. Until such time, if ever, as we can generate sufficient product revenues, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaborations, licensing arrangements and other marketing and distribution arrangements. We also could engage in discussions with third parties regarding partnerships, joint ventures, combinations or divestitures of one or more of our businesses as we seek to further the development of our research programs, improve our cash position and maximize stockholder value. There can be no assurance as to the timing, terms or consummation of any financing, collaboration, licensing arrangement or other marketing and distribution arrangement, partnership, joint venture, combination or divestiture. We may be unable to raise capital when needed or on attractive terms, which would force us to delay, limit, reduce or terminate our research and development programs. We will need to generate significant revenues to achieve profitability, and we may never do so.

Strategic Partnerships, Licenses and Collaborations

Baxalta

On September 23, 2014, we entered into the Baxalta agreement for the development and commercialization of ONIVYDE outside of the United States and Taiwan, or the licensed territory. As part of the Baxalta agreement, we granted Baxalta an exclusive, royalty-bearing right and license under our patent rights and know-how to develop and commercialize ONIVYDE in the licensed territory. On April 3, 2017, the Baxalta agreement and all other agreements related to our collaboration with Baxalta and any associated obligations, including our agreement related to commercial supply of ONIVYDE, were assigned to Ipsen in connection with the completion of the asset sale. We retained the rights to receive net milestone payments that may become payable pursuant to the Baxalta agreement for the ex-U.S. development and commercialization of ONIVYDE for up to $33.0 million, which is comprised of potential payments of $18.0 million from the sale of ONIVYDE in two additional major European countries, $5.0 million related to the sale of ONIVYDE in the first major non-European, non-Asian country and $10.0 million for the first patient dosed in a pivotal clinical trial in an indication other than pancreatic cancer.

Actavis

In November 2013, we entered into a development, license and supply agreement with Watson Laboratories, Inc., or Actavis, which we refer to as the Actavis agreement, pursuant to which we agreed to develop, manufacture and exclusively supply the bulk form of doxorubicin hydrochloride (HCl) liposome injection, or the initial product, to Actavis. On April 3, 2017, in connection with the completion of the asset sale, the Actavis agreement was assigned to Ipsen.

Silver Creek Pharmaceuticals, Inc.

In August 2010, we acquired a controlling financial interest in Silver Creek, a research and development company focused on areas outside of oncology. At such time, we had the ability to direct the activities of Silver Creek that most significantly impacted Silver Creek's economic performance through our ownership percentage and through the board of director seats we controlled. As such, we initially consolidated Silver Creek.

In the third quarter of 2017, Silver Creek completed its Series C preferred stock financing, which reduced our ownership percentage in Silver Creek below 50% and resulted in us no longer controlling the Silver Creek board of directors. We determined that we were no longer the primary beneficiary of Silver Creek, as we do not control the board of directors and do not direct the activities that have the most significant impact on Silver Creek's economic performance. As a result, we deconsolidated Silver Creek from our financial statements on July 13, 2017 and we recorded a gain on the deconsolidation of Silver Creek of $10.8 million for the year ended December 31, 2017 in our consolidated statement of operations and comprehensive income (loss). Starting on July 14, 2017, we accounted for our investment in Silver Creek under the equity method of accounting as we have the ability to exercise significant influence over Silver Creek. The carrying value of our investment in Silver Creek was $10.6 million at December 31, 2017.

Financial Obligations Related to the License and Development of ONIVYDE

In September 2005, Hermes BioSciences, Inc., or Hermes, which we acquired in October 2009, entered into a license agreement with PharmaEngine, Inc., or PharmaEngine, under which PharmaEngine received an exclusive license to research, develop, manufacture and commercialize ONIVYDE in Europe and certain countries in Asia. In May 2011, we entered into a new agreement with PharmaEngine, which we refer to as the PharmaEngine agreement, under which we reacquired all previously licensed rights for ONIVYDE, other than rights to commercialize ONIVYDE in Taiwan. As a result, we had the exclusive right to commercialize ONIVYDE in all territories in the world, except for Taiwan, where PharmaEngine has an exclusive commercialization right.

On April 3, 2017, the PharmaEngine agreement and all related agreements and any associated obligations, including our agreement related to commercial supply of ONIVYDE to PharmaEngine, were assigned to Ipsen in connection with the asset sale.

Financial Operations Overview

Revenues

Our revenue through December 31, 2017 has been derived from license fees, milestone payments and research, development, manufacturing and other payments received from collaborations, as well as from sales of ONIVYDE.

As a result of the asset sale, all revenue related to the commercial business has been reclassified under discontinued operations.

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

Research and development expenses

Research and development expenses consist of the costs associated with our research and discovery activities, including investment in our systems biology approach, conduct of preclinical studies and clinical trials, manufacturing development efforts and activities related to regulatory filings. Our research and development expenses consist of:

- employee salaries and related expenses, which include stock-based compensation and benefits for the personnel involved in our drug discovery and development activities;
- external research and development expenses incurred under agreements with third-party contract research organizations and investigative sites;
- manufacturing material expense for third-party manufacturing organizations and consultants, including costs associated with manufacturing product prior to product approval;
- license fees for and milestone payments related to in-licensed products and technologies; and
- facilities, depreciation and other allocated expenses, which include direct and allocated expenses for rent and maintenance of facilities, depreciation of leasehold improvements and equipment, and laboratory and other supplies.

We expense research and development costs as incurred. Conducting a significant amount of research and development is central to our business model. Product candidates in late stages of clinical development generally have higher development costs than those in earlier stages of clinical development, primarily due to the increased size and duration of late stage clinical trials. As a result of the refocusing of our development efforts, we expect our research and development expenses to decrease in the year ending December 31, 2018 as compared to the year ended December 31, 2017. We will still incur research and development expenses for the foreseeable future as we continue to develop our clinical stage product candidates and further advance our preclinical products and earlier stage research and development projects.

We use our employee and infrastructure resources across multiple research and development programs. We track expenses related to our most advanced product candidates on a per project basis. Accordingly, we allocate internal employee-related and infrastructure costs, as well as third-party costs, to each of these programs. We do not allocate to particular development programs either stock-based compensation expense or expenses related to preclinical programs. Costs that are not directly attributable to specific clinical programs, such as wages related to shared laboratory services, travel and employee training and development, are not allocated and are considered general research and discovery expenses.

The following table summarizes our principal product development programs, including the research and development expenses allocated to each clinical stage product candidate, for the years ended December 31, 2017, 2016 and 2015:

	Years Ended December 31,		
(in thousands)	**2017**	**2016**	**2015**
MM-121	$ 14,082	$ 17,866	$ 17,829
MM-141	10,016	13,317	12,236
MM-310	6,674	6,002	9,141
Legacy Programs (MM-302, MM-151, MM-131)	6,510	22,727	22,924
Preclinical, general research and discovery	23,130	43,570	51,187
Stock-based compensation	6,902	6,083	7,716
Total research and development expenses	$ 67,314	$ 109,565	$ 121,033

In connection with the asset sale, all expenses related to the commercial business have been reclassified under discontinued operations.

The successful development of our clinical and preclinical product candidates is highly uncertain. At this time, other than as discussed below, we cannot reasonably estimate the nature, timing or costs of the efforts that will be necessary to complete the remainder of the development of any of our clinical or preclinical product candidates or the period, if any, in which material net cash flows from these product candidates may commence. This is due to the numerous risks and uncertainties associated with developing drugs, including the uncertainty of:

- the scope, rate of progress and expense of our ongoing, as well as any additional, clinical trials and other research and development activities;
- the potential benefits of our product candidates over other therapies;

- our ability to market, commercialize and achieve market acceptance for any of our product candidates that we are developing or may develop in the future;
- future clinical trial results;
- the terms and timing of regulatory approvals; and
- the expense of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights.

A change in the outcome of any of these variables with respect to the development of a product candidate could mean a significant change in the costs and timing associated with the development of that product candidate. For example, if the FDA or another regulatory authority were to require us to conduct clinical trials beyond those which we currently anticipate will be required for the completion of clinical development of a product candidate or if we experience significant delays in enrollment in any of our clinical trials, we could be required to expend significant additional financial resources and time on the completion of clinical development.

MM-121 (seribantumab)

In February 2015, we initiated the global, open-label, biomarker-selected, Phase 2 randomized SHERLOC clinical trial evaluating MM-121 in combination with docetaxel, versus docetaxel alone, in patients with heregulin positive NSCLC. We expect to report top-line results from the SHERLOC clinical trial in the second half of 2018.

In August 2017, we initiated the global, double-blinded, placebo-controlled, biomarker-selected, Phase 2 randomized SHERBOC clinical trial of MM-121 in combination with fulvestrant, versus fulvestrant alone, in patients with heregulin positive, hormone receptor positive, ErbB2 (HER2) negative, metastatic breast cancer.

MM-141 (istiratumab)

In May 2015, we initiated the global, double-blinded, placebo-controlled, Phase 2 randomized CARRIE clinical trial of MM-141 in combination with nab-paclitaxel and gemcitabine, versus nab-paclitaxel and gemcitabine alone, in patients with newly diagnosed metastatic pancreatic cancer who have high serum levels of free IGF-1. We expect to report top-line results from the CARRIE clinical trial in the first half of 2018.

MM-310

In March 2017, we initiated a Phase 1 clinical trial of MM-310 to evaluate its safety and preliminary activity in patients with solid tumors and to identify the maximum tolerated dose. We expect to report safety data and the maximum tolerated dose from this trial in the second half of 2018.

Legacy Programs

In January 2017, we announced the completion of our strategic pipeline review resulting in the identification of what we believe to be the three most promising clinical programs, MM-121, MM-141 and MM-310. As a result, many product candidates in our pipeline were put on hold until such time as we determine the conditions are appropriate to invest in them. These molecules include MM-302, MM-151, MM-131 and certain early stage discovery efforts.

General and administrative expenses

General and administrative expenses consist primarily of salaries and other related costs for personnel, including stock-based compensation expenses and benefits, in our legal, intellectual property, business development, finance, information technology, corporate communications, investor relations and human resources departments. Other general and administrative expenses include costs for employee training and development, board of directors costs, depreciation, insurance expenses, facility-related costs not otherwise included in research and development expenses, professional fees for legal services, including patent-related expenses, and accounting and information technology services. As a result of the further reduction in headcount and refocusing of our development efforts announced in January 2017, we expect our general and administrative expenses to decrease in the year ending December 31, 2018 as compared to the year ended December 31, 2017.

Restructuring expenses

As a result of the October 2016 corporate restructuring activities, we recognized total restructuring expenses of $5.7 million during the year ended December 31, 2016 related to stock-based compensation expense for certain terminated employees, contractual termination benefits for employees with pre-existing severance arrangements and one-time employee termination benefits. These one-time employee termination benefits were comprised of severance, benefits and related costs.

On January 8, 2017, we announced a reduction in headcount by approximately 30% in connection with the asset sale and the completion of our strategic pipeline review. Upon the closing of the asset sale and the completion of our strategic pipeline review, we had approximately 80 employees.

As a result of the restructuring announced on January 8, 2017 in connection with the asset sale, for the year ended December 31, 2017, we recognized total restructuring expenses of $9.5 million, which was related to contractual termination benefits for employees with pre-existing severance arrangements. These one-time employee termination benefits are comprised of severance, benefits and related costs, all of which are expected to result in cash expenditures. The majority of these payments were made during the second quarter of 2017. The remaining payments represent severance payments that will be paid over one year. The expense of $9.5 million was included in discontinued operations, as the costs are directly associated with the sale of the commercial business.

Interest expense

Interest expense consists primarily of cash and non-cash interest related to our convertible notes and our 2022 notes.

In October and November 2017, we paid approximately $59.1 million, including $0.7 million for accrued and unpaid interest and $3.8 million of transaction costs, to purchase all of the remaining $60.8 million aggregate principal amount of outstanding convertible notes. We paid, in cash, an amount equal to $900 per $1,000 principal amount of convertible notes purchased, plus accrued and unpaid interest to, but not including, the date of purchase. A loss on extinguishment was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for year ended December 31, 2017. The $0.3 million loss on extinguishment represents the difference between the total settlement consideration transferred to the holders that was attributed to the liability component of the convertible notes, based on the fair value of that component at the time of settlement, and the net carrying value of the liability. The remaining settlement consideration transferred was allocated to the reacquisition of the embedded conversion option and recognized as a $4.2 million reduction of additional paid-in capital. Transaction costs incurred with third parties related to the conversion were allocated to the liability and equity components and resulted in an additional $3.5 million of interest expense and a $0.3 million reduction on additional paid-in capital.

In connection with the completion of the asset sale on April 3, 2017, the liability under the 2022 notes was satisfied. As a result of the early repayment of the 2022 notes, a loss on extinguishment of $25.0 million was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for the year ended December 31, 2017. The $25.0 million loss on extinguishment included a $20.1 million prepayment penalty and $4.9 million of amortization expense recognized for the remaining debt discount at settlement as a result of the early repayment.

As a result of the conversion agreements entered into on April 13, 2016, we recognized a one-time $14.6 million non-cash loss on extinguishment during the second quarter of 2016. This loss on extinguishment was recorded as a component of interest expense. Transaction costs incurred with third parties directly related to the conversion were allocated to the liability and equity components, resulting in additional interest expense recognized of $0.2 million during the second quarter of 2016. We expect that interest expense will decrease significantly in subsequent periods as compared to the year ended December 31, 2017 because we no longer have any significant debt recorded on the consolidated balance sheet data as of December 31, 2017.

Other (expense) income, net

Other (expense) income, net consists primarily of income related to tax incentive awards, our proportionate share of earnings and losses from our equity method investment in Silver Creek, and other income or expense-related items.

Critical Accounting Policies and Significant Judgments and Estimates

Our management's discussion and analysis of our financial condition and results of operations is based on our consolidated financial statements, which we have prepared in accordance with the rules and regulations of the Securities and Exchange Commission, or the SEC, and generally accepted accounting principles in the United States, or GAAP. The preparation of these consolidated financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements, as well as the reported revenues and expenses during the reporting periods. We evaluate our estimates and judgments on an ongoing basis. Estimates included in continuing and discontinuing operations include revenue recognition, estimates utilized in the valuation of inventory, useful lives with respect to long-lived assets and intangible assets, accounting for stock-based compensation, contingencies, intangible assets, goodwill, in-process research and development, or IPR&D, tax valuation reserves and accrued expenses. We base our estimates on historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Our actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are more fully described in Note 1, “Nature of the Business and Summary of Significant Accounting Policies,” in the accompanying notes to the consolidated financial statements appearing at the end of this Annual Report on Form 10-K, we believe that the following accounting policies are the most critical to aid in fully understanding and evaluating our financial condition and results of operations.

Inventory

We value our inventories at the lower of cost or net realizable value. We determine the cost of our inventories, which includes amounts related to materials and manufacturing overhead, on a first-in, first-out basis. We perform an assessment of the recoverability of capitalized inventory during each reporting period, and we write down any excess and obsolete inventories to their realizable value in the period in which the impairment is first identified. Such impairment charges, should they occur, are recorded as a component of “Cost of revenues.”

We capitalize inventory costs associated with our products after regulatory approval when, based on our judgment, future commercialization is considered probable and the future economic benefit is expected to be realized. Inventory acquired prior to receipt of marketing approval of a product candidate is expensed as research and development expense as incurred. Inventory that can be used in either the production of clinical or commercial product is expensed as research and development expense when selected for use in a clinical manufacturing campaign.

Shipping and handling costs for product shipments are recorded as incurred as a component of “Cost of revenues” along with amortization expense related to definite-lived intangible assets, costs associated with manufacturing the product and any inventory reserves or write-downs.

As a result of the asset sale, all inventory relates to the commercial business and has been reclassified under discontinued operations.

Goodwill and intangible assets

Goodwill and indefinite-lived intangible assets, including IPR&D assets, are evaluated for impairment on an annual basis or more frequently if an indicator of impairment is present. We perform our annual goodwill and IPR&D impairment evaluations on August 31st.

When performing an evaluation of goodwill impairment, we have the option to first assess qualitative factors to determine whether it is necessary to perform the quantitative two-step impairment test. If we elect this option and find, as a result of the qualitative assessment, that it is more likely than not that the fair value of the reporting unit is less than its carrying amount, the quantitative two-step impairment test is required; otherwise, further testing is not required. This requires us to assess the impact of significant events, milestones and changes to expectations and activities that may have occurred since the last impairment evaluation. Significant changes to these estimates, judgments and assumptions could materially change the outcome of the impairment assessment. Alternatively, we may elect to not first assess qualitative factors and immediately perform the quantitative two-step impairment test. If such an election occurs, in the first step, the fair value of our reporting unit is compared to the carrying value. If the carrying value of the net assets assigned to the reporting unit exceeds the fair value of the reporting unit, then the second step of the impairment test is performed in order to determine the implied fair value of the reporting unit’s goodwill. If the carrying value of the reporting unit’s goodwill exceeds the implied fair value, we would record an impairment loss equal to the difference. We operate in one operating segment, which is considered the only reporting unit.

We commence amortization of indefinite-lived intangible assets, such as IPR&D, once the associated research and development efforts have been completed. We amortize these product-related intangible assets over their estimated useful lives, and amortization expense is recorded as a component of “Cost of revenues.” We amortize other definite-lived assets, such as core technology, over their estimated useful lives as a component of “Research and development expenses.” Definite-lived intangible assets are evaluated for impairment whenever events or circumstances indicate that the carrying value may not be fully recoverable.

As a result of the asset sale, all goodwill and intangible assets related to the commercial business have been reclassified under discontinued operations.

Accrued expenses

As part of the process of preparing financial statements, we are required to estimate accrued expenses. This process involves identifying services that have been performed on our behalf and estimating the level of services performed and the associated costs incurred for such services where we have not yet been invoiced or otherwise notified of actual cost. We record these estimates in our consolidated financial statements as of each balance sheet date. Examples of estimated accrued expenses include:

- fees due to contract research organizations in connection with preclinical and toxicology studies and clinical trials;
- fees paid to investigative sites in connection with clinical trials; and
- professional service fees.

In accruing service fees, we estimate the time period over which services will be provided and the level of effort in each period. If the actual timing of the provision of services or the level of effort varies from the estimate, we will adjust the accrual accordingly. In the event that we do not identify costs that have been incurred or we under or overestimate the level of services performed or the costs of such services, our actual expenses could differ from such estimates. The date on which some services commence, the level of services performed on or before a given date and the cost of such services are often subjective determinations. We make estimates based on the facts and circumstances known to us at the time and in accordance with GAAP. There have been no material changes in estimates for the periods presented.

Revenue recognition

We recognize revenue when all of the following criteria are met: persuasive evidence of an arrangement exists; delivery has occurred or services have been rendered; the price to the customer is fixed or determinable; and collectability is reasonably assured.

Product revenues, net

Prior to the asset sale, we sold ONIVYDE to a limited number of specialty pharmaceutical distributors, or distributors, in the United States. Our distributors subsequently resold the products to healthcare providers. We recognized revenue on product sales when title and risk of loss passed to the distributor, which was typically upon delivery. Product revenues were recorded net of applicable reserves for discounts and allowances. As a result of the asset sale, all product revenues relate to the commercial business and have been reclassified under discontinued operations.

In order to conclude that the price is fixed or determinable, we must be able to reasonably estimate our net product revenues upon delivery to our distributors. As such, we estimated our net product revenues by deducting from our gross product revenues trade allowances, estimated contractual discounts, estimated Medicaid rebates, estimated reserves for product returns and estimated costs of other incentives offered to patients.

These discounts and allowances were based on estimates of the amounts earned or to be claimed on the related sales. Our estimates took into consideration our historical experience, current contractual and statutory requirements, specific known market events and trends, industry data and forecasted distributor buying and payment patterns. Actual amounts may ultimately differ from our estimates. If actual results varied, we would adjust these estimates, which could have an effect on earnings in the period of adjustment.

Product revenue reserves and allowances that reduce gross revenue are categorized as follows:

Trade allowances: We paid fees to our distributors for providing certain data to us as well as for maintaining contractual inventory and service levels. These trade allowances were recorded as a reduction to accounts receivable on the consolidated balance sheet at the time revenue was recognized.

Rebates and chargeback discounts: We were subject to discount obligations under state Medicaid programs and the Public Health Service 340B Drug Pricing Program, contracts with Federal government entities purchasing via the Federal Supply Schedule and various private organizations, such as group purchasing organizations (which we collectively refer to as third-party payors). We estimated the rebates and chargeback discounts we provided to third-party payors, based upon our expected payor mix, and deducted these estimated amounts from our gross product revenues at the time revenue was recognized. Chargeback discounts were processed when the third-party payor purchased the product at a discount from the distributor, who then in turn charged back to us the difference between the price initially paid by the distributor and the discounted price paid by the third-party payor. These chargeback discounts were recorded as a reduction to accounts receivable on the consolidated balance sheet at the time revenue was recognized. Rebates that were invoiced directly to us were recorded as accrued liabilities on the consolidated balance sheet at the time revenue was recognized.

Product returns: An allowance for product returns was established for returns expected to be made by distributors and was recorded at the time revenue was recognized, resulting in a reduction to product sales. In accordance with contractual terms, distributors had the right to return unopened and undamaged product that was within a permissible number of months before and after the product's expiration date, subject to contractual limitations. We had the ability to monitor inventory levels and the shelf life of product at distributors and could contractually control the amount of inventory that was sold to distributors. Based on inventory levels held by distributors and the structure of our distribution model, we concluded that we had the ability to reasonably estimate product returns at the time revenue was recognized. Our estimated rate of return was based on historical rates of return for comparable oncology products.

Other incentives: We offered co-pay mitigation support to commercially insured patients. Our co-pay mitigation program was intended to reduce each participating patient's portion of the financial responsibility for a product's purchase price to a specified dollar amount. Based upon the terms of our co-pay mitigation program, we estimated average co-pay mitigation amounts in order to establish a reserve for co-pay mitigation claims and deducted these estimated amounts from our gross product revenues at the later of the date that (i) the revenues were recognized or (ii) the incentive was offered. Claims under our co-pay mitigation program were subject to expiration.

As a result of the asset sale, all product revenue and related reserves on the balance sheet have been reclassified under discontinued operations.

License and collaboration revenues

We enter into biopharmaceutical product development agreements with collaborative partners for the research and development of therapeutic and diagnostic products. The terms of these agreements may include nonrefundable signing and licensing fees, funding for research, development and manufacturing, milestone payments and royalties or profit-sharing on any product sales derived from collaborations. These multiple-element arrangements are analyzed to determine whether the deliverables can be separated or whether they must be accounted for as a single unit of accounting.

The revenue recognition guidance related to multiple-element arrangements requires entities to separate and allocate consideration in a multiple-element arrangement according to the relative selling price of each deliverable. The fair value of deliverables under the arrangement may be derived using a best estimate of selling price if vendor specific objective evidence and third-party evidence are not available. Deliverables under the arrangement will be separate units of accounting provided that a delivered item has value to the customer on a stand-alone basis and if the arrangement does not include a general right of return relative to the delivered item and delivery or performance of the undelivered item is considered probable and substantially in the control of the vendor.

We entered into the Baxalta agreement in September 2014, which was evaluated under the accounting guidance on revenue recognition for multiple-element arrangements. We determined that the obligations under this agreement represented a single unit of accounting and that the agreement represented a services agreement. As a result, we estimated the level of effort expected to be completed and the consideration expected to be received from Baxalta as a result of providing the identified deliverables and recognized revenue related to the agreement based on proportional performance as effort was completed over the expected services period. As a result of the asset sale, all revenue related to the commercial business has been reclassified under discontinued operations.

We entered into the Actavis agreement in November 2013, which was evaluated under the accounting guidance on revenue recognition for multiple-element arrangements. We determined that the obligations represented a single unit of accounting and recognized revenue as product was supplied to Actavis. Therefore, we deferred total billed and billable milestones and development expenses related to this agreement. All milestone payments received and development expenses reimbursed until the period of commercialization were deferred, and upon commercialization would have been recognized over the delivery period of the bulk drug product to Actavis. As a result of the asset sale, all revenue related to the commercial business has been reclassified under discontinued operations.

All operating results recognized related to the Baxalta and Actavis agreements are presented as income from discontinued operations, net of tax in the consolidated statements of operations and comprehensive income (loss) for all periods presented. In addition, in the consolidated balance sheet as of December 31, 2016, the assets and liabilities related to the Baxalta and Actavis agreements have been presented separately.

Whenever we determine that an arrangement should be accounted for as a single unit of accounting, we determine the period over which the performance obligations would be performed and revenue would be recognized. If we cannot reasonably estimate the timing and the level of effort to complete our performance obligations under the arrangement, then revenue under the arrangement is recognized on a straight-line basis over the period we expect to complete our performance obligations.

Our collaboration agreements may include additional payments upon the achievement of performance-based milestones. As milestones are achieved, a portion of the milestone payment, equal to the percentage of the total time that we have performed the performance obligations to date divided by the total estimated time to complete the performance obligations, multiplied by the amount of the milestone payment, will be recognized as revenue upon achievement of such milestone. The remaining portion of the milestone will be recognized over the remaining performance period. Milestones that are tied to regulatory approvals are not considered probable of being achieved until such approval is received. Milestones tied to counterparty performance are not included in our revenue model until the performance conditions are met.

As a result of the asset sale, all license and collaboration revenue related to the commercial business has been reclassified under discontinued operations.

Stock-based compensation expense

We account for our stock-based compensation awards in accordance with Accounting Standards Codification, or ASC, 718, *Compensation – Stock Compensation*. ASC 718 requires all share-based payments to employees, including grants of employee stock options, to be recognized in the consolidated statements of operations and comprehensive loss based on their grant date fair values. For stock options granted to employees and to members of our board of directors for their service on the board of directors, we estimate the grant date fair value of each option award using the Black-Scholes option pricing model. The use of the Black-Scholes option pricing model requires us to make assumptions with respect to the expected term of the option, the expected volatility of our common stock consistent with the expected term of the option, the risk-free interest rate consistent with the expected term of the option and the expected dividend yield of our common stock. Stock-based compensation expense related to employee stock options is measured using the fair value of the award at the grant date, net of estimated forfeitures, and is adjusted annually to reflect actual forfeitures. Stock-based compensation expense is then recognized on a straight-line basis over the vesting period, which is also the requisite service period.

We record stock options issued to non-employees at fair value, remeasure to reflect the current fair value at each reporting period and recognize expense over the related service period. When applicable, these equity instruments are accounted for based on the fair value of the consideration received or the fair value of the equity instrument issued, whichever is more reliably measurable.

Results of Operations

Comparison of the years ended December 31, 2017 and 2016

	Years Ended December 31,	
(in thousands)	**2017**	**2016**
Research and development expenses	$ (67,314)	$ (109,565)
General and administrative expenses	(28,452)	(32,052)
Restructuring expenses	—	(5,710)
Loss from continuing operations	(95,766)	(147,327)
Interest income	895	276
Interest expense	(34,650)	(22,449)
Gain on deconsolidation of Silver Creek	10,848	—
Gain on sale of asset	1,703	—
Other expense, net	(1,433)	(8)
Net loss from continuing operations before income tax benefit	(118,403)	(169,508)
Income tax benefit	42,399	13,224
Net loss from continuing operations	$ (76,004)	$ (156,284)

Research and development expenses

Research and development expenses were $67.3 million for the year ended December 31, 2017 compared to $109.6 million for the year ended December 31, 2016, a decrease of $42.3 million, or 39%. This decrease was primarily attributable to:

- $20.4 million of decreased expenses related to our preclinical, general research and discovery in relation to the refocus of early stage development spend and lower overhead costs to support general research and development expense related to the April 2017 reduction in headcount;
- $16.2 million of decreased expenses related to our legacy programs (MM-302, MM-151, MM-131) as a result of our prioritization of MM-121, MM-141 and MM-310 and close-out activities associated with the legacy programs, in addition to a one-time non-cash impairment charge of $2.8 million recognized during the fourth quarter of 2016 related to the MM-302 IPR&D asset;
- $3.8 million of decreased MM-121 expenses related to the timing of activity and services incurred related to the ongoing Phase 2 SHERLOC clinical trial; and
- $3.3 million of decreased MM-141 expenses related to the timing of the services performed in the ongoing Phase 2 CARRIE clinical trial.

General and administrative expenses

General and administrative expenses were $28.5 million for the year ended December 31, 2017 compared to $32.1 million for the year ended December 31, 2016, a decrease of $3.6 million, or 11%. This decrease was primarily attributable to a decrease in corporate expenses related to reduced headcount levels and stock-based compensation in 2017 compared to 2016.

Restructuring expenses

No restructuring expenses were recognized in continuing operations during the year ended December 31, 2017. We recognized restructuring expenses of $5.7 million during the year ended December 31, 2016 related to our October 2016 corporate restructuring activities described above.

Interest expense

Interest expense was $34.7 million for the year ended December 31, 2017, compared to $22.5 million for the year ended December 31, 2016. This increase was primarily attributable to interest expense related to the settlement of the 2022 notes and an additional make-whole premium payment of approximately $20.1 million in the year ended December 31, 2017.

Gain on deconsolidation

We deconsolidated Silver Creek from our financial statements on July 13, 2017, the date we were no longer the primary beneficiary of Silver Creek, in accordance with ASC 810-10-40-4(c), *Consolidation*. As a result, we recorded a gain on the deconsolidation of Silver Creek of $10.8 million in the year ended December 31, 2017 in our consolidated statement of operations and comprehensive income (loss).

Other expense, net

Other expense, net was $1.4 million for the year ended December 31, 2017, compared to less than $0.1 million for the year ended December 31, 2016. The increase was primarily attributable to the $0.8 million of losses recognized in the year ended December 31, 2017 for our proportionate share of Silver Creek’s losses.

Income tax benefit (expense)

We recognized an income tax benefit of $42.4 million in continuing operations and an income tax expense of $46.6 million in discontinued operations for the year ended December 31, 2017. We recognized an income tax benefit of $13.2 million in continuing operations and an income tax expense of $13.2 million in discontinued operations for the year ended December 31, 2016. These increases were primarily related to the asset sale.

Discontinued operations

We recognized income from discontinued operations, net of tax of $546.9 million for the year ended December 31, 2017, as compared to income from discontinued operations, net of tax of $2.8 million recognized for the year ended December 31, 2016. This increase was primarily related to the asset sale.

Comparison of the years ended December 31, 2016 and 2015

	Years Ended December 31,	
(in thousands)	**2016**	**2015**
Research and development expenses	$ (109,565)	$ (121,033)
General and administrative expenses	(32,052)	(24,048)
Restructuring expenses	(5,710)	—
Loss from continuing operations	(147,327)	(145,081)
Interest income	276	99
Interest expense	(22,449)	(18,769)
Other (expense) income, net	(8)	917
Net loss from continuing operations before income tax benefit	(169,508)	(162,834)
Income tax benefit	13,224	11,215
Net loss from continuing operations	$ (156,284)	$ (151,619)

Research and development expenses

Research and development expenses were $109.6 million for the year ended December 31, 2016 compared to $121.0 million for the year ended December 31, 2015, a decrease of $11.4 million, or 9%. This decrease was primarily attributable to:

- $3.1 million of decreased MM-310 expenses primarily due to the timing of preclinical research activities and cost conservation measures implemented during 2016;
- $1.4 million of decreased MM-151 expenses primarily due to the completion of the Phase 1 clinical trial of MM-151 as a monotherapy and in combination with irinotecan in patients with solid tumors during 2015;
- $8.3 million of decreased expenses related to preclinical, general research and discovery as a result of our cost management efforts and the timing of manufacturing campaigns for our preclinical programs; and
- $1.6 million of decreased stock-based compensation expenses primarily due to a reduction in our headcount and a decrease in our stock price over the course of the year ended December 31, 2016.

These decreases were partially offset by:

- $1.1 million of increased MM-141 expenses related to increased costs associated with the ongoing Phase 2 CARRIE clinical trial, which was initiated in May 2015; and
- $1.2 million of increased MM-302 expenses primarily attributable to the non-cash impairment charge of $2.8 million recognized during the fourth quarter of 2016 related to the MM-302 IPR&D asset, offset by decreased activity in our Phase 2 clinical trial of MM-302 in locally advanced or metastatic breast cancer.

General and administrative expenses

General and administrative expenses were $32.1 million for the year ended December 31, 2016 compared to $24.0 million for the year ended December 31, 2015, an increase of $8.1 million, or 34%. This increase was primarily attributable to an increase in labor and labor-related expenses and facility-related costs.

Restructuring expenses

We recognized restructuring expenses of $5.7 million during the year ended December 31, 2016 related to our October 2016 corporate restructuring activities described above. No restructuring expenses were recognized during the year ended December 31, 2015.

Interest expense

Interest expense was $22.5 million for the year ended December 31, 2016 compared to $18.8 million for the year ended December 31, 2015. This increase was primarily attributable to a one-time non-cash charge of $14.6 million associated with the induced conversion of an aggregate principal amount of $64.2 million of our convertible notes in April 2016, offset by a decrease in interest expense related to our previously outstanding loans payable to Hercules Technology Growth Capital, Inc., or Hercules, that were repaid in full during December 2015.

Other (expense) income, net

Other expense, net was less than $0.1 million for the year ended December 31, 2016. Other income, net was $0.9 million for the year ended December 31, 2015, which was primarily related to the amortization of Massachusetts Life Sciences Center, or MLSC, tax incentives.

Income tax benefit (expense)

We recognized an income tax benefit of $13.2 million in continuing operations and an income tax expense of $13.2 million in discontinued operations for the year ended December 31, 2016. We recognized an income tax benefit of $11.2 million in continuing operations and an income tax expense of $11.2 million in discontinued operations for the year ended December 31, 2015.

Discontinued operations

We recognized income from discontinued operations, net of tax of $2.8 million for the year ended December 31, 2016, compared to income from discontinued operations, net of tax of $3.8 million recognized for the year ended December 31, 2015.

Liquidity and Capital Resources

Sources of liquidity

We have financed our operations through December 31, 2017 primarily through private placements of convertible preferred stock, collaborations, public offerings of our securities, secured debt financings, sales of ONIVYDE and the asset sale. Through December 31, 2017, we have received $575.0 million from the asset sale, $268.2 million from the sale of convertible preferred stock and warrants, $126.7 million of net proceeds from the sale of common stock in our initial public offering and a July 2013 follow-on underwritten public offering, $38.6 million of net proceeds from our 2015 “at the market offering” program, or the ATM offering, $39.6 million of net proceeds from a secured debt financing, $120.6 million of net proceeds from the issuance of the convertible notes in our July 2013 underwritten public offering, $168.5 million of net proceeds from the issuance of the 2022 notes, $487.6 million of upfront license fees, milestone payments, reimbursement of research and development costs and manufacturing services and other payments from our collaborations and $68.9 million of cash receipts related to ONIVYDE sales. We have also entered into an arrangement to use our manufacturing capabilities to manufacture drug product on behalf of Actavis, for which we have received $4.9 million in upfront fees and reimbursements as of December 31, 2017. As of December 31, 2017, we had unrestricted cash and cash equivalents of $93.4 million.

In April 2012, we closed our initial public offering pursuant to a registration statement on Form S-1, as amended. We sold an aggregate of 1,504,246 shares of common stock under the registration statement at a public offering price of $70.00 per share, including 74,246 shares pursuant to the exercise by the underwriters of an over-allotment option. Net proceeds were approximately $98.1 million, after deducting underwriting discounts and commissions and other offering expenses but prior to the payment of dividends on our Series B convertible preferred stock. At the time of our initial public offering, our convertible preferred stock and warrants to purchase convertible preferred stock automatically converted to common stock and warrants to purchase common stock, respectively.

On November 8, 2012, we entered into a Loan and Security Agreement, or the loan agreement, with Hercules. The loan agreement provided for an initial term loan advance of $25.0 million, which closed on November 8, 2012, and an additional term loan advance of $15.0 million, which closed on December 14, 2012 and resulted in aggregate net proceeds of $39.6 million. During the fourth quarter of 2015, we repaid the loans in full in conjunction with the issuance of the 2022 notes. We also paid an additional fee of $1.2 million that was due upon full repayment of the loans, as well as interest accrued through the repayment date.

On July 17, 2013, we sold an aggregate of 575,000 shares of our common stock at a price to the public of $50.00 per share and issued $125.0 million aggregate principal amount of convertible notes in concurrent underwritten public offerings. As a result of the concurrent common stock offering and convertible notes offering, we received aggregate net proceeds of approximately $147.3 million, after deducting underwriting discounts and commissions and offering expenses payable by us.

On July 13, 2015, we entered into a sales agreement with Cowen and Company, LLC, or Cowen, to sell, from time to time, shares of our common stock having an aggregate sales price of up to $40.0 million through the ATM offering, under which Cowen acted as sales agent. We concluded sales under the ATM offering in September 2015, having sold approximately 0.4 million shares of common stock and generating approximately $38.6 million in net proceeds, after deducting commissions and offering expenses.

On December 22, 2015, we closed a private placement of $175.0 million aggregate principal amount of 2022 notes. As a result of the issuance of the 2022 notes, we received net proceeds of approximately $168.5 million, after deducting private placement and offering expenses payable by us.

On April 3, 2017, the liability under the 2022 notes was satisfied. As a result of the early repayment of the 2022 notes, a loss on extinguishment of $25.0 million was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for the year ended December 31, 2017. The $25.0 million loss on extinguishment included a $20.1 million prepayment penalty and $4.9 million of amortization expense recognized for the remaining debt discount at settlement as a result of the early repayment.

In October and November 2017, we paid approximately $59.1 million, including $0.7 million for accrued and unpaid interest and $3.8 million of transaction costs, to purchase all of the remaining $60.8 million aggregate principal amount of outstanding convertible notes. We paid, in cash, an amount equal to $900 per $1,000 principal amount of convertible notes purchased, plus accrued and unpaid interest to, but not including, the date of purchase. A loss on extinguishment was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for year ended December 31, 2017. The $0.3 million loss on extinguishment represents the difference between the total settlement consideration transferred to the holders that was attributed to the liability component of the convertible notes, based on the fair value of that component at the time of settlement, and the net carrying value of the liability. The remaining settlement consideration transferred was allocated to the reacquisition of the embedded conversion option and recognized as a $4.2 million reduction of additional paid-in capital. Transaction costs incurred with third parties related to the conversion were allocated to the liability and equity components and resulted in an additional $3.5 million of interest expense and a $0.3 million reduction on additional paid-in capital.

Cash flows

The following table provides information regarding our cash flows for the years ended December 31, 2017, 2016 and 2015:

	Years Ended December 31,		
(in thousands)	**2017**	**2016**	**2015**
Net cash used in operating activities	$ (145,935)	$ (170,241)	$ (105,356)
Net cash provided by (used in) investing activities	576,891	(3,257)	75,110
Net cash (used in) provided by financing activities	(359,039)	9,416	180,164
Net increase (decrease) in cash and cash equivalents	$ 71,917	$ (164,082)	$ 149,918

Operating activities

Cash used in operating activities was $145.9 million during the year ended December 31, 2017, of which $104.3 million was used by continuing operations and $41.6 million was used by discontinued operations. The cash used in operating activities was primarily a result of our $76.0 million net loss from continuing operations and net decrease in assets and liabilities of $19.6 million. The net decrease in operating assets and liabilities during year ended December 31, 2017 was primarily driven by the increase in prepaid expenses and other assets offset by decreases in accounts payable and deferred rent. The non-cash adjustments to net loss of $8.7 million resulted in an increase in cash used, including removal of a $42.4 million income tax benefit, $17.3 million of non-cash activity related to discontinued operations, offset by $12.8 million of stock-based compensation expense, $3.7 million in non-cash interest expense and a $5.2 million non-cash loss on extinguishment.

Cash used in operating activities was $170.2 million during the year ended December 31, 2016, of which $122.9 million was used by continuing operations and $47.3 million was used by discontinued operations. Cash used in operating activities of $170.2 million during the year ended December 31, 2016 was primarily a result of our $156.3 million net loss from continuing operations and a net decrease in operating assets and liabilities of $7.5 million. The net decrease in operating assets and liabilities during the year ended December 31, 2016 was primarily driven by a decrease in accounts payable and accrued expenses. This decrease was offset by $40.9 million of non-cash items, including a $2.8 million IPR&D impairment charge related to MM-302, a $14.6 million non-cash loss on extinguishment related to the April 2016 conversion of a portion of the convertible notes, $12.1 million of stock-based compensation expense and $6.0 million of non-cash interest expense.

Cash used in operating activities was $105.4 million during the year ended December 31, 2015, of which $109.9 million was used by continuing operations and $4.5 million was provided by discontinued operations. Cash used in operating activities of $105.4 million during the year ended December 31, 2015 was primarily a result of our $151.6 million net loss from continuing operations. This net loss was offset by a net increase in operating assets and liabilities of $17.2 million and non-cash items of $24.6 million, including $13.2 million of stock-based compensation expense and $8.2 million of non-cash interest expense. The net increase in operating assets and liabilities during the year ended December 31, 2015 was primarily driven by an increase in accounts payable and accrued expenses.

Investing activities

Cash provided by investing activities of $576.9 million during the year ended December 31, 2017 was primarily due to cash received from the asset sale of $580.7 million, offset by $4.0 million of Silver Creek cash that was deconsolidated in July 2017.

Cash used in investing activities was $3.3 million during the year ended December 31, 2016, of which $2.8 million was used by continuing operations and $0.5 million was used by discontinued operations. Cash used in investing activities of $3.3 million for the year ended December 31, 2016 was primarily due to purchases of marketable securities of $84.3 million in addition to $2.6 million of property and equipment purchases, offset by proceeds from sales and maturities of marketable securities of $84.2 million.

Cash provided by investing activities was $75.1 million during the year ended December 31, 2015, of which $76.0 million was provided by continuing operations and $0.9 million was used by discontinued operations. Cash provided by investing activities of $75.1 million for the year ended December 31, 2015 was primarily due to proceeds from sales and maturities of marketable securities of $87.9 million, offset by $11.9 million of property and equipment purchases.

Financing activities

Cash used in financing activities of $359.0 million during the year ended December 31, 2017 was primarily due to the $175.0 million used to settle the principle balance of the 2022 notes, $54.7 million used to settle the convertible notes, and $140.0 million dividend paid in May 2017.

Cash provided by financing activities of $9.4 million for the year ended December 31, 2016 was primarily due to $6.2 million of proceeds received from the exercise of stock options and $3.4 million of total proceeds received from the issuance of convertible promissory notes and Series C preferred stock by Silver Creek.

Cash provided by financing activities of $180.2 million for the year ended December 31, 2015 was primarily due to $38.6 million of net proceeds from the ATM offering, $10.1 million of proceeds from the exercise of stock options and warrants, $169.4 million in net proceeds from the issuance of the 2022 notes, after considering the accounting treatment of $0.9 million of issuance costs that were allocated to the associated debt modification, and $2.1 million in net proceeds from the sale of Series B preferred stock by Silver Creek. These cash proceeds were offset by the repayment of $40.0 million in loans payable under the loan agreement with Hercules.

Funding requirements

We have incurred significant expenses and operating losses to date, and we expect to continue to incur significant expenses and operating losses for at least the next several years. We anticipate that we will continue to incur significant expenses as we:

- initiate or continue clinical trials of our most advanced product candidates;
- continue the research and development of our other product candidates;
- seek to discover additional product candidates;
- seek regulatory approvals for our product candidates that successfully complete clinical trials; and
- continue to provide the operational, financial and management information systems and personnel to support our product development.

As a result of the cash received from the consummation of the asset sale, we believe that at our currently forecasted spending rates, our existing financial resources, together with the net milestone payments we expect to receive under the Baxalta agreement, assuming certain milestones under such agreement are met, will be sufficient to fund our planned operations into the second half of 2019. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect. Because of the numerous risks and uncertainties associated with the development and commercialization of our product candidates, and the extent to which we utilize collaborations with third parties to participate in their development and commercialization, we are unable to estimate the amounts of increased capital outlays and operating expenditures associated with our current and anticipated clinical trials. Our future capital requirements will depend on many factors, including:

- the progress and results of the clinical trials of our most advanced product candidates;
- our ability to establish and maintain additional collaborations on favorable terms, and the success of any such future collaborations;
- the timing and amount of potential milestone payments related to ONIVYDE that we may receive from Ipsen and Baxalta;
- the scope, progress, results and costs of preclinical development, laboratory testing and clinical trials for our other product candidates;
- the costs, timing and outcome of regulatory review of our current and future product candidates;
- the costs of preparing, filing and prosecuting patent applications and maintaining, enforcing and defending intellectual property-related claims; and
- the extent to which we acquire or invest in businesses, products and technologies.

Until such time, if ever, as we can generate sufficient product revenues, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaborations, licensing arrangements and other marketing and distribution arrangements. We also could engage in discussions with third parties regarding partnerships, joint ventures, combinations or divestitures of one or more of our businesses as we seek to further the development of our research programs, improve our cash position and maximize stockholder value. There can be no assurance as to the timing, terms or consummation of any financing, collaboration, licensing arrangement or other marketing and distribution arrangement, partnership, joint venture, combination or divestiture. We do not have any committed external sources of funds. To the extent that we raise additional capital through the sale of equity or convertible debt securities, the ownership interest of our stockholders will be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our stockholders. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures or declaring dividends. For example, if we raise additional funds through marketing and distribution arrangements or other collaborations, strategic alliances or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or product candidates or to grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce or terminate our product development or commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

Borrowings

11.50% senior secured notes due 2022

In December 2015, we closed a private placement of $175.0 million aggregate principal amount of 2022 notes and entered into an indenture with U.S. Bank National Association as trustee and collateral agent. As a result of this placement, we received net proceeds of approximately $168.5 million, after deducting private placement and offering expenses payable by us.

In connection with the completion of the asset sale, on April 3, 2017, we irrevocably deposited the aggregate redemption price of the 2022 notes of 111.5% of the principal amount, plus accrued and unpaid interest of $7.4 million, with the trustee and irrevocably instructed the trustee to apply such amount to the redemption in full of the 2022 notes on the redemption date of April 27, 2017. The indenture was satisfied and discharged on April 3, 2017.

4.50% convertible notes due 2020

In July 2013, we issued $125.0 million aggregate principal amount of convertible notes. We issued the convertible notes under a base indenture between us and Wells Fargo Bank, National Association, as trustee, as supplemented by a supplemental indenture between us and the trustee. As a result of the convertible notes offering, we received net proceeds of approximately $120.6 million, after deducting underwriting discounts and commissions and offering expenses payable by us.

The convertible notes bear interest at a rate of 4.50% per year, payable semiannually in arrears on January 15 and July 15 of each year, beginning on January 15, 2014. The convertible notes are general unsecured senior obligations of ours and rank (i) pari passu in seniority with respect to the 2022 notes, (ii) senior in right of payment to any of our indebtedness that is expressly subordinated in right of payment to the convertible notes, (iii) equal in right of payment to any of our unsecured indebtedness that is not so subordinated, (iv) effectively junior in right of payment to any of our secured indebtedness to the extent of the value of the assets securing such indebtedness, and (v) structurally junior to all indebtedness and other liabilities (including trade payables) of our subsidiaries.

On April 13, 2016, we entered into separate, privately-negotiated conversion agreements with certain holders of the convertible notes. Under the conversion agreements, such holders agreed to convert an aggregate principal amount of $64.2 million of convertible notes held by them. We initially settled each $1,000 principal amount of convertible notes surrendered for conversion by delivering 14 shares of our common stock on April 18, 2016. In total, we issued an aggregate of 873,215 shares of our common stock on this initial closing date. In addition, pursuant to the conversion agreements, at the additional closings (as defined in the conversion agreements), we issued an aggregate of 363,511 shares of our common stock representing an aggregate of $27.7 million as additional payments in respect of the conversion of the convertible notes. The number of additional shares was determined based on the daily VWAP (as defined in the conversion agreements) of our common stock for each of the trading days in the 10-day trading period following the date of the conversion agreements.

The outstanding convertible notes will mature on July 15, 2020, or the maturity date, unless earlier repurchased by us or converted at the option of holders. Holders may convert their convertible notes at their option at any time prior to the close of business on the business day immediately preceding April 15, 2020 only under the following circumstances:

- during any calendar quarter commencing after September 30, 2013 (and only during such calendar quarter), if the last reported sale price of our common stock for at least 20 trading days (whether or not consecutive) during a period of 30 consecutive trading days ending on the last trading day of the immediately preceding calendar quarter is greater than or equal to 130% of the conversion price on each applicable trading day;
- during the five business day period after any five consecutive trading day period, or the measurement period, in which the trading price (as defined in the convertible senior notes) per $1,000 principal amount of convertible senior notes for each trading day of the measurement period was less than 98% of the product of the last reported sale price of our common stock and the conversion rate on each such trading day; or
- upon the occurrence of specified corporate events set forth in the indenture.

On or after April 15, 2020 until the close of business on the business day immediately preceding the maturity date, holders may convert their convertible notes at any time, regardless of the foregoing circumstances.

Following the repayment and satisfaction in full of our obligations to Hercules under the loan agreement, which occurred in December 2015, upon any conversion of the convertible notes, the convertible notes may be settled, at our election, in cash, shares of our common stock or a combination of cash and shares of our common stock.

The initial conversion rate of the convertible notes upon issuance in July 2013 was 160.0000 shares of our common stock per $1,000 principal amount of convertible notes, which was equivalent to an initial conversion price of $6.25 per share of common stock. As a result of the special cash dividend that was payable on May 26, 2017 to stockholders of record as of the close of business on May 17, 2017, the conversion rate of the convertible notes was adjusted from 160.0000 shares of our common stock per $1,000 principal amount of convertible notes to 235.2112 shares of our common stock per $1,000 principal amount of convertible notes. As a result of the one-for-ten reverse stock split of our common stock effected on September 5, 2017, the conversion rate of the convertible notes was further adjusted from 235.2112 shares of our common stock per $1,000 principal amount of convertible notes to 23.5210 shares of our common stock per $1,000 principal amount of convertible notes. The conversion rate will be subject to further adjustment in some events, but will not be adjusted for any accrued and unpaid interest. In addition, following certain corporate events that occur prior to the maturity date, we will increase the conversion rate for a holder who elects to convert its convertible notes in connection with such a corporate event in certain circumstances.

Upon the occurrence of a fundamental change (as defined in the indenture) involving us, holders of the convertible notes may require us to repurchase all or a portion of their convertible notes for cash at a price equal to 100% of the principal amount of the convertible notes to be purchased, plus accrued and unpaid interest to, but excluding, the fundamental change repurchase date.

The indenture contains customary terms and covenants and events of default with respect to the convertible notes. If an event of default (as defined in the indenture) occurs and is continuing, the trustee by written notice to us, or the holders of at least 25% in aggregate principal amount of the convertible notes then outstanding by written notice to us and the trustee, may, and the trustee at the request of such holders will, declare 100% of the principal of and accrued and unpaid interest on the convertible notes to be due and payable. In the case of an event of default arising out of certain events of bankruptcy, insolvency or reorganization involving us or a significant subsidiary (as set forth in the indenture), 100% of the principal of and accrued and unpaid interest on the convertible notes will automatically become due and payable.

In October and November 2017, we paid approximately $59.1 million, including $0.7 million for accrued and unpaid interest and $3.8 million of transaction costs, to purchase all of the remaining $60.8 million aggregate principal amount of outstanding convertible notes. We paid, in cash, an amount equal to $900 per $1,000 principal amount of convertible notes purchased, plus accrued and unpaid interest to, but not including, the date of purchase. A loss on extinguishment was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for year ended December 31, 2017. The $0.3 million loss on extinguishment represents the difference between the total settlement consideration transferred to the holders that was attributed to the liability component of the convertible notes, based on the fair value of that component at the time of settlement, and the net carrying value of the liability. The remaining settlement consideration transferred was allocated to the reacquisition of the embedded conversion option and recognized as a $4.2 million reduction of additional paid-in capital. Transaction costs incurred with third parties related to the conversion were allocated to the liability and equity components and resulted in an additional $3.5 million of interest expense and a $0.3 million reduction on additional paid-in capital.

Loan agreement

In November 2012, we entered into the loan agreement with Hercules pursuant to which we received loans in the aggregate principal amount of $40.0 million. As permitted under the loan agreement, we had previously extended the interest-only payment period with the aggregate principal balance of the loans to be repaid in monthly installments starting on June 1, 2014 and continuing through November 1, 2016. On June 25, 2014, we entered into an amendment to the loan agreement whereby the period during which we make interest-only payments was extended until October 1, 2014. On November 6, 2014, we entered into a further amendment to the loan agreement, whereby the period during which we make interest-only payments was extended until February 1, 2015. On February 25, 2015, we entered into a fourth amendment to the loan agreement pursuant to which the maturity date and the period during which we make interest-only payments on our current loans in the aggregate principal amount of $40.0 million was extended. As a result of this amendment, we were required to repay the outstanding aggregate principal balance of the loan beginning on June 1, 2016 and continuing through November 1, 2018. As a result of the FDA's approval of our new drug application, or NDA, for ONIVYDE, which occurred on October 22, 2015, we elected to extend the interest-only period by an additional six months so that we would repay the outstanding aggregate principal balance of the loans beginning on December 1, 2016 and continuing through November 1, 2018. In addition, as a result of the FDA's approval of our NDA for ONIVYDE, we could elect to draw, at any time until August 1, 2016, an additional term loan advance of up to $15.0 million. Principal and interest payments on the additional term loan advance would be made in the same manner as our current term loan in the aggregate principal amount of $40.0 million. We did not borrow against the additional term loan advance. Upon the earlier of full repayment of the loans or November 1, 2016, we were required to pay Hercules a fee of $1.2 million.

In connection with the loan agreement, we granted Hercules a security interest in all of our personal property now owned or hereafter acquired, excluding intellectual property but including the proceeds from the sale, if any, of intellectual property, and a negative pledge on intellectual property. The loan agreement also contained certain representations, warranties and non-financial covenants.

During the fourth quarter of 2015, we repaid the loans in full in conjunction with the issuance of the 2022 notes. The total repayment amount included the $40.0 million in outstanding principal, the $1.2 million fee discussed above and interest accrued up through the repayment date.

Contractual obligations and commitments

The following table summarizes our contractual obligations as of December 31, 2017:

	Payments Due by Period				
(in thousands)	**Total**	**Less than 1 year**	**1 to 3 years**	**3 to 5 years**	**More than 5 years**
Operating lease obligations, net of scheduled sublease payments	$ 4,980	$ 3,422	$ 1,558	$ —	$ —
Repayment of MLSC tax incentive awards	1,402	1,402	—	—	—
Antibody and technology licensing costs	260	174	86	—	—
Total contractual cash obligations	$ 6,642	$ 4,998	$ 1,644	$ —	$ —

Expenditures to contract research organizations represent a significant cost in clinical development. However, our contracts with these research organizations are cancellable at our option upon short notice and do not have cancellation penalties. Therefore, payments to contract research organizations have not been included in the above table.

In May 2014, the MLSC awarded us an additional $0.6 million of tax incentives under its Life Science Tax Incentive Program, which allows us to monetize approximately $0.6 million of state research and development tax credits. In exchange for these incentives, we pledged to hire an incremental 31 employees and to maintain the additional headcount through at least December 31, 2018. Due to our failure to meet this headcount target as of December 31, 2016 as a result of our October 2016 corporate restructuring activities, we will be required to repay approximately $0.3 million of this award. As such, this repayment obligation has been included in the above table.

In March 2015, the MLSC awarded us an additional $1.4 million of tax incentives under its Life Science Tax Incentive Program, which allows us to monetize approximately $1.2 million of state research and development tax credits. In exchange for these incentives, we pledged to hire an incremental 75 employees and to maintain the additional headcount through at least December 31, 2019. Due to our failure to meet this headcount target as of December 31, 2016 as a result of our October 2016 corporate restructuring activities, we will be required to repay approximately $1.0 million of this award. As such, this repayment obligation has been included in the above table.

Other than the specific payments noted in the table and as described above, milestone and royalty payments associated with antibody licensing, manufacturing technology licensing costs and other in-licensed collaboration payments have not been included in the above table, as management cannot reasonably estimate if or when they will occur. For instance, under a collaboration agreement with Dyax Corp. related to antibody identification and evaluation, we may be required to make aggregate development and regulatory milestone payments of up to $16.2 million for therapeutic products and aggregate regulatory milestone payments of up $1.0 million for diagnostic products directed to selected targets associated with MM-121 and MM-141. We also are required to pay mid single digit royalties on net sales of licensed products.

Off-Balance Sheet Arrangements

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

Tax Loss Carryforwards

At December 31, 2017, we had net operating loss carryforwards for federal and state income tax purposes of $138.1 million and $223.4 million, respectively. In March 2016, the Financial Accounting Standards Board issued Accounting Standards Update, or ASU, No. 2016-09, “Compensation - Stock Compensation (Topic 718),” effective for annual periods beginning after December 15, 2016. The guidance changes how companies account for certain aspects of share-based payments to employees. Entities will be required to recognize income tax effects of awards in the income statement when the awards vest or are settled. In accordance with the updated guidance, we increased the federal and state net operating loss carryforwards by approximately $39.2 million and $25.2 million, respectively, for the deductions related to the exercise of stock options. Our existing federal and state net operating loss carryforwards begin to expire 2028 through 2036. We also had available research and development credits for federal and state income tax purposes of approximately $28.8 million and $18.7 million, respectively. The federal and state research and development credits will begin to expire in 2022 and 2026, respectively. As of December 31, 2017, we also had available investment tax credits for state income tax purposes of $0.4 million, which began to expire in 2018 and will continue to expire through 2020 if they are not utilized. We have Orphan Drug Credits of $120.8 million, which begin to expire in 2031. We have evaluated the positive and negative evidence bearing upon the realizability of our deferred tax assets, which are comprised principally of net operating loss carryforwards and research and development credits. Under the applicable accounting standards, we have considered our history of losses and concluded that it is more likely than not that we will not recognize the benefits of federal and state deferred tax assets. Accordingly, a full valuation allowance has been established against the deferred tax assets. In the second quarter of 2017, when the asset sale was consummated, we utilized deferred tax assets. The valuation allowance was released during the year ended December 31, 2017 when we determined it is more likely than not that the deferred tax assets will be realizable in that period.

On December 22, 2017, the SEC staff issued Staff Accounting Bulletin No. 118 to address the application of GAAP in situations when a registrant does not have the necessary information available, prepared, or analyzed (including computations) in reasonable detail to complete the accounting for certain income tax effects of the Tax Cuts and Jobs Act, or the TCJA. We have recognized the provisional tax impacts related to the revaluation of the deferred tax assets and liabilities and included these amounts in our consolidated financial statements for the year ended December 31, 2017. The ultimate impact may differ from these provisional amounts due to, among other things, additional analysis, changes in interpretations and assumptions we have made, additional regulatory guidance that may be issued, and actions we may take as a result of the TCJA, which could result in changes to the provisional tax impacts during 2018.

Utilization of the net operating loss and tax credit carryforwards may be subject to a substantial annual limitation under Section 382 of the Internal Revenue Code of 1986, as amended, or the Internal Revenue Code, due to ownership change limitations that have occurred previously or that could occur in the future. These ownership changes may limit the amount of net operating loss and tax credit carryforwards that can be utilized annually to offset future taxable income and tax. We completed an evaluation of ownership changes through December 31, 2017 to assess whether utilization of our net operating loss or tax credit carryforwards would be subject to an annual limitation under Section 382 of the Internal Revenue Code. We believe that we can utilize all of our existing tax attributes as a result of the analysis. To the extent an ownership change occurs in the future, the net operating loss and tax credit carryforwards may be subject to limitation.

We have not, as of yet, conducted a study of our domestic research and development credit carryforwards and Orphan Drug Credits. This study may result in an increase or decrease to our credit carryforwards; however, until a study is completed and any adjustment is known, no amounts are being presented as an uncertain tax position. A full valuation allowance has been provided against our credits, and if an adjustment is required, this adjustment would be offset by an adjustment to the valuation allowance. As a result, there would be no impact to the statement of operations and comprehensive income (loss), balance sheet or cash flows if an adjustment were required.

Recent Accounting Pronouncements

See Note 1, "Nature of the Business and Summary of Significant Accounting Policies," in the accompanying notes to the consolidated financial statements for a description of recent accounting pronouncements applicable to our business.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

We invest in a variety of financial instruments, principally cash deposits, money market funds, securities issued by the U.S. government and its agencies and corporate debt securities. The goals of our investment policy are preservation of capital, fulfillment of liquidity needs and fiduciary control of cash and investments. We also seek to maximize income from our investments without assuming significant risk.

Our primary exposure to market risk is interest income sensitivity, which is affected by changes in the general level of interest rates, particularly because our investments are in short-term marketable securities. Due to the short-term duration of our investment portfolio and the low risk profile of our investments, an immediate 10% change in interest rates would not have a material effect on the fair market value of our portfolio. We have the ability and intention to hold our investments until maturity, and therefore, we would not expect our operating results or cash flows to be affected to any significant degree by the effect of a sudden change in market interest rates on our investment portfolio.

We do not currently have any auction rate or mortgage-backed securities. We do not believe our cash, cash equivalents and marketable securities have significant risk of default or illiquidity, however we cannot provide absolute assurance that in the future our investments will not be subject to adverse changes in market value.

Item 8. Financial Statements and Supplementary Data

Our consolidated financial statements, together with the report of our independent registered public accounting firm, appear on pages F-1 through F-34 of this Annual Report on Form 10-K.

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

None.

Item 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer (our principal executive officer and principal financial officer, respectively), evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2017. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the

Exchange Act is accumulated and communicated to the company’s management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of December 31, 2017, our Chief Executive Officer and Chief Financial Officer concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level.

Internal Control Over Financial Reporting

Management’s Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting for the company. Internal control over financial reporting is defined in Rule 13a-15(f) or 15d-15(f) promulgated under the Exchange Act as a process designed by, or under the supervision of, the company’s principal executive and principal financial officers and effected by the company’s 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 GAAP and includes those policies and procedures that:

- pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of the assets of the company;
- provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with GAAP, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and
- 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. Therefore, even those systems determined to be effective can provide only reasonable assurance with respect to financial statement preparation and presentation. 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.

Our management assessed the effectiveness of our internal control over financial reporting as of December 31, 2017. In making this assessment, management used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission in Internal Control-Integrated Framework (2013). Based on its assessment, management concluded that, as of December 31, 2017, our internal control over financial reporting is effective based on those criteria.

The effectiveness of our internal control over financial reporting as of December 31, 2017 has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report, which appears herein.

Changes in Internal Control Over Financial Reporting

No change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) occurred during the three months ended December 31, 2017 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information

None.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

The information required by this Item 10 will be included under the captions "Executives," "Director Nomination Process," "Board Policies," "Code of Business Conduct and Ethics," "Board Meetings and Attendance" and "Section 16(a) Beneficial Ownership Reporting Compliance" in our definitive proxy statement to be filed with the SEC with respect to our 2018 Annual Meeting of Stockholders and is incorporated herein by reference.

Item 11. Executive Compensation

The information required by this Item 11 will be included under the captions "Executive and Director Compensation Processes," "Compensation Discussion and Analysis," "Summary Compensation Table," "2017 Grants of Plan-Based Awards Table," "Outstanding Equity Awards at 2017 Year End," "2017 Option Exercises and Stock Vested Table," "Employment Agreements," "Potential Payments Upon Termination or Change in Control" and "Compensation Committee Interlocks and Insider Participation" in our definitive proxy statement to be filed with the SEC with respect to our 2018 Annual Meeting of Stockholders and is incorporated herein by reference.

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

The information required by this Item 12 will be included under the captions "Security Ownership of Certain Beneficial Owners and Management" and "Securities Authorized for Issuance under Equity Compensation Plans" in our definitive proxy statement to be filed with the SEC with respect to our 2018 Annual Meeting of Stockholders and is incorporated herein by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence

The information required by this Item 13 will be included, as applicable, under the captions "Employment Agreements," "Potential Payments Upon Termination or Change in Control," "Board Determination of Independence" and "Related Person Transactions" in our definitive proxy statement to be filed with the SEC with respect to our 2018 Annual Meeting of Stockholders and is incorporated herein by reference.

Item 14. Principal Accountant Fees and Services

The information required by this Item 14 will be included under the captions "Audit Fees and Services" and "Pre-Approval Policies and Procedures" in our definitive proxy statement to be filed with the SEC with respect to our 2018 Annual Meeting of Stockholders and is incorporated herein by reference.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(1) Financial Statements

Our consolidated financial statements are set forth on pages F-1 through F-34 of this Annual Report on Form 10-K and are incorporated herein by reference.

(2) Financial Statement Schedules

Schedules have been omitted since they are either not required or not applicable or the information is otherwise included herein.

(3) Exhibits

Exhibit Number	Description of Exhibit
1.1	Sales Agreement, dated as of December 15, 2017, by and between the Registrant and Cowen and Company, LLC (incorporated by reference to Exhibit 1.2 to the Registrant's Registration Statement on Form S-3 filed on December 15, 2017)
2.1	Asset Purchase and Sale Agreement, dated as of January 7, 2017, by and between the Registrant and Ipsen S.A. (incorporated by reference to Exhibit 2.1 to the Registrant's Current Report on Form 8-K filed on January 9, 2017)
3.1	Restated Certificate of Incorporation of the Registrant, as amended (incorporated by reference to Exhibit 3.1 to the Registrant's Quarterly Report on Form 10-Q filed on November 8, 2017)
3.2	Amended and Restated Bylaws of the Registrant (incorporated by reference to Exhibit 3.5 to the Registrant's Registration Statement on Form S-1, as amended, filed on January 13, 2012)
4.1*	Specimen certificate evidencing shares of common stock
4.2	Indenture, dated as of July 17, 2013, by and between the Registrant and Wells Fargo Bank, National Association, as trustee (incorporated by reference to Exhibit 4.1 to the Registrant's Current Report on Form 8-K filed on July 18, 2013)
4.3	First Supplemental Indenture, dated as of July 17, 2013, by and between the Registrant and Wells Fargo Bank, National Association, as trustee (incorporated by reference to Exhibit 4.2 to the Registrant's Current Report on Form 8-K filed on July 18, 2013)
10.1#	2008 Stock Incentive Plan (incorporated by reference to Exhibit 10.2 to the Registrant's Registration Statement on Form S-1, as amended, filed on July 8, 2011)
10.2#	2011 Stock Incentive Plan (incorporated by reference to Exhibit 10.3 to the Registrant's Registration Statement on Form S-1, as amended, filed on January 13, 2012)
10.3#	Form of Incentive Stock Option Agreement under 2011 Stock Incentive Plan (incorporated by reference to Exhibit 10.4 to the Registrant's Registration Statement on Form S-1, as amended, filed on January 13, 2012)
10.4#	Form of Non-Qualified Stock Option Agreement under 2011 Stock Incentive Plan (incorporated by reference to Exhibit 10.5 to the Registrant's Registration Statement on Form S-1, as amended, filed on January 13, 2012)
10.5#	Employment Agreement, dated as of August 10, 2017, by and between the Registrant and Jean M. Franchi (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q filed on November 8, 2017)
10.6#	Employment Agreement, dated as of May 4, 2017, by and between the Registrant and Sergio L. Santillana (incorporated by reference to Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2017)
10.7#	Employment Agreement, dated as of May 1, 2017, by and between the Registrant and Daryl C. Drummond (incorporated by reference to Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2017)
10.8#	Employment Agreement, dated as of January 17, 2017, by and between the Registrant and Richard Peters (incorporated by reference to Exhibit 10.6 to the Registrant's Annual Report on Form 10-K filed on March 1, 2017)
10.9#	Employment Agreement, dated as of February 24, 2015, by and between the Registrant and Jeffrey A. Munsie (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2017)

Exhibit Number	Description of Exhibit
10.10#	Retention Bonus Agreement, dated as of April 3, 2017, by and between the Registrant and Jeffrey A. Munsie (incorporated by reference to Exhibit 10.7 to the Registrant's Quarterly Report on Form 10-Q filed on May 10, 2017)
10.11#*	Scientific Advisory Board Consulting and Confidentiality Agreement, dated as of February 6, 2018, by and between the Registrant and George D. Demetri
10.12#	Form of Indemnification Agreement between the Registrant and each director and executive officer (incorporated by reference to Exhibit 10.12 to the Registrant's Registration Statement on Form S-1, as amended, filed on August 19, 2011)
10.13#	Separation and Release of Claims Agreement, dated as of October 11, 2016, by and between the Registrant and Robert J. Mulroy (incorporated by reference to Exhibit 10.7 to the Registrant's Annual Report on Form 10-K filed on March 1, 2017)
10.14#	Separation and Release of Claims Agreement, dated as of April 11, 2017, by and between the Registrant and Peter N. Laivins (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q filed on May 10, 2017)
10.15#	Separation and Release of Claims Agreement, dated as of April 11, 2017, by and between the Registrant and William M. McClements (incorporated by reference to Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q filed on May 10, 2017)
10.16#	Separation and Release of Claims Agreement, dated as of April 11, 2017, by and between the Registrant and Edward J. Stewart (incorporated by reference to Exhibit 10.4 to the Registrant's Quarterly Report on Form 10-Q filed on May 10, 2017)
10.17	Indenture of Lease, dated as of August 24, 2012, by and between the Registrant and DWF IV One Kendall, LLC (as successor-in-interest to RB Kendall Fee, LLC), as amended by the First Amendment of Lease, dated as of March 18, 2013 (incorporated by reference to Exhibit 10.14 to the Registrant's Annual Report on Form 10-K filed on March 20, 2013)
10.18	Second Amendment of Lease, dated as of September 12, 2013, by and between the Registrant and DWF IV One Kendall, LLC (as successor-in-interest to RB Kendall Fee, LLC) (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q filed on November 8, 2013)
10.19	Third Amendment of Lease, dated as of February 23, 2015, by and between the Registrant and DWF IV One Kendall, LLC (incorporated by reference to Exhibit 10.15 to the Registrant's Annual Report on Form 10-K filed on February 27, 2015)
10.20	Fourth Amendment of Lease, dated as of July 22, 2015, by and between the Registrant and DWF IV One Kendall, LLC (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q filed on November 9, 2015)
10.21	Fifth Amendment of Lease, dated as of April 3, 2017, by and between the Registrant and ARE-MA Region No. 59, LLC (incorporated by reference to Exhibit 10.8 to the Registrant's Quarterly Report on Form 10-Q filed on May 10, 2017)
10.22	Sixth Amendment of Lease, dated as of June 9, 2017, by and between the Registrant and ARE-MA Region No. 59, LLC (incorporated by reference to Exhibit 10.11 to the Registrant's Quarterly Report on Form 10-Q filed on August 9, 2017)
10.23*	Seventh Amendment of Lease, dated as of February 6, 2018, by and between the Registrant and ARE-MA Region No. 59, LLC
10.24	Sublease Agreement, dated as of April 3, 2017, by and between the Registrant and Ipsen Bioscience, Inc. (incorporated by reference to Exhibit 10.9 to the Registrant's Quarterly Report on Form 10-Q filed on May 10, 2017)
10.25†	Exclusive License Agreement, dated as of November 1, 2000, by and between the Registrant (as successor-in-interest to Hermes BioSciences, Inc.) and The Regents of the University of California, as amended on October 6, 2003, September 13, 2006, June 6, 2007 and September 28, 2007 (incorporated by reference to Exhibit 10.20 to the Registrant's Registration Statement on Form S-1, as amended, filed on October 26, 2011)
10.26†	Collaboration Agreement, dated as of November 16, 2009, by and between the Registrant and Adimab LLC, as amended on April 27, 2010, June 2, 2010 and October 11, 2011 (incorporated by reference to Exhibit 10.22 to the Registrant's Registration Statement on Form S-1, as amended, filed on October 26, 2011)
10.27†	Sublicense Agreement, dated as of June 30, 2008, by and between the Registrant and Dyax Corp. (incorporated by reference to Exhibit 10.23 to the Registrant's Registration Statement on Form S-1, as amended, filed on July 8, 2011)

Exhibit Number	Description of Exhibit
10.28†	Amended and Restated Collaboration Agreement, dated as of January 24, 2007, by and between the Registrant and Dyax Corp., as amended on July 31, 2008 and November 6, 2009 (incorporated by reference to Exhibit 10.24 to the Registrant's Registration Statement on Form S-1, as amended, filed on October 26, 2011)
10.29	Amendment to Amended and Restated Collaboration Agreement, dated as of January 18, 2012, by and between the Registrant and Dyax Corp. (incorporated by reference to Exhibit 10.26 to the Registrant's Annual Report on Form 10-K filed on March 20, 2013)
10.30	Stipulation and Agreement of Settlement and Release, dated as of October 6, 2017, by and among the Registrant, Wells Fargo Bank, National Association, Wolverine Flagship Fund Trading Limited, 1992 MSF International Ltd (formerly known as Highbridge International LLC) and 1992 Tactical Credit Master Fund, L.P. (formerly known as Highbridge Tactical Credit & Convertibles Master Fund, L.P.) (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K filed on October 10, 2017)
21.1*	Subsidiaries of the Registrant
23.1*	Consent of PricewaterhouseCoopers LLP, an independent registered public accounting firm
31.1*	Certification of Principal Executive Officer pursuant to Rule 13a-14(a) or Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2*	Certification of Principal Financial Officer pursuant to Rule 13a-14(a) or Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32.1+	Certification of Principal Executive Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
32.2+	Certification of Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101.INS*	XBRL Instance Document
101.SCH*	XBRL Taxonomy Extension Schema Document
101.CAL*	XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF*	XBRL Taxonomy Extension Definition Linkbase Document
101.LAB*	XBRL Taxonomy Extension Label Linkbase Database
101.PRE*	XBRL Taxonomy Extension Presentation Linkbase Document

* Filed herewith.

\+ Furnished herewith.

\# Management contract or compensatory plan, contract or agreement.

† Confidential treatment requested as to portions of the exhibit. Confidential materials omitted and filed separately with the Securities and Exchange Commission.

Item 16. Form 10-K Summary

Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

MERRIMACK PHARMACEUTICALS, INC.

Date: March 12, 2018

By: /s/ Richard Peters, M.D., Ph.D.
Richard Peters, M.D., Ph.D.
President and Chief Executive Officer

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

Signature	Title	Date
/s/ Richard Peters, M.D., Ph.D. Richard Peters, M.D., Ph.D.	President, Chief Executive Officer and Director (Principal Executive Officer)	March 12, 2018
/s/ Jean M. Franchi Jean M. Franchi	Chief Financial Officer and Treasurer (Principal Financial and Accounting Officer)	March 12, 2018
/s/ Gary L. Crocker Gary L. Crocker	Chairman of the Board	March 12, 2018
/s/ George D. Demetri, M.D. George D. Demetri, M.D.	Director	March 12, 2018
/s/ John M. Dineen John M. Dineen	Director	March 12, 2018
/s/ Vivian S. Lee, M.D., Ph.D. Vivian S. Lee, M.D., Ph.D.	Director	March 12, 2018
/s/ Ulrik B. Nielsen, Ph.D. Ulrik B. Nielsen, Ph.D.	Director	March 12, 2018
/s/ Michael E. Porter, Ph.D. Michael E. Porter, Ph.D.	Director	March 12, 2018
/s/ James H. Quigley James H. Quigley	Director	March 12, 2018
/s/ Russell T. Ray Russell T. Ray	Director	March 12, 2018

MERRIMACK PHARMACEUTICALS, INC.
INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of Merrimack Pharmaceuticals, Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Merrimack Pharmaceuticals, Inc. and its subsidiary as of December 31, 2017 and 2016, and the related consolidated statements of operations and comprehensive income (loss), of non-controlling interest and stockholders' equity (deficit) and of cash flows for each of the three years in the period ended December 31, 2017, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2017, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2017 and 2016, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2017 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2017, based on criteria established in Internal Control - Integrated Framework (2013) issued by the COSO.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Annual Report on Internal Control Over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) ("PCAOB") and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

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 (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) 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 (iii) 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.

Emphasis of Matter

As discussed in Note 1 to the consolidated financial statements, the Company will require additional financing to fund future operations. Management's plans in regard to this matter are described in Note 1.

/s/PricewaterhouseCoopers LLP
Boston, Massachusetts
March 12, 2018

We have served as the Company's auditor since 2002.

Merrimack Pharmaceuticals, Inc.

Consolidated Balance Sheets

(in thousands, except per share amounts)	December 31, 2017	December 31, 2016
Assets		
Current assets:		
Cash and cash equivalents	$ 93,441	$ 21,524
Restricted cash	102	102
Accounts receivable, net	100	275
Prepaid expenses and other current assets	1,403	2,239
Assets held for sale	—	33,295
Total current assets	95,046	57,435
Restricted cash	674	674
Property and equipment, net	6,467	14,212
Equity method investment	10,551	—
Other assets	4,588	27
Long-term assets held for sale	—	9,135
Total assets	$ 117,326	$ 81,483
Liabilities, non-controlling interest and stockholders' equity (deficit)		
Current liabilities:		
Accounts payable, accrued expenses and other	$ 17,606	$ 28,670
Deferred rent	2,171	2,014
Liabilities held for sale	—	57,538
Total current liabilities	19,777	88,222
Deferred rent, net of current portion	1,209	3,386
Long-term debt, net of current portion	—	216,861
Long-term liabilities held for sale	—	25,673
Other long-term liabilities	56	—
Total liabilities	21,042	334,142
Commitments and contingencies (Note 16)		
Non-controlling interest	—	(1,539)
Stockholders' equity (deficit):		
Preferred stock, $0.01 par value: 10,000 shares authorized at December 31, 2017 and 2016; no shares issued or outstanding at December 31, 2017 or 2016	—	—
Common stock, $0.01 par value: 20,000 shares authorized at December 31, 2017 and 2016, 13,343 and 13,020 issued and outstanding at December 31, 2017 and 2016, respectively	1,334	1,302
Additional paid-in capital	577,721	702,377
Accumulated deficit	(482,771)	(954,799)
Total stockholders' equity (deficit)	96,284	(251,120)
Total liabilities, non-controlling interest and stockholders' equity (deficit)	$ 117,326	$ 81,483

The accompanying notes are an integral part of these consolidated financial statements.

Merrimack Pharmaceuticals, Inc.

Consolidated Statements of Operations and Comprehensive Income (Loss)

(in thousands, except per share amounts)	Years Ended December 31, 2017	2016	2015
Costs and expenses:			
Research and development expenses	$ 67,314	$ 109,565	$ 121,033
General and administrative expenses	28,452	32,052	24,048
Restructuring expenses	—	5,710	—
Total costs and expenses	95,766	147,327	145,081
Loss from continuing operations	(95,766)	(147,327)	(145,081)
Other income and expenses:			
Interest income	895	276	99
Interest expense	(34,650)	(22,449)	(18,769)
Gain on deconsolidation of Silver Creek Pharmaceuticals, Inc.	10,848	—	—
Gain on sale of asset	1,703	—	—
Other (expense) income, net	(1,433)	(8)	917
Net loss from continuing operations before income tax benefit	(118,403)	(169,508)	(162,834)
Income tax benefit	42,399	13,224	11,215
Net loss from continuing operations	(76,004)	(156,284)	(151,619)
Discontinued operations:			
Income from discontinued operations, net of tax	546,872	2,766	3,832
Net income (loss)	470,868	(153,518)	(147,787)
Net (loss) income attributable to non-controlling interest	(1,160)	(1,778)	170
Net income (loss) attributable to Merrimack Pharmaceuticals, Inc.	$ 472,028	$ (151,740)	$ (147,957)
Other comprehensive income:			
Unrealized gain on available-for-sale securities	—	—	74
Other comprehensive income	—	—	74
Comprehensive income (loss)	$ 472,028	$ (151,740)	$ (147,883)
Amounts attributable to Merrimack Pharmaceuticals, Inc.:			
Net loss from continuing operations	$ (74,844)	$ (154,506)	$ (151,789)
Income from discontinued operations, net of tax	546,872	2,766	3,832
Net income (loss) attributable to Merrimack Pharmaceuticals, Inc.	$ 472,028	$ (151,740)	$ (147,957)
Basic and dilutive net income (loss) per common share			
Net loss from continuing operations	$ (5.66)	$ (12.33)	$ (13.63)
Net income from discontinued operations, net of tax	41.33	0.22	0.34
Net income (loss) per share	$ 35.67	$ (12.11)	$ (13.29)
Weighted-average common shares used in per share calculations—basic and diluted	13,232	12,533	11,136
Cash dividend paid per common share	$ 10.55	$ —	$ —

The accompanying notes are an integral part of these consolidated financial statements.

Merrimack Pharmaceuticals, Inc.

Consolidated Statements of Non-Controlling Interest and Stockholders' Equity (Deficit)

(in thousands)	Non-Controlling Interest	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Other Comprehensive (Loss) Income	Accumulated Deficit	Total Stockholders' Equity (Deficit)
Balance at December 31, 2014	$ 69	10,670	$ 1,067	$ 552,037	$ (74)	$ (655,170)	$ (102,140)
Exercise of stock options and common stock warrants	—	536	54	10,047	—	—	10,101
Issuance of common stock in at the market offering, net of issuance costs	—	381	38	38,522	—	—	38,560
Issuance of Series B preferred stock by Silver Creek Pharmaceuticals, Inc.	895	—	—	1,188	—	—	1,188
Stock-based compensation	—	—	—	15,351	—	—	15,351
Other comprehensive income (loss)	—	—	—	—	74	—	74
Loss attributable to non-controlling interest	(725)	—	—	—	—	725	725
Net loss	—	—	—	—	—	(147,787)	(147,787)
Balance at December 31, 2015	$ 239	11,587	$ 1,159	$ 617,145	$ —	$ (802,232)	$ (183,928)
Exercise of stock options	—	196	20	6,422	—	—	6,442
Issuance of common stock due to conversion of convertible notes due 2020	—	1,237	123	100,838	—	—	100,961
Consideration allocated to reacquisition of conversion feature of convertible notes due 2020	—	—	—	(39,923)	—	—	(39,923)
Issuance of Series C preferred stock by Silver Creek Pharmaceuticals, Inc.	(827)	—	—	2,689	—	—	2,689
Stock-based compensation	—	—	—	15,206	—	—	15,206
Loss attributable to non-controlling interest	(951)	—	—	—	—	951	951
Net loss	—	—	—	—	—	(153,518)	(153,518)
Balance at December 31, 2016	$ (1,539)	13,020	$ 1,302	$ 702,377	$ —	$ (954,799)	$ (251,120)
Exercise of stock options	—	323	32	6,657	—	—	6,689
Consideration allocated to reacquisition of conversion feature on extinguishment of convertible notes due 2020	—	—	—	(4,481)	—	—	(4,481)
Dividend paid	—	—	—	(140,000)	—	—	(140,000)
Issuance of Series C preferred stock by Silver Creek Pharmaceuticals, Inc.	847	—	—	—	—	—	—
Stock-based compensation	—	—	—	13,168	—	—	13,168
Loss attributable to non-controlling interest	(1,160)	—	—	—	—	1,160	1,160
Deconsolidation of non-controlling interest	1,852	—	—	—	—	—	—
Net income	—	—	—	—	—	470,868	470,868
Balance at December 31, 2017	$ —	13,343	$ 1,334	$ 577,721	$ —	$ (482,771)	$ 96,284

The accompanying notes are an integral part of these consolidated financial statements.

Merrimack Pharmaceuticals, Inc.

Consolidated Statements of Cash Flows

(in thousands)	Years Ended December 31, 2017	2016	2015
Cash flows from operating activities			
Net income (loss)	$ 470,868	$ (153,518)	$ (147,787)
Less:			
Income from discontinued operations	546,872	2,766	3,832
Loss from continuing operations	(76,004)	(156,284)	(151,619)
Adjustments to reconcile net loss to net cash used in operating activities			
Non-cash interest expense	3,678	6,004	8,217
Non-cash loss on extinguishment	5,202	14,566	—
Non-cash activity related to discontinued operations	17,282	13,224	11,215
Benefit from intra period tax allocation	(42,399)	(13,224)	(11,215)
Loss on disposal of property and equipment	—	493	4
Gain on sale of property and equipment	(439)	(40)	—
Impairment of in-process research and development intangible asset	—	2,800	—
Depreciation and amortization expense	5,221	4,895	3,250
Stock-based compensation expense	12,788	12,140	13,161
Loss on equity method investment	849	—	—
Gain on deconsolidation of Silver Creek Pharmaceuticals, Inc.	(10,848)	—	—
Changes in operating assets and liabilities:			
Accounts receivable	175	(264)	1,654
Prepaid expenses and other assets	(8,476)	2,184	(32)
Accounts payable, accrued expenses and other	(9,278)	(9,837)	13,163
Deferred rent and tax incentives	(2,021)	408	2,374
Net cash used in continuing operations for operating activities	(104,270)	(122,935)	(109,828)
Net cash (used in) provided by discontinuing operations for operating activities	(41,665)	(47,306)	4,472
Net cash used in operating activities	(145,935)	(170,241)	(105,356)
Cash flows from investing activities			
Purchase of marketable securities	—	(84,262)	—
Proceeds from sales and maturities of marketable securities	—	84,160	87,899
Purchase of property and equipment	(915)	(2,640)	(11,902)
Deconsolidation of Silver Creek Pharmaceuticals, Inc. cash	(4,002)	—	—
Proceeds on sale of property and equipment	1,094	—	—
Proceeds from sale of discontinued operations	580,714	—	—
Net cash provided by (used in) continuing operations for investing activities	576,891	(2,742)	75,997
Net cash used in discontinuing operations for investing activities	—	(515)	(887)
Net cash provided by (used in) investing activities	576,891	(3,257)	75,110
Cash flows from financing activities			
Proceeds from exercise of options and warrants to purchase common stock	6,917	6,224	10,087
Proceeds from at the market offering, net of issuance costs	—	—	38,560
Proceeds from issuance of senior secured notes due 2022, net of issuance costs	—	—	169,434
Proceeds from issuance of preferred stock by Silver Creek Pharmaceuticals, Inc.	3,994	3,361	2,083
Repayment of debt	(229,662)	—	(40,000)
Payment of dividend	(140,000)	—	—
Other financing activities, net	(288)	(169)	—
Net cash (used in) provided by financing activities	(359,039)	9,416	180,164
Net increase (decrease) in cash and cash equivalents	71,917	(164,082)	149,918
Cash and cash equivalents, beginning of period	21,524	185,606	35,688
Cash and cash equivalents, end of period	$ 93,441	$ 21,524	$ 185,606
Non-cash investing and financing activities			
Purchases of property and equipment in accounts payable, accrued expenses and other	$ 14	$ 130	$ 816
Receivables related to stock option exercises in prepaid expenses and other current assets	—	232	14
Receivables related to the sale of property and equipment in prepaid expenses and other current assets	—	40	—
Principal amount of convertible notes due 2020 converted into shares of common stock	—	64,209	—
Supplemental disclosure of cash flows			
Cash paid for income taxes	$ 7,926	$ —	$ —
Cash paid for interest	30,966	23,914	10,087

The accompanying notes are an integral part of these consolidated financial statements.

1. Nature of the Business and Summary of Significant Accounting Policies

Nature of the Business

Merrimack Pharmaceuticals, Inc. (the “Company”) is a clinical stage biopharmaceutical company based in Cambridge, Massachusetts that is outthinking cancer by targeting biomarker-defined cancers. The Company’s vision is to ensure that cancer patients and their families live fulfilling lives. The Company’s mission is to transform cancer care through the smart design and development of targeted solutions based on a deep understanding of cancer pathways and biological markers. All of the Company’s development programs, including four clinical trials and six candidates in preclinical development, fit into the Company’s strategy of (1) understanding the biological problems it is trying to solve, (2) designing specific solutions against the problems it is trying to solve and (3) developing those solutions for biomarker-selected patients. This three-pronged strategy seeks to ensure optimal patient outcomes.

On April 3, 2017, the Company completed the previously announced asset sale (the “Asset Sale”) with Ipsen S.A. (“Ipsen”). Pursuant to the Asset Purchase and Sale Agreement, dated as of January 7, 2017 (the “Asset Sale Agreement”), between the Company and Ipsen, the Company sold to Ipsen its right, title and interest in the non-cash assets, equipment, inventory, contracts and intellectual property primarily related to or used in the Company’s business operations and activities involving or relating to developing, manufacturing and commercializing ONIVYDE and MM-436 (the “Commercial Business”). The Company received $575.0 million in cash, plus a working capital adjustment of $5.7 million, and is eligible to receive up to $450.0 million in additional regulatory approval-based milestone payments. The working capital adjustment of $5.7 million was agreed to with Ipsen and received by the Company in the year ended December 31, 2017. The Company also retained the right to receive net milestone payments that may become payable for the ex-U.S. development and commercialization of ONIVYDE for up to $33.0 million pursuant to a license and collaboration agreement (the “Baxalta Agreement”) with Baxalta Incorporated, Baxalta US Inc. and Baxalta GmbH (collectively, “Baxalta”). The Company entered into the Baxalta Agreement in 2014, and on April 3, 2017, the Baxalta Agreement was assigned to Ipsen in connection with the completion of the Asset Sale.

The Company’s non-commercial assets, including its clinical and preclinical development programs, were not included in the Asset Sale and remain assets of the Company. The Company’s most advanced assets and a description of the status of each asset is as follows:

- **MM-121 (seribantumab)**: MM-121 is a fully human monoclonal antibody that binds to the ErbB3 (HER3) receptor and targets heregulin positive cancers. There are two active development programs for MM-121, each in a Phase 2 clinical trial. The Company is currently conducting the global, open-label, biomarker-selected, Phase 2 randomized SHERLOC clinical trial, evaluating MM-121 in combination with docetaxel in patients with heregulin positive non-small cell lung cancer. The Company is also conducting the global, double-blinded, placebo-controlled, biomarker-selected, Phase 2 randomized SHERBOC clinical trial evaluating MM-121 in combination with fulvestrant in patients with heregulin positive, hormone receptor positive, ErbB2 (HER2) negative, metastatic breast cancer;
- **MM-141 (istiratumab)**: MM-141 is a fully human tetravalent bispecific antibody designed to block tumor survival signals by targeting receptor complexes containing the insulin-like growth factor 1 (“IGF-1”), receptor and ErbB3 (HER3) cell surface receptor. The Company is currently conducting and has completed enrollment of the global, double-blinded, placebo-controlled, Phase 2 randomized CARRIE clinical trial evaluating MM-141 in combination with nab-paclitaxel and gemcitabine in patients with previously untreated metastatic pancreatic cancer with high serum levels of free IGF-1; and
- **MM-310**: MM-310 is an antibody-directed nanotherapeutic that contains a novel prodrug of the highly potent chemotherapy docetaxel and targets the ephrin receptor A2 receptor, which is highly expressed in most solid tumor types, such as prostate, ovarian, bladder, gastric, pancreatic and lung cancers. The Company initiated a Phase 1 clinical trial to evaluate safety and preliminary activity of MM-310 and to identify the maximum tolerated dose in the first quarter of 2017.

The Company is subject to risks and uncertainties common to companies in the biopharmaceutical industry, including, among other things, its ability to secure additional capital to fund operations, success of clinical trials, development by competitors of new technological innovations, dependence on collaborative arrangements, protection of proprietary technology, compliance with government regulations and dependence on key personnel. Product candidates currently under development will require significant additional research and development efforts, including extensive preclinical and clinical testing and regulatory approval prior to commercialization. These efforts require significant amounts of capital, adequate personnel, infrastructure and extensive compliance reporting capabilities.

The Company's product candidates are in development. There can be no assurance that the Company's research and development will be successfully completed, that adequate protection for the Company's intellectual property will be obtained, that any products developed will obtain necessary government regulatory approval or that any approved products will be commercially viable. Even if the Company's product development efforts are successful, it is uncertain when, if ever, the Company will generate significant revenue from product sales. The Company operates in an environment of rapid change in technology and substantial competition from pharmaceutical and biotechnology companies, among others. In addition, the Company is dependent upon the services of its employees and consultants.

In accordance with Accounting Standards Codification ("ASC") 205-40, *Going Concern*, the Company has evaluated whether there are conditions and events, considered in the aggregate, that raise substantial doubt about the Company's ability to continue as a going concern within one year after the date that the consolidated financial statements are issued. As of December 31, 2017 the Company had an accumulated deficit of $482.8 million. During the year ended December 31, 2017, the Company incurred a net loss from continuing operations of $76.0 million and used $104.3 million of cash in continuing operations for operating activities. The Company expects to continue to generate operating losses in the foreseeable future. The Company expects that its cash and cash equivalents of $93.4 million at December 31, 2017 will be sufficient to fund its operating expenses and capital expenditure requirements for at least the next 12 months from issuance of the financial statements. The future viability of the Company beyond that point is dependent on its ability to raise additional capital to finance its operations.

The Company will ultimately need to seek additional funding through public or private equity or debt financings, through existing or new collaboration arrangements, or through divestitures of its assets. The Company may not be able to obtain financing on acceptable terms, or at all, and the Company may not be able to enter into additional collaborative arrangements or divest its assets. The terms of any financing may adversely affect the holdings or the rights of the Company's stockholders. Arrangements with collaborators or others may require the Company to relinquish rights to certain of its technologies or product candidates. If the Company is unable to obtain funding, the Company could be forced to delay, reduce or eliminate its research and development programs or commercialization efforts, which could adversely affect its business prospects.

Summary of Significant Accounting Policies

The Company's significant accounting policies include policies related to both continuing and discontinuing operations.

Segment Information

Operating segments are defined as components of an enterprise engaging in business activities for which discrete financial information is available and regularly reviewed by the chief operating decision maker in deciding how to allocate resources and in assessing performance. The Company views its operations and manages its business as one operating segment and the Company operates in only one geographic region (the United States).

Basis of Presentation and Consolidation

The accompanying consolidated financial statements have been prepared under U.S. generally accepted accounting principles ("GAAP") and include the accounts of the Company and its wholly owned subsidiary.

As of March 31, 2017, the Commercial Business met all the conditions to be classified as held-for-sale and represents a discontinued operation since the disposal of the Commercial Business is a strategic shift that will have a major effect on the Company's operations and financial results. The Company will not have further significant involvement in the operations of the discontinued Commercial Business. The operating results of the Commercial Business are reported as discontinued operations, net of tax in the consolidated statements of operations and comprehensive income (loss) for all periods presented. In addition, in the consolidated balance sheet as of December 31, 2016, the assets and liabilities held for sale have been presented separately. For additional information, see Note 2, "Discontinued Operations – Sale of Commercial Business."

The consolidated financial statements have historically included the accounts of the Company and Silver Creek Pharmaceuticals, Inc. ("Silver Creek") with all intercompany transactions and balances eliminated in consolidation. Silver Creek represented a variable interest entity that the Company consolidated as the primary beneficiary. As discussed in Note 3, "Investment in Silver Creek," Silver Creek completed a preferred stock financing in the third quarter of 2017, which reduced the Company's ownership percentage in Silver Creek below 50% and resulted in the Company no longer controlling the Silver Creek board of directors. The Company determined that it is no longer the primary beneficiary of Silver Creek since the Company does not control the board of directors and does not direct the activities that have the most significant impact on Silver Creek's economic performance. Therefore, the Company deconsolidated Silver Creek from its financial statements in the third quarter of 2017 in accordance with ASC 810-10-40-4(c), *Consolidation*. The Company accounts for its investment in Silver Creek under the equity method of accounting as of December 31, 2017.

The Company’s consolidated balance sheet as of December 31, 2016 included Silver Creek’s assets and liabilities, after intercompany eliminations. The Company’s consolidated balance sheet as of December 31, 2017 does not include the assets and liabilities of Silver Creek since the Company deconsolidated Silver Creek in the third quarter of 2017. The Company’s consolidated statements of operations and comprehensive income (loss) for the year ended December 31, 2017 include Silver Creek’s results for the period through July 13, 2017, the day immediately preceding the deconsolidation of Silver Creek.

On August 11, 2017, the Company’s stockholders approved an amendment to the Company's certificate of incorporation to effect a one-for-ten reverse stock split of its issued and outstanding common stock (the “Reverse Split”). On September 5, 2017, the Company filed an amendment to its certificate of incorporation to effect the Reverse Split, and on September 6, 2017, the Reverse Split was effective for trading purposes. As a result of the Reverse Split, every ten shares of common stock issued and outstanding was converted into one share of common stock, reducing the number of issued and outstanding shares of common stock from approximately 132.8 million shares to approximately 13.28 million shares. No fractional shares were issued in connection with the Reverse Split. The amendment to the certificate of incorporation also proportionately reduced the number of authorized shares of common stock from 200 million to 20 million. The Reverse Split did not change the par value of the common stock. The Reverse Split did not change the number of authorized shares or par value of the Company’s preferred stock, of which there are no shares issued or outstanding. All outstanding stock options and convertible notes entitling their holders to purchase shares of common stock or acquire shares of common stock upon conversion, as the case may be, were adjusted as a result of the Reverse Split, as required by the terms of these securities. This change is reflected throughout the financial statements as appropriate. As a result, all share and per share amounts have been adjusted retroactively to reflect the Reverse Split for all periods. For additional information, see Note 14, “Stock-Based Compensation.”

Use of Estimates

GAAP requires the Company’s management to make estimates and judgments that may affect the reported amounts of assets, liabilities, revenues, expenses and related disclosures. The Company bases estimates and judgments on historical experience and on various other factors that it believes to be reasonable under the circumstances. The most significant estimates in these consolidated financial statements include, but may not be limited to, revenue recognition, estimates utilized in the valuation of inventory, accounting for stock-based compensation and accrued expenses. The Company’s actual results may differ from these estimates under different assumptions or conditions. The Company evaluates its estimates on an ongoing basis. Changes in estimates are reflected in reported results in the period in which they become known by the Company’s management.

Certain estimates, such as revenue recognition, estimates of discounts and allowances related to commercial sales of ONIVYDE, estimates utilized in the valuation of inventory, useful lives with respect to long-lived assets and intangible assets, contingencies, intangible assets, goodwill and in-process research and development (“IPR&D”) related specifically to the Commercial Business, which has been reclassified under discontinued operations and included in assets and liabilities held for sale.

Cash, Cash Equivalents and Restricted Cash

Cash and cash equivalents are short-term, highly liquid investments with original maturities of three months or less at the date of purchase. Investments qualifying as cash equivalents primarily consist of money market funds, commercial paper, corporate notes and bonds and certificates of deposit.

Cash accounts with any type of restriction are classified as restricted cash. If restrictions are expected to be lifted in the next twelve months, the restricted cash account is classified as current. As of December 31, 2017 and 2016, the Company recorded restricted cash of $0.8 million and $0.8 million, respectively, which was primarily related to the Company’s facility lease.

Marketable Securities

The Company classifies marketable securities with a remaining maturity when purchased of greater than three months as available-for-sale. Available-for-sale securities are carried at fair value, with the unrealized gains and losses included in other comprehensive income (loss) as a component of stockholders’ equity (deficit) until realized. To determine whether an other-than-temporary impairment exists, the Company performs an analysis to assess whether it intends to sell, or whether it would more likely than not be required to sell, the security before the expected recovery of the amortized cost basis. Where the Company intends to sell a security, or may be required to do so, the security’s decline in fair value is deemed to be other-than-temporary and the full amount of the unrealized loss is recognized on the statement of operations and comprehensive income (loss) as an other-than-temporary impairment charge. When this is not the case, the Company performs additional analysis on all securities with unrealized losses to evaluate losses associated with the creditworthiness of the security. Credit losses are identified where the Company does not expect to receive cash flows, based on using a single best estimate, sufficient to recover the amortized cost basis of a security and amount of the loss recognized in other income (expense). Realized gains and losses are recognized in interest income. Any premium or discount arising at purchase is amortized and/or accreted to interest income. The Company did not have any marketable securities as of December 31, 2017 or 2016.

Inventory

The Company values its inventories at the lower of cost or net realizable value. The Company determines the cost of its inventories, which includes amounts related to materials and manufacturing overhead, on a first-in, first-out basis. The Company performs an assessment of the recoverability of capitalized inventory during each reporting period, and it writes down any excess and obsolete inventories to their realizable value in the period in which the impairment is first identified. Such impairment charges, should they occur, are recorded as a component of "Cost of revenues."

The Company capitalizes inventory costs associated with the Company's products after regulatory approval when, based on management's judgment, future commercialization is considered probable and the future economic benefit is expected to be realized. Inventory acquired prior to receipt of marketing approval of a product candidate is expensed as research and development expense as incurred. Inventory that can be used in either the production of clinical or commercial product is expensed as research and development expense when selected for use in a clinical manufacturing campaign.

Shipping and handling costs for product shipments are recorded as incurred as a component of "Cost of revenues" along with amortization expense related to definite-lived intangible assets, costs associated with manufacturing the product and any inventory reserves or write-downs.

As a result of the Asset Sale, all inventory relates to the Commercial Business and has been reclassified under discontinued operations.

Property and Equipment

Property and equipment, including leasehold improvements, are recorded at cost and depreciated when placed into service using the straight-line method, based on their estimated useful lives as follows:

Asset Classification	Estimated Useful Life (in years)
Lab equipment	3 - 7
IT equipment	3 - 7
Leaseholds improvements	Lesser of useful life or lease term
Furniture and fixtures	3 - 7

Costs for capital assets not yet placed into service have been capitalized as construction-in-progress and will be depreciated in accordance with the above guidelines once placed into service. Costs for repairs and maintenance are expensed as incurred, while major betterments are capitalized. The Company capitalizes interest cost incurred on funds used to construct property and equipment. The capitalized interest is recorded as part of the asset to which it relates and is depreciated over the asset's estimated useful life. Upon retirement or sale, the cost of assets disposed of and the related accumulated depreciation are removed from the accounts and any resulting gain or loss is reflected in earnings.

The Company reviews its long-lived assets for impairment whenever events or changes in business circumstances indicate that the carrying amount of assets may not be fully recoverable or that the useful lives of these assets are no longer appropriate. Each impairment test is based on a comparison of the undiscounted cash flow to the recorded value of the asset. If impairment is indicated, the asset will be written down to its estimated fair value on a discounted cash flow basis.

Goodwill and Intangible Assets

Goodwill and indefinite-lived intangible assets, including IPR&D assets, are evaluated for impairment on an annual basis or more frequently if an indicator of impairment is present. The Company performs its annual goodwill and IPR&D impairment evaluations on August 31st.

When performing an evaluation of goodwill impairment, the Company has the option to first assess qualitative factors to determine whether it is necessary to perform the quantitative two-step impairment test. If the Company elects this option and finds, as a result of the qualitative assessment, that it is more likely than not that the fair value of the reporting unit is less than its carrying amount, the quantitative two-step impairment test is required; otherwise, further testing is not required. This requires the Company to assess the impact of significant events, milestones and changes to expectations and activities that may have occurred since the last impairment evaluation. Significant changes to these estimates, judgments and assumptions could materially change the outcome of the impairment assessment. Alternatively, the Company may elect to not first assess qualitative factors and immediately perform the quantitative two-step impairment test. If such an election occurs, in the first step, the fair value of the Company's reporting unit is compared to the carrying value. If the carrying value of the net assets assigned to the reporting unit exceeds the fair value of the reporting unit, then the second step of the impairment test is performed in order to determine the implied fair value of the reporting unit's goodwill. If the carrying value of the reporting unit's goodwill exceeds the implied fair value, then the Company would record an impairment loss equal to the difference. As described above, the Company operates in one operating segment, which is considered the only reporting unit.

As a result of the Asset Sale, all goodwill and intangible assets relate to the Commercial Business and have been reclassified under discontinued operations.

Accrued Expenses

As part of the process of preparing financial statements, the Company is required to estimate accrued expenses. This process involves identifying services that have been performed on the Company's behalf and estimating the level of services performed and the associated costs incurred for such services where the Company has not yet been invoiced or otherwise notified of actual cost. The Company records these estimates in its consolidated financial statements as of each balance sheet date. Examples of estimated accrued expenses include:

- fees due to contract research organizations in connection with preclinical and toxicology studies and clinical trials;
- fees paid to investigative sites in connection with clinical trials; and
- professional service fees.

In accruing service fees, the Company estimates the time period over which services will be provided and the level of effort in each period. If the actual timing of the provision of services or the level of effort varies from the estimate, the Company adjusts the accrual accordingly. In the event that the Company does not identify costs that have been incurred or it under or overestimates the level of services performed or the costs of such services, its actual expenses could differ from such estimates. The date on which some services commence, the level of services performed on or before a given date and the cost of such services are often subjective determinations. The Company prepares its estimates based on the facts and circumstances known to it at the time and in accordance with GAAP. There have been no material changes in estimates for the periods presented.

Non-Controlling Interest

Non-controlling interest represents the non-controlling stockholders' proportionate share of preferred stock and net loss of the Company's majority owned consolidated subsidiary, Silver Creek. The non-controlling stockholders' proportionate share of the preferred stock in Silver Creek is reflected as non-controlling interest in the Company's consolidated balance sheets as a component of mezzanine equity.

As discussed in Note 3, "Investment in Silver Creek," Silver Creek completed a preferred stock financing in the third quarter of 2017, which reduced the Company's ownership percentage in Silver Creek below 50% and resulted in the Company no longer controlling the Silver Creek board of directors. The Company determined that it is no longer the primary beneficiary of Silver Creek since the Company does not control the board of directors and does not direct the activities that have the most significant impact on Silver Creek's economic performance. Therefore, the Company deconsolidated Silver Creek from its financial statements in the third quarter of 2017 in accordance with ASC 810-10-40-4(c), *Consolidation*.

Revenue Recognition

The Company recognizes revenue when all of the following criteria are met: persuasive evidence of an arrangement exists; delivery has occurred or services have been rendered; the price to the customer is fixed or determinable; and collectability is reasonably assured.

Product Revenues, Net

Prior to the Asset Sale, the Company sold ONIVYDE to a limited number of specialty pharmaceutical distributors in the United States (collectively, its "Distributors"). The Company's Distributors subsequently resold the products to healthcare providers. The

Company recognized revenue on product sales when title and risk of loss had passed to the Distributor, which was typically upon delivery. Product revenues were recorded net of applicable reserves for discounts and allowances. As a result of the Asset Sale, all product revenues relate to the Commercial Business and have been reclassified under discontinued operations.

In order to conclude that the price is fixed or determinable, the Company must be able to reasonably estimate its net product revenues upon delivery to its Distributors. As such, the Company estimated its net product revenues by deducting from its gross product revenues trade allowances, estimated contractual discounts, estimated Medicaid rebates, estimated reserves for product returns and estimated costs of other incentives offered to patients.

These discounts and allowances were based on estimates of the amounts earned or to be claimed on the related sales. The Company's estimates took into consideration its historical experience, current contractual and statutory requirements, specific known market events and trends, industry data and forecasted Distributor buying and payment patterns. Actual amounts may ultimately differ from the Company's estimates. If actual results varied, the Company would adjust these estimates, which could have an effect on earnings in the period of adjustment.

Product revenue reserves and allowances that reduce gross revenue are categorized as follows:

Trade Allowances: The Company paid fees to its Distributors for providing certain data to the Company as well as for maintaining contractual inventory and service levels. These trade allowances were recorded as a reduction to accounts receivable on the consolidated balance sheet at the time revenue is recognized.

Rebates and Chargeback Discounts: The Company was subject to discount obligations under state Medicaid programs and the Public Health Service 340B Drug Pricing Program, contracts with Federal government entities purchasing via the Federal Supply Schedule and various private organizations, such as group purchasing organizations (collectively, its "Third-party Payors"). The Company estimated the rebates and chargeback discounts it provided to Third-party Payors, based upon its estimated payor mix, and deducted these estimated amounts from its gross product revenues at the time revenue was recognized. Chargeback discounts were processed when the Third-party Payor purchased the product at a discount from the Distributor, who then in turn charged back to the Company the difference between the price initially paid by the Distributor and the discounted price paid by the Third-party Payor. These chargeback discounts were recorded as a reduction to accounts receivable on the consolidated balance sheet at the time revenue was recognized. Rebates that were invoiced directly to the Company were recorded as accrued liabilities on the consolidated balance sheet at the time revenue was recognized.

Product Returns: An allowance for product returns was established for returns expected to be made by Distributors and was recorded at the time revenue was recognized, resulting in a reduction to product sales. In accordance with contractual terms, Distributors had the right to return unopened and undamaged product that was within a permissible number of months before and after the product's expiration date, subject to contractual limitations. The Company had the ability to monitor inventory levels and the shelf life of product at Distributors and could contractually control the amount of inventory that was sold to Distributors. Based on inventory levels held by Distributors and the structure of the Company's distribution model, the Company concluded that it had the ability to reasonably estimate product returns at the time revenue was recognized. The Company's estimated rate of return was based on historical rates of return for comparable oncology products.

Other Incentives: The Company offered co-pay mitigation support to commercially insured patients. The Company's co-pay mitigation program was intended to reduce each participating patient's portion of the financial responsibility for a product's purchase price to a specified dollar amount. Based upon the terms of the Company's co-pay mitigation program, the Company estimated average co-pay mitigation amounts in order to establish a reserve for co-pay mitigation claims and deducted these estimated amounts from its gross product revenues at the later of the date that (i) the revenues were recognized or (ii) the incentive was offered. Claims under the Company's co-pay mitigation program were subject to expiration.

All product revenue recognized relates to the Commercial Business and is presented as income from discontinued operations, net of tax in the consolidated statements of operations and comprehensive income (loss) for all periods presented. In addition, in the consolidated balance sheet as of December 31, 2016, the balance sheet accounts described above are included in assets and liabilities held for sale.

License and Collaboration Revenues

The Company enters into biopharmaceutical product development agreements with collaborative partners for the research and development of therapeutic and diagnostic products. The terms of the agreements may include nonrefundable signing and licensing fees, funding for research, development and manufacturing, milestone payments and royalties or profit-sharing on any product sales derived from collaborations. These multiple-element arrangements are analyzed to determine whether the deliverables can be separated or whether they must be accounted for as a single unit of accounting.

The revenue recognition guidance related to multiple-element arrangements requires entities to separate and allocate consideration in a multiple-element arrangement according to the relative selling price of each deliverable. The fair value of deliverables under the arrangement may be derived using a best estimate of selling price if vendor specific objective evidence and third-party evidence are not available. Deliverables under the arrangement will be separate units of accounting provided that a delivered item has value to the customer on a stand-alone basis and if the arrangement does not include a general right of return relative to the delivered item and delivery or performance of the undelivered item is considered probable and substantially in the control of the vendor.

In September 2014, the Company entered into the Baxalta Agreement with Baxter International Inc., Baxter Healthcare Corporation and Baxter Healthcare SA (collectively, "Baxter") for the development and commercialization of ONIVYDE outside of the United States and Taiwan (the "Licensed Territory"). In connection with Baxter International Inc.'s separation of the Baxalta business, the Baxalta Agreement was assigned to Baxalta during the second quarter of 2015. The Baxalta Agreement was evaluated under the accounting guidance on revenue recognition for multiple-element arrangements. The Company determined that the obligations under this agreement represent a single unit of accounting and that the agreement represents a services agreement. As a result, the Company has estimated the level of effort expected to be completed as a result of providing the identified deliverables and will recognize revenue related to the agreement based on proportional performance as effort is completed over the expected services period.

The Company also entered into a development, license and supply agreement (the "Actavis Agreement") with Watson Laboratories, Inc. ("Actavis") in November 2013, which was evaluated under the accounting guidance on revenue recognition for multiple-element arrangements.

All operating results recognized related to the Baxalta Agreement and Actavis Agreement are presented as income from discontinued operations, net of tax in the consolidated statements of operations and comprehensive income (loss) for all periods presented. In addition, in the consolidated balance sheet as of December 31, 2016, the assets and liabilities related to the Baxalta Agreement and Actavis Agreement have been presented separately as assets and liabilities held for sale. Both the Baxalta Agreement and Actavis Agreement were assigned to Ipsen in connection with the completion of the Asset Sale.

Whenever the Company determines that an arrangement should be accounted for as a single unit of accounting, it determines the period over which the performance obligations would be performed and revenue would be recognized. If the Company cannot reasonably estimate the timing and the level of effort to complete its performance obligations under the arrangement, then revenue under the arrangement is recognized on a straight-line basis over the period the Company expects to complete its performance obligations.

The Company's collaboration agreements may include additional payments upon the achievement of performance-based milestones. As milestones are achieved, a portion of the milestone payment, equal to the percentage of the total time that the Company has performed the performance obligations to date divided by the total estimated time to complete the performance obligations, multiplied by the amount of the milestone payment, will be recognized as revenue upon achievement of such milestone. The remaining portion of the milestone will be recognized over the remaining performance period. Milestones that are tied to regulatory approvals are not considered probable of being achieved until such approval is received. Milestones tied to counterparty performance are not included in the Company's revenue model until the performance conditions are met.

Other Revenues

Prior to the Asset Sale, the Company was a party to separate commercial supply agreements with Baxalta and PharmaEngine, Inc. ("PharmaEngine") pursuant to which the Company supplied ONIVYDE to these entities. Revenue was recognized under these commercial supply arrangements when the counterparty took delivery of the commercial supply product and when the other general revenue recognition criteria outlined above were met. The Baxalta Agreement and the PharmaEngine agreement were assigned to Ipsen in connection with the completion of the Asset Sale.

The Company was also eligible to receive royalty revenues on Baxalta's net sales of ONIVYDE in the Licensed Territory. The Company recognizes royalty revenues in the period that the related sales occur.

All other revenue recognized relates to the Commercial Business and is presented as income from discontinued operations, net of tax in the consolidated statements of operations and comprehensive income (loss) for all periods presented.

Research and Development Expenses

Research and development expenses are charged to expense as incurred. Research and development expenses are comprised of costs incurred in performing research and development activities, including personnel-related costs, stock-based compensation, facilities, research-related overhead, clinical trial costs, contracted services, research-related manufacturing, license fees and other external costs. The Company accounts for nonrefundable advance payments for goods and services that will be used in future research and development activities as expenses when the services have been performed or when the goods have been received rather than when the payment is made.

General and Administrative Expenses

General and administrative expenses are comprised of salaries and other related costs for personnel, including stock-based compensation expenses and benefits, in the Company's commercial, legal, intellectual property, business development, finance, information technology, corporate communications, investor relations and human resources departments. Other general and administrative expenses include costs for employee training and development, board of directors costs, depreciation, insurance expenses, facility-related costs not otherwise included in research and development expenses, professional fees for legal services, including patent-related expenses, and accounting and information technology services.

Stock-Based Compensation Expense

The Company accounts for its stock-based compensation awards in accordance with ASC 718, *Compensation – Stock Compensation*. ASC 718 requires all share-based payments to employees, including grants of employee stock options, to be recognized in the consolidated statements of operations and comprehensive income (loss) based on their grant date fair values. For stock options granted to employees and to members of the Company's Board of Directors for their service on the Board of Directors, the Company estimates the grant date fair value of each option award using the Black-Scholes option pricing model. The use of the Black-Scholes option pricing model requires the Company to make assumptions with respect to the expected term of the option, the expected volatility of the Company's common stock consistent with the expected term of the option, the risk-free interest rate consistent with the expected term of the option and the expected dividend yield of the Company's common stock. Stock-based compensation expense related to employee stock options is measured using the fair value of the award at the grant date, net of estimated forfeitures, and is adjusted annually to reflect actual forfeitures. Stock-based compensation expense is then recognized on a straight-line basis over the vesting period, which is also the requisite service period.

The Company records stock options issued to non-employees at fair value, remeasures to reflect the current fair value at each reporting period and recognizes expense over the related service period. When applicable, these equity instruments are accounted for based on the fair value of the consideration received or the fair value of the equity instrument issued, whichever is more reliably measurable.

Comprehensive Loss

Comprehensive loss consists of net loss and unrealized gains and losses on available-for-sale marketable securities.

Other (Expense) Income, Net

The Company records other income or expense related to tax incentive awards other income or expense-related items as components of "Other (expense) income, net" within the consolidated statements of operations and comprehensive income (loss).

The Company has been awarded tax incentives by the Massachusetts Life Sciences Center ("MLSC"), an independent agency of the Commonwealth of Massachusetts. These tax incentives require that the Company achieve certain hiring targets. Failure to maintain the additional headcount in subsequent periods could require the Company to repay some or all of the incentives. The Company recognizes the benefit of these incentives on a straight-line basis over the five-year performance period of each award, beginning when the Company achieves the hiring goal target, with a cumulative catch-up recognized in the period that the hiring goal target is achieved. The Company received MLSC tax incentives in 2011, 2013, 2014 and 2015 totaling $3.8 million in the aggregate, allowing the Company to monetize approximately $3.4 million of state research and development tax credits. As a result of the October 2016 corporate restructuring described more fully in Note 12, "Restructuring Activities," the Company determined that it would be required to repay a portion of the 2014 and 2015 tax incentives received from the MLSC in the aggregate amount of $1.4 million. Such amounts have been classified as current liabilities as of December 31, 2017.

The Company recognized $0.1 million and $0.7 million in income related to these MLSC tax incentives during the years ended December 31, 2016 and 2015, respectively. No income was recognized during the year ended December 31, 2017.

Income Taxes

The Company accounts for income taxes under the asset and liability method. Under this method, deferred tax assets and liabilities are recognized for the estimated future tax consequences attributable to differences between financial statement carrying amounts of existing assets and liabilities and their respective tax bases. Deferred tax assets and liabilities are measured using enacted rates in effect for the year in which these temporary differences are expected to be recovered or settled. Valuation allowances are provided if based on the weight of available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized.

The Company provides reserves for potential payments of tax to various tax authorities related to uncertain tax positions and other issues. Reserves are based on a determination of whether and how much of a tax benefit taken by the Company in its tax filing is more likely than not to be realized following resolution of any potential contingencies present related to the tax benefit. Potential interest and penalties associated with such uncertain tax positions are recorded as components of income tax expense. To date, the Company has not taken any uncertain tax positions or recorded any reserves, interest or penalties.

Concentration of Credit Risk

Financial instruments that subject the Company to credit risk consist primarily of cash, cash equivalents and marketable securities. The Company places its cash deposits in accredited financial institutions and, therefore, the Company's management believes these funds are subject to minimal credit risk. The Company invests cash equivalents in money market funds. The Company has no significant off-balance sheet concentrations of credit risk such as foreign currency exchange contracts, option contracts or other hedging arrangements. The Company also is subject to credit risk from its accounts receivable related to its product sales and collaborators. The Company evaluates the creditworthiness of each of its customers and has determined that all of its customers are creditworthy. To date, the Company has not experienced significant losses with respect to the collection of its accounts receivable.

No customer individually accounted for 10% or more of total gross revenues or total gross accounts receivable for the years ended December 31, 2017, 2016 or 2015.

Recent Accounting Pronouncements

In May 2014, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2014-09, "Revenue from Contracts with Customers (Topic 606)," which supersedes all existing revenue recognition requirements, including most industry-specific guidance. The new standard requires a company to recognize revenue when it transfers goods or services to customers in an amount that reflects the consideration that the company expects to receive for those goods or services. This guidance was originally effective for interim and annual periods beginning after December 15, 2016 and allows for adoption using a full retrospective method, or a modified retrospective method. Early adoption was originally not permitted. Subsequent to the issuance of ASU 2014-09, the FASB also issued the following updates related to ASC 606, *Revenue from Contracts with Customers:*

- In August 2015, the FASB issued ASU 2015-14, "Revenue from Contracts with Customers (Topic 606): Deferral of the Effective Date," whereby the effective date for the new revenue standard was deferred by one year. As a result of ASU 2015-14, the new revenue standard is now effective for annual periods, and interim periods within those annual periods, beginning after December 15, 2017, and early adoption is now permitted for annual periods beginning after December 15, 2016, including interim periods within that annual period.
- In March 2016, the FASB issued ASU 2016-08, "Revenue from Contracts with Customers (Topic 606): Principal versus Agent Considerations (Reporting Revenue Gross versus Net)," to clarify the implementation guidance on principal versus agent considerations.
- In April 2016, the FASB issued ASU 2016-10, "Revenue from Contracts with Customers (Topic 606): Identifying Performance Obligations and Licensing," to clarify the principle for determining whether a good or service is "separately identifiable" from other promises in the contract and to clarify the categorization of licenses of intellectual property.
- In May 2016, the FASB issued ASU 2016-12, "Revenue from Contracts with Customers (Topic 606): Narrow-Scope Improvements and Technical Expedients," to clarify guidance on transition, determining collectability, non-cash consideration and the presentation of sales and other similar taxes.
- In December 2016, the FASB issued ASU 2016-20, "Technical Corrections and Improvements to Topic 606, Revenue from Contracts with Customers," that allows entities not to make qualitative disclosures about remaining performance obligations in certain cases, adds disclosure requirements for entities that elect certain optional exemptions and adds twelve additional technical corrections and improvements to the new revenue standard.

The Company does not have any revenue generating contracts with customers due to the sale of the Commercial Business in 2017 and therefore does not expect adoption of the new revenue standard to have a material impact on the consolidated financial statements. The Company will adopt the new revenue standard on January 1, 2018 using the modified retrospective approach.

In January 2016, the FASB issued ASU 2016-01, "Financial Statements – Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Liabilities," which contains a number of provisions related to the measurement, presentation and disclosure of financial instruments. This guidance will be effective for annual reporting periods beginning after December 15, 2017, including interim periods within those annual periods. Early adoption of this guidance is not permitted with the exception of certain specific presentation requirements that are not currently applicable to the Company. The Company will adopt this guidance as of the required effective date of January 1, 2018 and does not anticipate that the adoption will have a material impact to the consolidated financial statements.

In February 2016, the FASB issued ASU 2016-02, "Leases (Topic 842)," which supersedes all existing lease accounting guidance within ASC 840, *Leases*. The new standard requires that lease assets and lease liabilities be recognized by lessees for those leases previously classified as operating leases under ASC 840, with limited exceptions. This update also creates a new definition of a lease and provides guidance as to whether a contract is or contains a lease. This guidance will be effective for annual reporting periods beginning after December 15, 2018, including interim periods within those annual reporting periods, and early adoption is permitted. The Company is currently evaluating the potential impact that the adoption of this guidance may have on the consolidated financial statements.

In August 2016, the FASB issued ASU 2016-15, "Statement of Cash Flows (Topic 230): Classification of Certain Cash Receipts and Cash Payments," which is intended to reduce diversity in practice in how entities present certain types of cash transactions in the statement of cash flows. This guidance also clarifies how the predominance principle should be applied when classifying cash receipts and cash payments that have attributes of more than one class of cash flows. This guidance will be effective for annual reporting periods beginning after December 15, 2017, including interim periods within those annual reporting periods, and early adoption is permitted. An entity that elects early adoption must adopt all of the amendments in the same period. The Company will adopt ASU 2016-15 as of the required effective date of January 1, 2018 and is currently evaluating the potential impact that the adoption of this guidance may have on the consolidated financial statements.

In November 2016, the FASB issued ASU 2016-18, "Statement of Cash Flows (Topic 230): Restricted Cash," which will require entities to show the change in the total of cash, cash equivalents, restricted cash and restricted cash equivalents within the statement of cash flows. As a result, entities will no longer separately present transfers between unrestricted cash and restricted cash. This guidance will be effective for annual reporting periods beginning after December 15, 2017, including interim periods within those annual reporting periods, and early adoption is permitted. The Company does not anticipate a material impact to the consolidated financial statements as a result of the adoption of this guidance.

In May 2017, the FASB issued ASU 2017-09, "Compensation - Stock Compensation (Topic 718): Scope of Modification Accounting," which provides guidance about which changes to the terms or conditions of a share-based payment award require an entity to apply modification accounting in ASU 2017-09. The standard should be applied prospectively to awards modified on or after the adoption date. This guidance will be effective for annual periods, and interim periods within those annual periods, beginning after December 15, 2017. Early adoption is permitted, including adoption in any interim period. The Company will adopt ASU 2017-09 as of the required effective date of January 1, 2018. The adoption of ASU 2017-09 will have an impact on the accounting for the modification of stock-based awards, if any, after the date of adoption.

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

2. Discontinued Operations - Sale of Commercial Business

Ipsen

As of March 31, 2017, the Commercial Business met all the conditions to be classified as held-for-sale and represents a discontinued operation since the disposal of the Commercial Business is a strategic shift that will have a major effect on the Company's operations and financial results. The Company will not have further significant involvement in the operations of the discontinued Commercial Business. The operating results of the Commercial Business are reported as discontinued operations, net of tax in the consolidated statements of operations and comprehensive income (loss) for all periods presented. In addition, in the consolidated balance sheet as of December 31, 2016, the assets and liabilities held for sale have been presented separately. This change is reflected throughout the financial statements as appropriate.

As discussed in Note 1, “Nature of the Business and Summary of Significant Accounting Policies,” on April 3, 2017, the Company completed the sale of the Commercial Business to Ipsen. Pursuant to the Asset Sale Agreement, the Company may be entitled to up to $450.0 million in additional payments based on the achievement by or on behalf of Ipsen of certain milestone events if the U.S. Food and Drug Administration (the “FDA”) approves ONIVYDE for certain indications as follows: (i) $225.0 million upon the regulatory approval by the FDA of ONIVYDE for the first-line treatment of metastatic adenocarcinoma of the pancreas (a) in combination with fluorouracil and leucovorin (with or without oxaliplatin), (b) in combination with gemcitabine and abraxane or (c) following submission and filing of regulatory approval by Ipsen for purposes of commercialization by Ipsen; (ii) $150.0 million upon the regulatory approval by the FDA of ONIVYDE for the treatment of small cell lung cancer after failure of first-line chemotherapy; and (iii) $75.0 million upon the regulatory approval by the FDA of ONIVYDE for an additional indication unrelated to those described above.

Discontinued Operations and Assets Held for Sale

The consolidated financial statements for the years ended December 31, 2017, 2016 and 2015 reflect the operations of the Commercial Business as a discontinued operation. Discontinued operations for the years ended December 31, 2017, 2016 and 2015 includes the following:

(in thousands)	Years Ended December 31,		
	2017	2016	2015
Revenues:			
Product revenues, net	$ 16,135	$ 53,064	$ 4,328
License and collaboration revenues	7,797	87,119	84,930
Other revenues	1,973	4,090	—
Total revenues	25,905	144,273	89,258
Costs and expenses:			
Cost of revenues	3,890	6,912	46
Research and development expenses	3,002	51,352	39,955
Selling, general and administrative expenses	10,907	48,677	33,747
Restructuring expenses	9,535	146	—
Total costs and expenses	27,334	107,087	73,748
Other income and expenses:			
Interest expense	(6,743)	(21,196)	(463)
Gain on sale of Commercial Business	601,670	—	—
Income from discontinued operations	$ 593,498	$ 15,990	$ 15,047
Income tax expense	(46,626)	(13,224)	(11,215)
Total income from discontinued operations	$ 546,872	$ 2,766	$ 3,832

The carrying value of the assets and liabilities of the Commercial Business classified as “Assets held for sale” in the consolidated balance sheets are as follows:

(in thousands)		December 31, 2016
Assets		
Current assets:		
Accounts receivable, net	$	17,194
Inventory		14,554
Prepaid expenses and other current assets		1,547
Total current assets held for sale		33,295
Property and equipment, net		1,553
Intangible assets, net		3,977
Goodwill		3,605
Total long-term assets held for sale		9,135
Liabilities		
Current liabilities:		
Accounts payable, accrued expenses and other		21,312
Deferred revenues		36,226
Total current liabilities held for sale		57,538
Deferred revenues, net of current portion		25,673
Total long-term liabilities held for sale		25,673

The Company has reclassified approximately $0.6 million of accounts payable, accrued expenses and other from continuing operations to discontinuing operations for the year ended December 31, 2016.

3. Investment in Silver Creek

On August 20, 2010, the Company acquired a controlling financial interest in Silver Creek. At such time, the Company had the ability to direct the activities of Silver Creek that most significantly impacted Silver Creek’s economic performance through its ownership percentage and through the board of director seats controlled by the Company. As such, Silver Creek was consolidated by the Company.

Since the Company acquired its financial interest, Silver Creek has raised funding through the issuance of Series A, B and C preferred stock. The Company has not participated in any Silver Creek financings nor has it provided any funding since the Company acquired its financial interest. As of December 31, 2016, the Company held an ownership interest in Silver Creek greater than 50% and maintained the ability to control the board of directors and the activities that most significantly impacted the economic performance of Silver Creek.

During the third quarter of 2017, Silver Creek completed its Series C preferred stock financing, which reduced the Company’s ownership percentage in Silver Creek below 50% and resulted in the Company no longer controlling the Silver Creek board of directors. As of December 31, 2017, the Company’s ownership percentage in Silver Creek was approximately 43%. The Company determined that it is no longer the primary beneficiary of Silver Creek since the Company does not control the board of directors and does not direct the activities that have the most significant impact on Silver Creek’s economic performance. Therefore, the Company deconsolidated Silver Creek from its financial statements on July 13, 2017 in accordance with ASC 810-10-40-4(c), *Consolidation*. Starting on July 14, 2017, the Company accounted for its investment in Silver Creek under the equity method of accounting as it has the ability to exercise significant influence over Silver Creek. Under the equity method of accounting, the Company will record its proportionate share of the investee’s earnings (losses) in its results of operations with a corresponding increase (decrease) in the carrying value of the investment.

The Company recorded a gain on the deconsolidation of Silver Creek of $10.8 million for the year ended December 31, 2017 in the consolidated statement of operations and comprehensive income (loss). On the date of deconsolidation, the fair value of the Company's investment in Silver Creek exceeded the Company's share of the net assets of Silver Creek, which generated the gain. On July 14, 2017, the Company recorded its investment in Silver Creek at a fair value of $11.4 million, which was based on a third party valuation report. The gain on deconsolidation includes the following:

(in thousands)		
Fair value of the Company's retained investment in Silver Creek	$	11,400
Carrying value of non-controlling interest		(1,852)
Derecognition of Silver Creek's net liabilities		1,300
Gain recognized on deconsolidation of Silver Creek	$	10,848

The change in the non-controlling interest related to Silver Creek was as follows:

(in thousands)		Non-Controlling Interest
Balance at December 31, 2016	$	(1,539)
Net loss attributable to Silver Creek through July 13, 2017		(1,160)
Issuance of Silver Creek Series C preferred stock		847
Balance at date of deconsolidation		(1,852)
Carrying value of non-controlling interest		1,852
Balance at December 31, 2017	$	—

(in thousands)		Non-Controlling Interest
Balance at December 31, 2015	$	239
Issuance of Silver Creek Series C preferred stock		(827)
Net loss attributable to Silver Creek		(951)
Balance at December 31, 2016	$	(1,539)

As of December 31, 2017, the Company held an equity investment in Silver Creek, which was accounted for as an equity method investment. The carrying value of the investment in Silver Creek was $10.6 million at December 31, 2017. During the year ended December 31, 2017, the Company recorded a loss associated with Silver Creek of $0.8 million as a component of other (expense) income, net in the consolidated statements of operations and comprehensive income (loss), representing its proportionate share of Silver Creek's losses from July 14, 2017 through December 31, 2017.

4. Net Loss Per Common Share

Basic net income (loss) per share is calculated by dividing the net income (loss) attributable to Merrimack Pharmaceuticals, Inc. by the weighted-average number of common shares outstanding during the period.

Diluted net income (loss) per share is computed by dividing the net income (loss) attributable to Merrimack Pharmaceuticals, Inc. by the weighted-average number of dilutive common shares outstanding during the period. Dilutive shares outstanding is calculated by adding to the weighted shares outstanding any potential (unissued) shares of common stock from outstanding stock options based on the treasury stock method. In a period when a net loss is reported, all common stock equivalents are excluded from the calculation because they would have an anti-dilutive effect, meaning the loss per share would be reduced. Therefore, in periods where a loss is reported, there is no difference in basic and dilutive loss per share.

The Company follows the two-class method when computing net income (loss) per share, when it has issued shares that meet the definition of participating securities. The two-class method determines net income (loss) per share for each class of common and participating securities according to dividends declared or accumulated and participating rights in undistributed earnings. The two-class method requires income available to common stockholders for the period to be allocated between common and participating securities based on their respective rights to receive dividends, as if all income for the period has been distributed, or losses to be allocated if they are contractually required to fund losses. There were no amounts allocated to participating securities for the years ended December 31, 2017, 2016 and 2015, as the Company was in a loss position and had no shares that met the definition of participating securities outstanding as of December 31, 2017, 2016 and 2015.

As discussed in Note 11, "Borrowings," in July 2013, the Company issued $125.0 million aggregate principal amount of 4.50% convertible notes due 2020 (the "Convertible Notes") in an underwritten public offering. Following the repayment and satisfaction in full of the Company's obligations to Hercules Technology Growth Capital, Inc. ("Hercules") under its Loan and Security Agreement with Hercules (the "Loan Agreement"), which occurred in December 2015, upon any conversion of the Convertible Notes, the Convertible Notes may be settled, at the Company's election, in cash, shares of the Company's common stock or a combination of cash and shares of the Company's common stock. For purposes of calculating the maximum dilutive impact, it is presumed that the conversion premium will be settled in common stock, inclusive of a contractual make-whole provision resulting from a fundamental change, and the resulting potential common shares included in diluted earnings per share if the effect is more dilutive. As of December 31, 2016, $60.8 million aggregate principal amount of the Convertible Notes remained outstanding. As of December 31, 2017, no Convertible Notes remained outstanding.

The stock options and conversion premium on the Convertible Notes are excluded from the calculation of diluted loss per share because the net loss for the years ended December 31, 2017, 2016 and 2015 causes such securities to be anti-dilutive. Securities excluded from the calculation of diluted loss per share are shown in the chart below:

	Years Ended December 31,		
(in thousands)	**2017**	**2016**	**2015**
Outstanding options to purchase common stock	1,616	1,903	1,921
Conversion of the Convertible Notes	—	1,216	2,500

5. License and Collaboration Agreements

Baxalta

On April 3, 2017, the Baxalta Agreement was assigned to Ipsen in connection with the completion of the Asset Sale, as discussed in Note 1, "Nature of the Business and Summary of Significant Accounting Policies." The Company retained the rights to receive net milestone payments that may become payable pursuant to the Baxalta Agreement for the ex-U.S. development and commercialization of ONIVYDE for up to $33.0 million, which is comprised of potential payments of $18.0 million from the sale of ONIVYDE in two additional major European countries, $5.0 million related to the sale of ONIVYDE in the first major non-European, non-Asian country and $10.0 million for the first patient dosed in a pivotal clinical trial in an indication other than pancreatic cancer.

6. Fair Value of Financial Instruments

Fair value is an exit price, representing the amount that would be received from the sale of an asset or paid to transfer a liability in an orderly transaction between market participants. Fair value is determined based on observable and unobservable inputs. Observable inputs reflect readily obtainable data from independent sources, while unobservable inputs reflect certain market assumptions. As a basis for considering such assumptions, GAAP establishes a three-tier value hierarchy, which prioritizes the inputs used to develop the assumptions and for measuring fair value as follows: (Level 1) observable inputs such as quoted prices in active markets for identical assets; (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 requires the Company to develop its own assumptions. This hierarchy requires the Company to use observable market data, when available, and to minimize the use of unobservable inputs when determining fair value.

Recurring Fair Value Measurements

The carrying values of cash, restricted cash, prepaid expenses, accounts receivable, accounts payable and accrued expenses, and other short-term assets and liabilities approximate their respective fair values due to the short-term maturities of these assets and liabilities.

The following tables summarize assets and liabilities measured at fair value on a recurring basis as of December 31, 2017 and 2016 and the input categories associated with those assets and liabilities:

	December 31, 2017		
(in thousands)	**Level 1**	**Level 2**	**Level 3**
Assets:			
Money market funds	$ 89,310	$ —	$ —
Totals	$ 89,310	$ —	$ —

(in thousands)	December 31, 2016 Level 1	Level 2	Level 3
Assets:			
Money market funds	$ 12,373	$ —	$ —
Totals	$ 12,373	$ —	$ —
Liabilities:			
Silver Creek warrant liability	$ —	$ —	$ 1,499
Totals	$ —	$ —	$ 1,499

In December 2016, Silver Creek issued warrants to purchase an aggregate of 1.9 million shares of Silver Creek Series C preferred stock. The issuance of these warrants is described more fully in Note 11, "Borrowings." The Silver Creek warrants were valued at $1.5 million as of December 31, 2016 using a Black-Scholes option pricing model, probability-weighted for different exercise scenarios. The key assumptions utilized in the Black-Scholes option pricing model as of December 31, 2016 were a risk-free interest rate of 2.3%, expected dividend yield of 0.0%, expected volatility of 61.7% and expected term of 6.9 years.

During the first quarter of 2017, Silver Creek issued additional warrants to purchase an aggregate of 1.8 million shares of Silver Creek Series C preferred stock. During the second quarter of 2017, Silver Creek issued additional warrants to purchase an aggregate of 0.3 million shares of Silver Creek Series C preferred stock. In June 2017, Silver Creek amended the outstanding warrant purchase agreements to increase the number of shares for which each warrant is redeemable.

During the third quarter of 2017, Silver Creek completed its Series C preferred stock financing, issuing 2.0 million shares of Series C preferred stock at $1.50 per share for proceeds of $2.9 million. In conjunction with this sale, Silver Creek also issued warrants to purchase an aggregate of 1.7 million shares of Silver Creek Series C preferred stock. The sale of additional shares of Series C preferred stock in the third quarter resulted in the deconsolidation of Silver Creek, effective July 13, 2017. As such, the Company valued the warrants on that date. The warrants were valued at $5.2 million and $1.5 million as of July 13, 2017 and December 31, 2016, respectively, using a Black-Scholes option pricing model, probability-weighted for different exercise scenarios. The key assumptions utilized in the Black-Scholes option pricing model as of July 14, 2017 were a risk-free interest rate of 2.1%, expected dividend yield of 0.0%, expected volatility of 60.0% and expected term of 6.4 years – 7.0 years. The key assumptions utilized in the Black-Scholes option pricing model as of December 31, 2016 were a risk-free interest rate of 2.3%, expected dividend yield of 0.0%, expected volatility of 61.7% and expected term of 6.9 years. Changes in the fair value of the warrants are recognized as a component of "other (expense) income, net" in the consolidated statements of operations and comprehensive income (loss). The change in fair value through the date of deconsolidation on July 13, 2017 for the year ended December 31, 2017 was $1.1 million and is recorded in other income (expense) on the statement of operations and comprehensive income (loss).

There were no changes in valuation techniques or transfers between the fair value measurement levels during the years ended December 31, 2017 or 2016. There were no liabilities measured at fair value on a recurring basis as of December 31, 2017.

Other Fair Value Measurements

The estimated fair value of the Convertible Notes was $57.5 million as of December 31, 2016. The Company estimated the fair value of the Convertible Notes by using a quoted market rate in an inactive market, which is classified as a Level 2 input. The carrying value of the Convertible Notes was $47.0 million as of December 31, 2016 due to the bifurcation of the conversion feature of the Convertible Notes as described more fully in Note 11, "Borrowings." No other fair value measurements were required during the year ended December 31, 2017, as the Company purchased the Convertible Notes in 2017.

As discussed in Note 11, "Borrowings," in December 2015, the Company closed a private placement of $175.0 million aggregate principal amount of 11.50% senior secured notes due 2022 (the "2022 Notes"). The Company estimated the fair value of the 2022 Notes by using publicly-available information related to one of the 2022 Notes borrower's portfolio of debt investments based on unobservable inputs, which is classified as a Level 3 input. The estimated fair value of the 2022 Notes was $167.0 million as of December 31, 2016. The carrying value of the 2022 Notes was $169.9 million as of December 31, 2016. No other fair value measurements were required during the year ended December 31, 2017, as the 2022 Notes were redeemed in 2017.

7. Marketable Securities

As of both December 31, 2017 and 2016, the Company maintained only cash equivalents comprised of money market funds. As of December 31, 2017, the Company did not hold any marketable securities.

There were no realized gains or losses on available-for-sale securities during the years ended December 31, 2017, 2016 or 2015.

8. Intangible Assets, Net

As part of the acquisition of Hermes BioSciences, Inc. on October 6, 2009, the Company acquired IPR&D assets of $2.8 million related to MM-302, an antibody-targeted nanotherapeutic that contains a chemotherapy drug.

In December 2016, the Company determined that it would stop the ongoing Phase 2 clinical trial of MM-302, which is an antibody-targeted nanotherapeutic containing a chemotherapy drug. The decision to stop the trial was made following an independent Data and Safety Monitoring Board (the "DSMB") opinion that continuing the clinical trial would be unlikely to demonstrate benefit over the comparator treatments. Subsequent to this recommendation, a futility assessment was performed that confirmed the DSMB's opinion. Both the treatment and control arms were found to have shorter than expected median progression free survival. While patients currently enrolled in the clinical trial may choose to continue on their assigned treatment based upon discussion with their study physician, no further development of MM-302 is being contemplated by the Company at this time. As a result of this determination, the Company recorded an impairment charge of $2.8 million during the fourth quarter of 2016. This impairment charge was recorded as a component of "Research and development expenses" within the consolidated statements of operations and comprehensive income (loss).

The Company did not have any intangible assets in continuing operations as of December 31, 2017 or 2016.

9. Property and Equipment, Net

Property and equipment, net as of December 31, 2017 and 2016 consisted of the following:

	December 31,	
(in thousands)	**2017**	**2016**
Lab equipment	$ 13,486	$ 17,537
IT equipment	3,853	8,509
Leasehold improvements	20,790	20,633
Furniture and fixtures	335	626
Construction in process	30	378
Total property and equipment, gross	38,494	47,683
Less: Accumulated depreciation	(32,027)	(33,471)
Total property and equipment, net	$ 6,467	$ 14,212

Depreciation expense was $5.1 million, $6.5 million and $4.8 million for the years ended December 31, 2017, 2016 and 2015, respectively. Capitalized interest costs were insignificant for the years ended December 31, 2017, 2016 and 2015.

During the year ended December 31, 2016, the Company recognized a $0.5 million charge related to the disposal of property and equipment. There were no significant losses recognized related to the disposal of property and equipment during the years ended December 31, 2017 and 2015. During the years ended December 31, 2017 and 2016, the Company recognized a $0.4 million and less than $0.1 million gain on the sale of equipment, respectively. There were no significant gains recognized related to the sale of property and equipment during the year ended December 31, 2015.

10. Accounts Payable, Accrued Expenses and Other

Accounts payable, accrued expenses and other as of December 31, 2017 and 2016 consisted of the following:

	December 31,	
(in thousands)	2017	2016
Accounts payable	$ 2,887	$ 2,692
Accrued goods and services	5,663	7,534
Accrued clinical trial costs	3,901	8,776
Accrued drug purchase costs	222	480
Accrued payroll and related benefits	2,884	3,394
Accrued restructuring expenses	628	774
Accrued interest	—	2,100
Accrued dividends payable	19	19
Silver Creek warrant liability	—	1,499
Deferred tax incentives	1,402	1,402
Total accounts payable, accrued expenses and other	$ 17,606	$ 28,670

11. Borrowings

2022 Notes

In December 2015, the Company closed a private placement of $175.0 million aggregate principal amount of 2022 Notes and entered into an indenture (the “U.S. Bank Indenture”) with U.S. Bank National Association as trustee and collateral agent (the “2020 Notes Trustee”). As a result of this placement, the Company received net proceeds of approximately $168.5 million, after deducting private placement and offering expenses payable by the Company. The private placement and offering expenses included $0.9 million of transaction costs that were expensed in accordance with the debt modification guidance per ASC 470, *Debt*, as further discussed below. The 2022 Notes bear interest at a rate of 11.50% per year, payable semi-annually on June 15 and December 15 of each year, beginning on June 15, 2016. The Company will pay semi-annual installments of principal on the 2022 Notes of $21,875,000 each, subject to adjustment as provided in the 2022 Notes, on June 15 and December 15 of each year, beginning on June 15, 2019. The 2022 Notes will mature on December 15, 2022, unless earlier redeemed or repurchased in accordance with their terms prior to such date.

The Company may redeem the 2022 Notes at its option, in whole or in part from time to time at a price equal to the principal amount plus accrued interest and a specified make-whole premium. If the Company experiences certain change of control events as defined in the U.S. Bank Indenture, the holders of the 2022 Notes will have the right to require the Company to purchase all or a portion of the 2022 Notes at a purchase price in cash equal to 101% of the principal amount thereof, plus accrued and unpaid interest to the date of purchase. In addition, upon certain asset sale events as defined in the U.S. Bank Indenture, the Company may be required to offer to use the net proceeds thereof to purchase all or a portion of the 2022 Notes at 100% of the principal amount thereof, plus accrued and unpaid interest to the date of purchase.

The 2022 Notes are senior secured obligations of the Company and will be equal in right of payment to all existing and future pari passu indebtedness of the Company (including the Convertible Notes), will be senior in right of payment to all existing and future subordinated indebtedness of the Company, will have the benefit of a security interest in the 2022 Notes collateral and will be junior in lien priority in respect of any asset-based lending collateral that secures any first priority lien obligations from time to time. The 2022 Notes contain customary covenants, including covenants that limit or restrict the Company’s ability to incur liens, incur indebtedness, and make certain restricted payments, but do not contain covenants related to future financial performance. The 2022 Notes are secured by a first priority lien on substantially all of the Company’s assets.

The 2022 Notes contain customary events of default. Upon certain events of default occurring, the 2022 Notes Trustee may declare 100% of the principal of and accrued and unpaid interest, if any, on all the 2022 Notes to be due and payable. In the case of certain events of bankruptcy, insolvency or reorganization involving the Company or a restricted subsidiary, 100% of the principal of, and accrued and unpaid interest on, the 2022 Notes will automatically become due and payable. There have been no events of default as of or during the year ended December 31, 2016.

The Company assessed the 2022 Notes pursuant to ASC 815, *Derivatives and Hedging*, to determine if any features necessitated bifurcation from the host instrument. The Company concluded that none of the embedded redemption features within the 2022 Notes require bifurcation, as these features are clearly and closely related to the host instrument.

Debt issuance costs incurred by the Company, excluding costs allocated to the debt modification as discussed below, are accounted for as a direct deduction to the carrying value of the 2022 Notes and are amortized to interest expense using the effective interest method over the life of the 2022 Notes. The effective interest rate associated with the 2022 Notes is 12.32%. For the years ended December 31, 2017, 2016 and 2015, interest expense related to the 2022 Notes was approximately $6.7 million, $20.9 million, and $0.5 million, respectively. These amounts are included as a component of income from discontinued operations, net of tax in the consolidated statement of operations and comprehensive income (loss).

In connection with the completion of the Asset Sale on April 3, 2017, the liability under the 2022 Notes was satisfied. As a result of the early repayment of the 2022 Notes, a loss on extinguishment of $25.0 million was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for the year ended December 31, 2017. The $25.0 million loss on extinguishment included a $20.1 million prepayment penalty and $4.9 million of amortization expense recognized for the remaining debt discount at settlement as a result of the early repayment.

Convertible Notes

In July 2013, the Company issued $125.0 million aggregate principal amount of Convertible Notes in an underwritten public offering. The Company issued the Convertible Notes under an indenture, dated as of July 17, 2013 (the “Base Indenture”) between the Company and Wells Fargo Bank, National Association, as trustee (the “Convertible Notes Trustee”), as supplemented by a supplemental indenture, dated as of July 17, 2013, between the Company and the Convertible Notes Trustee (together with the Base Indenture, the “Wells Fargo Indenture”). As a result of the Convertible Notes offering, the Company received net proceeds of approximately $120.6 million, after deducting underwriting discounts and commissions and offering expenses payable by the Company.

The Convertible Notes bear interest at a rate of 4.50% per year, payable semiannually in arrears on January 15 and July 15 of each year, beginning on January 15, 2014. The Convertible Notes are general unsecured senior obligations of the Company and rank (i) pari passu in seniority with respect to the 2022 Notes, (ii) senior in right of payment to any of the Company’s indebtedness that is expressly subordinated in right of payment to the Convertible Notes, (iii) equal in right of payment to any of the Company’s unsecured indebtedness that is not so subordinated, (iv) effectively junior in right of payment to any of the Company’s secured indebtedness to the extent of the value of the assets securing such indebtedness and (v) structurally junior to all indebtedness and other liabilities (including trade payables) of the Company’s subsidiaries.

The Company separately accounted for the liability and equity components of the Convertible Notes by bifurcating gross proceeds between the indebtedness, or liability component, and the embedded conversion option, or equity component. This bifurcation was done by estimating an effective interest rate as of the date of issuance for similar notes which do not contain an embedded conversion option. The gross proceeds received from the issuance of the Convertible Notes less the initial amount allocated to the indebtedness resulted in a $53.8 million allocation to the embedded conversion option. The embedded conversion option was recorded in stockholders’ deficit and as debt discount, to be subsequently amortized as interest expense over the term of the Convertible Notes. Underwriting discounts and commissions and offering expenses totaled $4.4 million and were allocated to the indebtedness and the embedded conversion option based on their relative values.

On April 13, 2016, the Company entered into separate, privately-negotiated conversion agreements (the “Conversion Agreements”) with certain holders of the Convertible Notes. Under the Conversion Agreements, such holders agreed to convert an aggregate principal amount of $64.2 million of Convertible Notes held by them. The Company initially settled each $1,000 principal amount of Convertible Notes surrendered for conversion by delivering 14 shares of the Company’s common stock on April 18, 2016. In total, the Company issued an aggregate of 873,215 shares of its common stock on this initial closing date. In addition, pursuant to the Conversion Agreements, at the additional closings (as defined in the Conversion Agreements), the Company issued an aggregate of 363,551 shares of the Company’s common stock representing an aggregate of $27.7 million as additional payments in respect of the conversion of the Convertible Notes. The number of additional shares was determined based on the daily VWAP (as defined in the Conversion Agreements) of the Company’s common stock for each of the trading days in the 10-day trading period following the date of the Conversion Agreements. The issuance of 1,236,766 total shares of the Company’s common stock pursuant to the Conversion Agreements resulted in an increase to common stock and additional paid-in capital of $101.0 million.

As a result of the conversion, the Company recognized an overall loss on extinguishment of $14.6 million representing the difference between the total settlement consideration transferred to the holders that was attributed to the liability component of the Convertible Notes, based on the fair value of that component at the time of conversion, and the net carrying value of the liability. The loss on extinguishment was recorded as interest expense during the second quarter of 2016. The remaining settlement consideration transferred was allocated to the reacquisition of the embedded conversion option and recognized as a $39.8 million reduction of additional paid-in capital. Transaction costs incurred with third parties related to the conversion were allocated to the liability and equity components and resulted in an additional $0.2 million of interest expense and a $0.2 million reduction of additional paid-in capital.

The outstanding Convertible Notes will mature on July 15, 2020 (the "Maturity Date"), unless earlier repurchased by the Company or converted at the option of holders. Holders may convert their Convertible Notes at their option at any time prior to the close of business on the business day immediately preceding April 15, 2020 only under the following circumstances:

- during any calendar quarter commencing after September 30, 2013 (and only during such calendar quarter), if the last reported sale price of the Company's common stock for at least 20 trading days (whether or not consecutive) during a period of 30 consecutive trading days ending on the last trading day of the immediately preceding calendar quarter is greater than or equal to 130% of the conversion price on each applicable trading day;
- during the five business day period after any five consecutive trading day period (the "measurement period") in which the trading price (as defined in the Convertible Notes) per $1,000 principal amount of Convertible Notes for each trading day of the measurement period was less than 98% of the product of the last reported sale price of the Company's common stock and the conversion rate on each such trading day; or
- upon the occurrence of specified corporate events set forth in the Wells Fargo Indenture.

On or after April 15, 2020 until the close of business on the business day immediately preceding the Maturity Date, holders may convert their Convertible Notes at any time, regardless of the foregoing circumstances.

Following the repayment and satisfaction in full of the Company's obligations to Hercules under the Loan Agreement, which occurred in December 2015, upon any conversion of the Convertible Notes, the Convertible Notes may be settled, at the Company's election, in cash, shares of the Company's common stock or a combination of cash and shares of the Company's common stock.

The initial conversion rate of the Convertible Notes upon issuance in July 2013 was 160 shares of the Company's common stock per $1,000 principal amount of Convertible Notes, which was equivalent to an initial conversion price of $6.25 per share of common stock. As a result of the special cash dividend that was payable on May 26, 2017 to stockholders of record as of the close of business on May 17, 2017, the conversion rate of the Convertible Notes was adjusted from 160.0000 shares of the Company's common stock per $1,000 principal amount of Convertible Notes to 235.2112 shares of the Company's common stock per $1,000 principal amount of Convertible Notes. As a result of the one-for-ten reverse stock split of the Company's common stock effected on September 5, 2017, the conversion rate of the Convertible Notes was further adjusted from 235.2112 shares of the Company's common stock per $1,000 principal amount of Convertible Notes to 23.5210 shares of the Company's common stock per $1,000 principal amount of Convertible Notes. The conversion rate will be subject to further adjustment in some events, but will not be adjusted for any accrued and unpaid interest. In addition, following certain corporate events that occur prior to the Maturity Date, the Company will increase the conversion rate for a holder who elects to convert its Convertible Notes in connection with such a corporate event in certain circumstances.

Upon the occurrence of a fundamental change (as defined in the Wells Fargo Indenture) involving the Company, holders of the Convertible Notes may require the Company to repurchase all or a portion of their Convertible Notes for cash at a price equal to 100% of the principal amount of the Convertible Notes to be purchased, plus accrued and unpaid interest to, but excluding, the fundamental change repurchase date.

The Wells Fargo Indenture contains customary terms and covenants and events of default with respect to the Convertible Notes. If an event of default (as defined in the Wells Fargo Indenture) occurs and is continuing, the Convertible Notes Trustee by written notice to the Company, or the holders of at least 25% in aggregate principal amount of the Convertible Notes then outstanding by written notice to the Company and the Convertible Notes Trustee, may, and the Convertible Notes Trustee at the request of such holders will, declare 100% of the principal of and accrued and unpaid interest on the Convertible Notes to be due and payable. In the case of an event of default arising out of certain events of bankruptcy, insolvency or reorganization involving the Company or a significant subsidiary (as set forth in the Indenture), 100% of the principal of and accrued and unpaid interest on the Convertible Notes will automatically become due and payable. There were no events of default as of or during the years ended December 31, 2017 and 2016.

For the years ended December 31, 2017, 2016 and 2015, interest expense related to the Convertible Notes was $9.2 million, $22.7 million and $13.7 million, respectively. As discussed below, interest expense for the year ended December 31, 2017 includes a loss on extinguishment of $0.3 million associated with the October and November 2017 extinguishment as well as $3.5 million of transaction costs. As discussed above, interest expense for the year ended December 31, 2016 includes the loss on extinguishment of $14.6 million associated with the April 2016 conversion of the Convertible Notes as well as $0.2 million of related transaction costs.

In October and November 2017, the Company paid approximately $59.1 million, including $0.7 million for accrued and unpaid interest and $3.8 million of transaction costs, to purchase all of its remaining $60.8 million aggregate principal amount of outstanding Convertible Notes. The Company paid, in cash, an amount equal to $900 per $1,000 principal amount of Convertible Notes purchased, plus accrued and unpaid interest to, but not including, the date of purchase. A loss on extinguishment of $0.3 million was recognized in interest expense in the consolidated statement of operations and comprehensive income (loss) for year ended December 31, 2017. The $0.3 million loss on extinguishment represents the difference between the total settlement consideration transferred to the holders that was attributed to the liability component of the Convertible Notes, based on the fair value of that component at the time of settlement, and the net carrying value of the liability. The remaining settlement consideration transferred was allocated to the reacquisition of the embedded conversion option and recognized as a $4.2 million reduction of additional paid-in capital. Transaction costs incurred with third parties related to the conversion were allocated to the liability and equity components and resulted in an additional $3.5 million of interest expense and a $0.3 million reduction on additional paid-in capital.

Loan Agreement

In November 2012, the Company entered into the Loan Agreement with Hercules pursuant to which the Company received loans in the aggregate principal amount of $40.0 million. The Company, as permitted under the Loan Agreement, had previously extended the interest-only payment period with the aggregate principal balance of the loans to be repaid in monthly installments starting on June 1, 2014 and continuing through November 1, 2016. On June 25, 2014, the Company entered into an amendment to the Loan Agreement, whereby the Company and Hercules agreed to extend until October 1, 2014 the period during which the Company makes interest-only payments. On November 6, 2014, the Company entered into a further amendment to the Loan Agreement, whereby the Company and Hercules agreed to extend by four additional months the period during which the Company makes interest-only payments. On February 25, 2015, the Company entered into a fourth amendment to the Loan Agreement pursuant to which the Company and Hercules agreed to extend the maturity date and the period during which the Company makes interest-only payments on its current loans in the aggregate principal amount of $40.0 million. As a result of this amendment, the Company was required to repay the outstanding aggregate principal balance of the loan beginning on June 1, 2016 and continuing through November 1, 2018. As a result of the FDA's approval of the Company's new drug application for ONIVYDE, which occurred on October 22, 2015, the Company elected to extend the interest-only period by an additional six months such that the Company would repay the outstanding aggregate principal balance of the loans beginning on December 1, 2016 and continuing through November 1, 2018. This amendment was treated as a debt modification for accounting purposes.

Upon the earlier of full repayment of the loans or November 1, 2016, the Company was required to pay Hercules a fee of $1.2 million, which had been recorded as a discount to the loans and as a long-term liability on the Company's consolidated balance sheets. Additionally, the Company reimbursed Hercules for costs incurred related to the loans, which was reflected as a discount to the carrying value of the loans. The Company amortized these loan discounts totaling $1.6 million to interest expense over the term of the loans using the effective interest method.

In connection with the Loan Agreement, the Company granted Hercules a security interest in all of the Company's personal property now owned or hereafter acquired, excluding intellectual property but including the proceeds from the sale, if any, of intellectual property, and a negative pledge on intellectual property. The Loan Agreement also contained certain representations, warranties and non-financial covenants of the Company.

During the fourth quarter of 2015, the Company repaid the loans in full in conjunction with the issuance of the 2022 Notes. The total repayment amount included the $40.0 million in outstanding principal, the $1.2 million fee discussed above and interest accrued up through the repayment date. The Company assessed the repayment of the Loan Agreement with Hercules in conjunction with the issuance of the 2022 Notes, of which Hercules holds a portion, in accordance with the debt extinguishment and modification guidance per ASC 470, *Debt*. Based upon this assessment, the Company concluded that this transaction represented a debt modification, and accordingly, $0.3 million of unamortized debt issuance costs related to the Loan Agreement are being amortized as an adjustment of interest expense over the life of the 2022 Notes using the effective interest method. In addition, $0.9 million of debt issuance costs associated with the 2022 Notes were allocated to the modified Loan Agreement and expensed as a component of "Interest expense" on the consolidated statement of operations and comprehensive income (loss) for the year ended December 31, 2015.

For the year ended December 31, 2015, interest expense related to the Hercules loans was $5.4 million. No interest expense related to the Hercules loans was recognized during the years ended December 31, 2017 and 2016.

Credit Facility

On November 8, 2016, the Company entered into a Loan and Security Agreement (the "Credit Agreement") with BioPharma Credit Investments IV Sub, LP ("Pharmakon") pursuant to which a credit facility of an aggregate principal amount of at least $15.0 million and up to $25.0 million was available. If the Company borrowed under the Credit Agreement, the credit facility would have borne interest at an annual rate of 11.50%.

The Company had not borrowed any amounts under the Credit Agreement as of December 31, 2016 and, on April 27, 2017, the Credit Agreement expired.

Silver Creek Convertible Notes

In December 2012, the Company's then-majority owned subsidiary, Silver Creek, entered into a Note Purchase Agreement pursuant to which it issued convertible notes to various lenders in aggregate principal amounts of $1.6 million in December 2012, $0.9 million during the year ended December 31, 2013 and $1.0 million during the year ended December 31, 2014. The notes issued pursuant to the Note Purchase Agreement bore interest at 6% per annum. Upon issuance, these convertible notes contained a feature wherein if at any time prior to maturity Silver Creek entered into a qualifying equity financing, defined as a sale or series of related sales of equity securities prior to the maturity date and resulting in at least $4.0 million of gross proceeds, the notes would automatically convert into the next qualifying equity financing at a 25% discount. The Company determined that this convertible feature met the definition of a derivative and required separate accounting treatment. The derivative was estimated to be valued at $0.2 million using a probability-weighted model and was recorded as derivative liability on the consolidated balance sheets. For the year ended December 31, 2014, the derivative was remeasured upon conversion of the notes with the gain in remeasurement recognized in other income. The specific notes that were outstanding as of December 31, 2014 matured and converted, along with an immaterial amount of accrued interest into shares of Silver Creek Series A preferred stock on December 31, 2014.

In May 2016, Silver Creek issued an aggregate of $1.0 million of convertible notes (the "Silver Creek Notes"). In August 2016, Silver Creek issued $0.2 million of additional Silver Creek Notes under the same terms as the May 2016 issuance. The Silver Creek Notes were automatically convertible into shares of Silver Creek equity under a variety of conversion scenarios. The Silver Creek Notes bore interest at 6% per annum and were set to mature and convert, along with accrued interest, into Silver Creek Series B preferred stock at a conversion price of $1.35 per share on December 31, 2016. If, prior to maturity, Silver Creek entered into a sale or series of related sales of equity securities resulting in at least $4.0 million of gross proceeds, the Silver Creek Notes would convert into the equity securities sold at the lesser of the price paid per share for the equity securities or $1.60 per share. Principal and accrued interest related to the Silver Creek Notes were not permitted to be paid in cash by Silver Creek without the consent of a majority of the noteholders.

In December 2016, Silver Creek executed a Series C Preferred Stock and Warrant Purchase Agreement (the "Silver Creek Series C Agreement") whereby it agreed to sell 1.5 million shares of Silver Creek Series C preferred stock to new investors at a purchase price of $1.50 per share. In connection with this financing, holders of the Silver Creek Notes agreed to convert all principal and accrued interest associated with the Silver Creek Notes into 0.8 million shares of Silver Creek Series C preferred stock at a conversion price of $1.50 per share.

New purchasers of the Silver Creek Series C preferred stock also received warrants to purchase an aggregate of 1.9 million shares of Silver Creek Series C preferred stock at a future date. The exercise price of the warrants varies based upon the achievement of certain milestone events defined in the related warrant agreements. Milestone Event 1 is defined as the date that is seven business days following the acceptance by the FDA of Silver Creek's filing of an investigational new drug application ("IND"), or 30 business days after the IND is filed without FDA rejection of the application. Milestone Event 2 is defined as the date that is seven business days following the date when Silver Creek completes a Phase 1 clinical trial, provided that if Silver Creek receives proceeds of less than $4.0 million pursuant to the sale of Series C preferred stock, Milestone Event 2 means the date that is seven business days following the first dose in humans in a clinical trial.

Of the warrants to purchase 1.9 million shares of Silver Creek Series C preferred stock that were issued, warrants to purchase 1.2 million shares of Silver Creek Series C preferred stock are exercisable at an exercise price of $1.75 per share if the warrant is exercised prior to the date that is 30 business days after the date that the holder receives notice from Silver Creek of the achievement of Milestone Event 1, or $2.25 per share if the warrant is exercised on or after the date that is 30 business days after the holder receives notice from Silver Creek of the achievement of Milestone Event 1. The remaining warrants to purchase 0.7 million shares of Silver Creek Series C preferred stock are exercisable at an exercise price of $2.25 per share if the warrant is exercised prior to the date that is 30 business days after the date that the holder receives notice from Silver Creek of the achievement of Milestone Event 2, or $2.75 per share if the warrant is exercised on or after the date that is 30 business days after Milestone Event 2. All warrants to purchase Silver Creek Series C preferred stock are exercisable until the earliest of (i) the consummation of a Silver Creek liquidation event, (ii) the consummation of an initial public offering of Silver Creek common stock, (iii) four months after the achievement of Milestone Event 2 or (iv) seven years from the date of issuance.

The warrants to purchase Silver Creek Series C preferred stock were classified as a current liability in accordance with ASC 480, *Distinguishing Liabilities from Equity*, and initially measured at fair value, as described more fully in Note 6, "Fair Value of Financial Instruments." The fair value of the warrants was deducted from the total Silver Creek Series C preferred stock proceeds received by Silver Creek, and the remaining proceeds received were allocated to the Silver Creek Series C preferred stock.

The Company has no future payments under any borrowings.

12. Restructuring Activities

On October 3, 2016, the Company announced a 22% reduction in headcount as part of a major corporate restructuring with the objective of prioritizing its research and development on a focused set of systems biology-derived oncology products and strengthening its financial runway. On this same date, the Company also announced the resignation of Robert Mulroy, the Company's former President and Chief Executive Officer.

Under this corporate restructuring, the Company recognized total restructuring expenses of $5.7 million for the year ended December 31, 2016, which was related to stock-based compensation expense for certain terminated employees, contractual termination benefits for employees with pre-existing severance arrangements and one-time employee termination benefits. These one-time employee termination benefits were comprised of severance, benefits and related costs, all of which resulted in cash expenditures during the third and fourth quarters of 2016.

On January 8, 2017, the Company announced a reduction in headcount by approximately 30% in connection with the Asset Sale and the completion of its strategic pipeline review. Upon the closing of the Asset Sale and the completion of its strategic pipeline review, the Company had approximately 80 employees.

Under this corporate restructuring, the Company recognized total restructuring expenses of $9.5 million for the year ended December 31, 2017, which was related to contractual termination benefits for employees with pre-existing severance arrangements. These one-time employee termination benefits are comprised of severance, benefits and related costs, all of which are expected to result in cash expenditures. The majority of these payments were made during the second quarter of 2017. The remaining payments represent severance payments that will be paid over one year. The expense of $9.5 million was included as a component of income from discontinued operations, net of tax in the consolidated statements of operations and comprehensive income (loss), as the costs are directly associated with the Asset Sale.

The following table summarizes the charges related to the restructuring activities as of December 31, 2017 and 2016:

(in thousands)	Accrued Restructuring Expenses at December 31, 2016	Expenses	Less: Payments	Accrued Restructuring Expenses at December 31, 2017
Severance, benefits and related costs due to workforce reduction	$ 774	$ 9,521	$ (9,667)	$ 628
Totals	$ 774	$ 9,521	$ (9,667)	$ 628

(in thousands)	Expenses	Less: Payments	Less: Non-Cash Expenses	Accrued Restructuring Expenses at December 31, 2016
Severance, benefits and related costs due to workforce reduction	$ 5,710	$ (3,565)	$ (1,371)	$ 774
Totals	$ 5,710	$ (3,565)	$ (1,371)	$ 774

13. Common Stock

In July 2015, the Company entered into a Sales Agreement with Cowen and Company, LLC ("Cowen") to sell shares of the Company's common stock having an aggregate sales price of up to $40.0 million through an "at the market offering" program under which Cowen acted as the sales agent. The Company concluded sales under this program in September 2015, having sold approximately 0.4 million shares of common stock and generating approximately $38.6 million in net proceeds, after deducting commissions and offering expenses.

As of December 31, 2017 and 2016, the Company had 20.0 million shares of $0.01 par value common stock authorized. There were approximately 13.3 million and 13.0 million shares of common stock issued and outstanding as of December 31, 2017 and 2016, respectively.

14. Stock-Based Compensation

In 2008, the Company adopted the 2008 Stock Incentive Plan (as amended, the “2008 Plan”) for employees, officers, directors, consultants and advisors. The 2011 Stock Incentive Plan (the “2011 Plan”) became effective upon closing of the Company’s initial public offering in April 2012. Upon effectiveness of the 2011 Plan, no further awards were available to be issued under the 2008 Plan. The 2011 Plan is administered by the Board of Directors of the Company and permits the Company to grant incentive and non-qualified stock options, stock appreciation rights, restricted stock, restricted stock units and other stock-based awards. Additional shares also become available for grant by reason of the forfeiture, cancellation, expiration or termination of existing awards. The Company registered 0.4 million, 0.4 million and 0.4 million of additional shares of common stock related to the 2011 Plan in February 2016, February 2015 and March 2014, respectively. As of December 31, 2017, there were 0.4 million shares remaining available for grant under the 2011 Plan.

The Board of Directors authorized and declared a special cash dividend of $140.0 million on the Company's common stock, which was payable on May 26, 2017 to stockholders of record as of the close of business on May 17, 2017. The Board of Directors determined, in accordance with the adjustment provision of each of the Company’s 1999 Stock Option Plan, as amended, the 2008 Plan and the 2011 Plan (collectively, the “Equity Plans”), that the special cash dividend was unusual and non-recurring and that appropriate adjustment to the stock options to purchase shares of the Corporation’s common stock outstanding under the Equity Plans was required. The Company treated this adjustment as a modification to the original stock option grant because the terms of the agreements were modified in order to preserve the value of the option awards after a large non-recurring cash dividend. The calculation of the incremental compensation expense is based on the excess of the fair value of the award measured immediately before and after the modification. As a result, the Company recognized an incremental compensation expense of $6.9 million associated with the modification that occurred for the year ended December 31, 2017.

On August 11, 2017, the Company’s stockholders approved an amendment to the Company's certificate of incorporation to effect the Reverse Split. On September 5, 2017, the Company filed an amendment to its certificate of incorporation to effect the Reverse Split, and on September 6, 2017, the Reverse Split was effective for trading purposes. As a result of the Reverse Split, every ten shares of common stock issued and outstanding was converted into one share of common stock, reducing the number of issued and outstanding shares of common stock from approximately 132.8 million shares to approximately 13.28 million shares. No fractional shares were issued in connection with the Reverse Split. The amendment to the certificate of incorporation also proportionately reduced the number of authorized shares of common stock from 200 million to 20 million. The Reverse Split did not change the par value of the common stock. The Reverse Split did not change the number of authorized shares or par value of the Company’s preferred stock, of which there are no shares issued or outstanding. All outstanding stock options and Convertible Notes entitling their holders to purchase shares of common stock or acquire shares of common stock upon conversion, as the case may be, were adjusted as a result of the Reverse Split, as required by the terms of these securities.

During the years ended December 31, 2017, 2016 and 2015, the Company issued options to purchase 2.1 million, 0.4 million and 0.4 million shares of common stock, respectively. These options generally vest over a three-year period for employees. Options granted to directors generally vest immediately.

The fair value of stock options granted to employees during the years ended December 31, 2017, 2016 and 2015 was estimated at the date of grant using the following assumptions:

	Years Ended December 31,		
	2017	2016	2015
Risk-free interest rate	1.7 – 2.2%	1.1 – 2.0%	1.5 – 1.8%
Expected dividend yield	0%	0%	0%
Expected term	5.0 – 6.1 years	5.0 – 5.8 years	5.0 – 5.9 years
Expected volatility	64 – 68%	67 – 69%	66 – 67%

The Company uses the simplified method to calculate the expected term, as it does not have sufficient historical exercise data to provide a reasonable basis upon which to estimate the expected term of its stock options. Under this approach, the expected term is calculated to be the average of the ten-year contractual term of the option and the weighted-average vesting term of the option, taking into consideration multiple vesting tranches. The computation of expected volatility is based on the historical volatility of comparable companies from a representative peer group selected based on industry and market capitalization. The risk-free interest rate is based on a treasury instrument whose term is consistent with the expected life of the stock options. Management estimates expected forfeitures based on historical experience and recognizes compensation costs only for those equity awards expected to vest.

The Company recognized stock-based compensation expense during the years ended December 31, 2017, 2016 and 2015 as follows:

	Years Ended December 31,		
(in thousands)	2017	2016	2015
Employee awards:			
Research and development expense	$ 6,902	$ 6,083	$ 7,711
General and administrative expense	5,886	4,685	5,392
Restructuring expense	—	1,371	—
Stock-based compensation expense for employee awards	12,788	12,139	13,103
Stock-based compensation expense for non-employee awards	—	1	58
Total stock-based compensation expense	$ 12,788	$ 12,140	$ 13,161

The following table summarizes stock option activity during the year ended December 31, 2017:

(in thousands, except per share amounts)	Options	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term (in years)	Aggregate Intrinsic Value
Outstanding at December 31, 2016	1,902	$ 57.70	5.97	$ 7,564
Granted	2,111	$ 23.69		
Exercised	(323)	$ 20.70		
Forfeited	(2,074)	$ 56.60		
Outstanding at December 31, 2017	1,616	$ 22.07	6.65	$ 60,031
Vested and expected to vest at December 31, 2017	1,615	$ 22.07	6.64	$ 60,031
Exercisable at December 31, 2017	996	$ 26.43	4.96	$ 59,689

The weighted-average grant date fair value of stock options granted during the years ended December 31, 2017, 2016 and 2015 was $4.07, $58.00 and $34.10, respectively.

The aggregate intrinsic value was calculated as the difference between the exercise price of the stock options and the fair value of the underlying common stock. The aggregate intrinsic value of options exercised during the years ended December 31, 2017, 2016 and 2015 was $2.4 million, $5.6 million and $30.9 million, respectively.

As of December 31, 2017, there was $5.0 million of total unrecognized stock-based compensation expense related to unvested employee stock options. The Company expects to recognize this expense over a weighted-average period of approximately 2.58 years.

15. Income Taxes

2017 U.S. Tax Reform

On December 22, 2017, President Trump signed into law the Tax Cuts and Jobs Act (the "TCJA") that significantly reforms the Internal Revenue Code of 1986, as amended (the "Internal Revenue Code"). The TCJA, among other things, contains significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, effective as of January 1, 2018; limitation of the tax deduction for interest expense; limitation of the deduction for net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks, in each case, for losses arising in taxable years beginning after December 31, 2017 (though any such tax losses may be carried forward indefinitely); modifying or repealing many business deductions and credits, including reducing the business tax credit for certain clinical testing expenses incurred in the testing of certain drugs for rare diseases or conditions generally referred to as "orphan drugs"; and repeal of the federal Alternative Minimum Tax ("AMT").

The staff of the Securities and Exchange Commission issued Staff Accounting Bulletin No. 118 to address the application of GAAP in situations when a registrant does not have the necessary information available, prepared or analyzed (including computations) in reasonable detail to complete the accounting for certain income tax effects of the TCJA. In connection with the initial analysis of the impact of the TCJA, the Company remeasured its deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, which is generally 21%. The remeasurement of the Company's deferred tax assets and liabilities was offset by a change in the valuation allowance.

The Company is still in the process of analyzing the impact to the Company of the TCJA. Where the Company has been able to make reasonable estimates of the effects related to which its analysis is not yet complete, the Company has recorded provisional amounts. The ultimate impact to the Company's consolidated financial statements of the TCJA may differ from the provisional amounts due to, among other things, additional analysis, changes in interpretations and assumptions the Company has made, additional regulatory guidance that may be issued, and actions the Company may take as a result of the TCJA. The accounting is expected to be complete when the Company's 2017 U.S. corporate income tax return is filed in 2018.

Income Taxes

The Company completed the Asset Sale and recorded the income tax implications of the sale in the second quarter of 2017. The Asset Sale generated taxable income for the Company, which has resulted in income tax expense. The Company released a portion of its valuation allowance in the year ended December 31, 2017, as it is now able to utilize its net operating loss carryforwards to offset the taxable income generated from the Asset Sale. The Company's current income tax expense for the year ended December 31, 2017 is $4.2 million, which is comprised of federal AMT of $0.3 million and state income tax of $3.9 million.

Intraperiod tax allocation rules require the Company to allocate the provision for income taxes between continuing operations and other categories of earnings, such as discontinued operations. In periods in which there is pre-tax loss from continuing operations and pre-tax income in other categories of earnings, such as discontinued operations, the Company must allocate to continuing operations an income tax benefit for the loss in continuing operations with an offsetting income tax expense to discontinued operations.

For the years ended December 31, 2017, 2016 and 2015, the Company recognized an income tax benefit of $42.4 million, $13.2 million and $11.2 million, respectively, in continuing operations and income tax expense in discontinued operations of $46.6 million, $13.2 million and $11.2 million, respectively.

A reconciliation of the Company's effective tax rate to the statutory federal income tax rate is as follows:

	Years Ended December 31,		
	2017	2016	2015
Federal income tax at statutory federal rate	35.0%	35.0%	35.0%
State taxes	1.7	0.6	1.2
Permanent differences	(3.0)	(6.3)	(2.4)
Stock-based compensation	(7.2)	(1.5)	(1.0)
Tax Cuts and Jobs Act impact	(19.9)	—	—
Tax credits	11.6	12.6	9.0
Change in deferred state tax rate	7.7	(0.3)	(1.9)
Other	0.3	3.7	(0.5)
Change in valuation allowance	9.9	(36.0)	(32.5)
Total	36.1%	7.8%	6.9%

Temporary differences that give rise to significant net deferred tax assets as of December 31, 2017 and 2016 are as follows:

	December 31,	
(in thousands)	**2017**	**2016**
Deferred tax assets		
Net operating losses	$ 43,133	$ 194,027
Capitalized research and development expenses	847	15,854
Credit carryforwards	164,709	144,823
Depreciation	2,605	2,557
Deferred compensation	5,855	12,463
Accrued expenses	905	3,601
Deferred revenue	—	21,935
Other temporary differences	2,145	25,276
Installment sale tax basis	15,868	—
Total gross deferred tax assets	236,067	420,536
Valuation allowance	(236,067)	(414,558)
Net deferred tax assets	—	5,978
Deferred tax liabilities		
Intangible assets	—	(1,428)
Debt discount	—	(4,550)
Net deferred taxes	$ —	$ —

At December 31, 2017, the Company had net operating loss carryforwards for federal and state income tax purposes of $138.1 million and $223.4 million, respectively. In March 2016, the FASB issued ASU No. 2016-09, “Compensation - Stock Compensation (Topic 718),” effective for annual periods beginning after December 15, 2016. The guidance changes how companies account for certain aspects of share-based payments to employees. Entities will be required to recognize income tax effects of awards in the income statement when the awards vest or are settled. In accordance with the updated guidance, the Company has increased the federal and state net operating loss carryforwards by approximately $39.2 million and $25.2 million, respectively, for the deductions related to the exercise of stock options. The Company's existing federal and state net operating loss carryforwards begin to expire 2028 through 2036. The Company also had available research and development credits for federal and state income tax purposes of approximately $28.8 million and $18.7 million, respectively. The federal and state research and development credits will begin to expire in 2022 and 2026, respectively. As of December 31, 2017, the Company also had available investment tax credits for state income tax purposes of $0.4 million, which began to expire in 2018 and will continue to expire through 2020 if they are not utilized. The Company has orphan drug credits of $120.8 million, which begin to expire in 2031.

Utilization of the net operating loss and tax credit carryforwards may be subject to a substantial annual limitation under Section 382 of the Internal Revenue Code due to ownership change limitations that have occurred previously or that could occur in the future. These ownership changes may limit the amount of net operating loss and tax credit carryforwards that can be utilized annually to offset future taxable income and tax. The Company completed an evaluation of ownership changes through December 31, 2017 to assess whether utilization of the Company’s net operating loss or tax credit carryforwards would be subject to an annual limitation under Section 382 of the Internal Revenue Code. The Company believes it can utilize all of its existing tax attributes as a result of the analysis. To the extent an ownership change occurs in the future, the net operating loss and tax credit carryforwards may be subject to limitation.

The Company has not, as of yet, conducted a study of its domestic research and development credit carryforwards and orphan drug credits. This study may result in an increase or decrease to the Company's credit carryforwards; however, until a study is completed and any adjustment is known, no amounts are being presented as an uncertain tax position. A full valuation allowance has been provided against the Company's credits, and if an adjustment is required, this adjustment would be offset by an adjustment to the valuation allowance. As a result, there would be no impact to the statement of operations and comprehensive loss, balance sheet or cash flows if an adjustment were required.

In the second quarter of 2017, when the Asset Sale was consummated, the Company determined that it would utilize a portion of its deferred tax assets to offset the income generated from the Asset Sale and released a portion of its valuation allowance. As of December 31, 2017, the Company has evaluated the positive and negative evidence bearing upon the realizability of its remaining deferred tax assets, which are comprised principally of net operating loss carryforwards and research and development credits. Under the applicable accounting standards, management has considered the Company's history of losses and concluded that it is more likely than not that the Company will not recognize the benefits of its deferred tax assets. Accordingly, a full valuation allowance has been established against the deferred tax assets. The change in the valuation allowance against the deferred tax assets in the years ended December 31, 2017, 2016 and 2015 was as follows:

(in thousands)	Balance at Beginning of Period	Additions	Deductions	Balance at End of Period
December 31, 2015	$ 257,489	$ 69,088	$ —	$ 326,577
December 31, 2016	326,577	87,981	—	414,558
December 31, 2017	414,558	66,801	(245,292)	236,067

The change in the valuation allowance in in the year ended December 31, 2017 primarily relates to the release of the valuation allowance as a result of the net operating loss utilization of $217.8 million to offset the gain on the sale of the Commercial Business. The change in valuation allowance also includes a net decrease of $27.5 million related to the impact of the TCJA. Additions to the table above relate to losses generated in the current period.

16. Commitments and Contingencies

Operating Leases

The Company leases its office, laboratory and manufacturing space under non-cancelable operating leases. During August 2012, the Company entered into an Indenture of Lease (the “Amended Lease”), which amended and restated its facility lease. The Amended Lease will terminate on June 30, 2019. In accordance with all related amendments, the Company leases in total approximately 112,300 square feet at its corporate headquarters located at One Kendall Square in Cambridge, Massachusetts.

As part of the Amended Lease and subsequent amendments, the landlord agreed to reimburse the Company for a portion of tenant improvements made to the facility. As of December 31, 2016, the Company had received $9.5 million of tenant improvement reimbursements. Tenant improvement reimbursements are recorded within deferred rent and are amortized over the term of the lease as reductions to rent expense.

In May 2016, the Company entered into a sublease agreement (the “Sublease”) whereby a subtenant agreed to lease 8,143 square feet of office and lab space from the Company. The Sublease terminates on June 30, 2019. Rental income received from the subtenant has been classified by the Company as reduction of rent expense. Total future minimum rental payments to be received by the Company from the subtenant as of December 31, 2017 are $0.4 million.

In connection with the completion of the Asset Sale, on April 3, 2017, the Company entered into a sublease with Ipsen, pursuant to which Ipsen is subleasing approximately 70,237 square feet of space in the Company’s Cambridge, Massachusetts facility through the end of the term of the lease on June 30, 2019.

Total rent expense was $3.6 million, $5.0 million and $4.3 million for the years ended December 31, 2017, 2016 and 2015, respectively.

Future minimum lease commitments on non-cancelable operating leases and scheduled sublease payments as of December 31, 2017 are as follows:

Years ended December 31,	Gross Payments	Scheduled Sublease Payments	Net Payments
2018	$ 7,438	$ 4,016	$ 3,422
2019	3,753	2,195	1,558
Total future minimum lease payments	$ 11,191	$ 6,211	$ 4,980

17. Related Party Transactions

Related parties of the Company held approximately 4%, 7% and 7% of the outstanding shares of Silver Creek Series A and Series B preferred stock as of December 31, 2017, 2016 and 2015, respectively. No shares of Silver Creek Series C preferred stock issued during 2017 or 2016 were held by related parties of the Company as of December 31, 2017, 2016 or 2015.

18. Retirement Plan

On May 31, 2002, the Company established a 401(k) defined contribution savings plan (the "401(k) Plan") for its employees who meet certain service period and age requirements. Contributions are permitted up to the maximum allowed under the Internal Revenue Code of each covered employee's salary. The 401(k) Plan permits the Company to contribute at its discretion. For the years ended December 31, 2017, 2016 and 2015, the Company made contributions of $0.8 million, $1.3 million and $1.1 million, respectively, to the 401(k) Plan.

19. Selected Quarterly Financial Data (Unaudited)

The following table contains quarterly financial information for 2017 and 2016. The Company believes that the following information reflects all normal recurring adjustments necessary for a fair statement of the information for the periods presented. The operating results for any quarter are not necessarily indicative of results for any future period.

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(in thousands, except per share data)			
2017				
Research and development expenses	21,605	19,751	13,598	12,360
General and administrative expenses	5,634	14,798	3,366	4,654
Restructuring expenses	—	—	—	—
Net loss from continuing operations	(29,206)	(29,646)	(5,323)	(11,829)
(Loss) income from discontinued operations, net of tax	(947)	540,485	8,456	(1,122)
Net (loss) income	(30,153)	510,839	3,133	(12,951)
Net (loss) income attributable to Merrimack Pharmaceuticals, Inc.	(29,686)	511,563	3,102	(12,951)
Basic and dilutive net (loss) income per common share				
Net loss from continuing operations	(2.20)	(2.18)	(0.40)	(0.89)
Net (loss) income from discontinued operations, net of tax	(0.07)	40.80	0.64	(0.08)
Net (loss) income per share	(2.27)	38.62	0.24	(0.97)

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(in thousands, except per share data)			
2016				
Research and development expenses	28,002	27,695	28,247	25,621
General and administrative expenses	6,452	8,138	6,448	11,014
Restructuring expenses	—	—	809	4,901
Net loss from continuing operations	(37,715)	(51,633)	(26,845)	(40,091)
(Loss) income from discontinued operations, net of tax	(943)	675	(3,430)	6,464
Net loss	(38,658)	(50,958)	(30,275)	(33,627)
Net loss attributable to Merrimack Pharmaceuticals, Inc.	(38,473)	(50,750)	(30,068)	(32,449)
Basic and dilutive net (loss) income per common share				
Net loss from continuing operations	(3.23)	(4.07)	(2.06)	(2.93)
Net (loss) income from discontinued operations, net of tax	(0.08)	0.05	(0.27)	0.43
Net loss per share	(3.31)	(4.02)	(2.33)	(2.50)

MERRIMACK PHARMACEUTICALS

PO BOX 43004, Providence, RI 02940-3004

MR A SAMPLE
DESIGNATION (IF ANY)
ADD 1
ADD 2
ADD 3
ADD 4

CUSIP			XXXXXX XX X
Holder ID			XXXXXXXXXX
Insurance Value			1,000,000.00
Number of Shares			123456
DTC	12345678		123456789012345
Certificate Numbers	**Num/No.**	**Denom.**	**Total**
1234567890/1234567890	1	1	1
1234567890/1234567890	2	2	2
1234567890/1234567890	3	3	3
1234567890/1234567890	4	4	4
1234567890/1234567890	5	5	5
1234567890/1234567890	6	6	6
Total Transaction			7

ZQ|CERT#|COY|CLS|RGSTRY|ACCT#|TRANSTYPE|RUN#|TRANS#

COMMON STOCK **COMMON STOCK**

$0.01 PAR VALUE PER SHARE

Certificate Number
ZQ00000000

Shares
000000********************

MERRIMACK PHARMACEUTICALS

MERRIMACK PHARMACEUTICALS, INC.

INCORPORATED UNDER THE LAWS OF THE STATE OF DELAWARE

SEE REVERSE FOR CERTAIN DEFINITIONS

CUSIP 590328 20 9

THIS CERTIFIES THAT MR. SAMPLE & MRS. SAMPLE & MR. SAMPLE & MRS. SAMPLE

is the owner of ***ZERO HUNDRED THOUSAND ZERO HUNDRED AND ZERO***

THIS CERTIFICATE IS TRANSFERABLE IN CITIES DESIGNATED BY THE TRANSFER AGENT, AVAILABLE ONLINE AT www.computershare.com

FULLY-PAID AND NON-ASSESSABLE SHARES OF THE COMMON STOCK OF

Merrimack Pharmaceuticals, Inc. (the "Company"), transferable on the books of the Company in person or by duly authorized attorney, upon surrender of this Certificate properly endorsed. This Certificate and the shares represented hereby are issued and shall be held subject to all of the provisions of the Certificate of Incorporation and the Bylaws of the Company, each as amended and/or restated from time to time (copies of which are on file with the Company and the Transfer Agent), to all of which each holder, by acceptance hereof, assents. This Certificate is not valid unless countersigned and registered by the Transfer Agent and Registrar.

Witness the facsimile seal of the Company and the facsimile signatures of its duly authorized officers.

DATED DD-MMM-YYYY

Richard Peters
President

Treasurer

MERRIMACK PHARMACEUTICALS, INC.
CORPORATE SEAL
2010
DELAWARE

COUNTERSIGNED AND REGISTERED:
COMPUTERSHARE TRUST COMPANY, N.A.
TRANSFER AGENT AND REGISTRAR,

By ____________________
AUTHORIZED SIGNATURE

SECURITY INSTRUCTIONS ON REVERSE

1234567

MERRIMACK PHARMACEUTICALS, INC.

THE COMPANY WILL FURNISH WITHOUT CHARGE TO EACH STOCKHOLDER WHO SO REQUESTS A SUMMARY OF THE POWERS, DESIGNATIONS, PREFERENCES AND RELATIVE, PARTICIPATING, OPTIONAL OR OTHER SPECIAL RIGHTS OF EACH CLASS OF STOCK OF THE COMPANY AND THE QUALIFICATIONS, LIMITATIONS OR RESTRICTIONS OF SUCH PREFERENCES AND RIGHTS, AND THE VARIATIONS IN RIGHTS, PREFERENCES AND LIMITATIONS DETERMINED FOR EACH SERIES, WHICH ARE FIXED BY THE CERTIFICATE OF INCORPORATION OF THE COMPANY, AS AMENDED AND/OR RESTATED FROM TIME TO TIME, AND THE RESOLUTIONS OF THE BOARD OF DIRECTORS OF THE COMPANY, AND THE AUTHORITY OF THE BOARD OF DIRECTORS TO DETERMINE VARIATIONS FOR FUTURE SERIES. SUCH REQUEST MAY BE MADE TO THE OFFICE OF THE SECRETARY OF THE COMPANY OR TO THE TRANSFER AGENT. THE OWNER OF A LOST OR DESTROYED STOCK CERTIFICATE, OR HIS LEGAL REPRESENTATIVES, MAY BE REQUIRED TO GIVE THE COMPANY A BOND TO INDEMNIFY IT AND ITS TRANSFER AGENTS AND REGISTRARS AGAINST ANY CLAIM THAT MAY BE MADE AGAINST THEM ON ACCOUNT OF THE ALLEGED LOSS OR DESTRUCTION OF ANY SUCH CERTIFICATE.

The following abbreviations, when used in the inscription on the face of this certificate, shall be construed as though they were written out in full according to applicable laws or regulations:

TEN COM	- as tenants in common	UNIF GIFT MIN ACT	- .... (Cust) .... Custodian .... (Minor) ....
TEN ENT	- as tenants by the entireties		under Uniform Gifts to Minors Act .... (State)
JT TEN	- as joint tenants with right of survivorship and not as tenants in common	UNIF TRF MIN ACT	- .... (Cust) .... Custodian (until age ....) .... (Minor) .... under Uniform Transfers to Minors Act .... (State)

Additional abbreviations may also be used though not in the above list.

PLEASE INSERT SOCIAL SECURITY OR OTHER IDENTIFYING NUMBER OF ASSIGNEE

For value received, ______________________ hereby sell, assign and transfer unto

(PLEASE PRINT OR TYPEWRITE NAME AND ADDRESS, INCLUDING POSTAL ZIP CODE, OF ASSIGNEE)

____ Shares

of the common stock represented by the within Certificate, and do hereby irrevocably constitute and appoint

____ Attorney

to transfer the said stock on the books of the within-named Company with full power of substitution in the premises.

Dated: ______________________ 20 __________

Signature: ______________________

Signature: ______________________

Notice: The signature to this assignment must correspond with the name as written upon the face of the certificate, in every particular, without alteration or enlargement, or any change whatever.

Signature(s) Guaranteed: Medallion Guarantee Stamp

THE SIGNATURE(S) SHOULD BE GUARANTEED BY AN ELIGIBLE GUARANTOR INSTITUTION (Banks, Stockbrokers, Savings and Loan Associations and Credit Unions) WITH MEMBERSHIP IN AN APPROVED SIGNATURE GUARANTEE MEDALLION PROGRAM, PURSUANT TO S.E.C. RULE 17Ad-15.

SECURITY INSTRUCTIONS

THIS IS WATERMARKED PAPER. DO NOT ACCEPT WITHOUT NOTING WATERMARK. HOLD TO LIGHT TO VERIFY WATERMARK.

The IRS requires that we report the cost basis of certain shares acquired after January 1, 2011. If your shares were covered by the legislation and you have sold or transferred the shares and requested a specific cost basis calculation method, we have processed as requested. If you did not specify a cost basis calculation method, we have defaulted to the first in, first out (FIFO) method. Please visit our website or consult your tax advisor if you need additional information about cost basis.

If you do not keep in contact with us or do not have any activity in your account for the time periods specified by state law, your property could become subject to state unclaimed property laws and transferred to the appropriate state.

Exhibit 10.11

MERRIMACK PHARMACEUTICALS, INC.

SCIENTIFIC ADVISORY BOARD
CONSULTING AND CONFIDENTIALITY AGREEMENT

This Scientific Advisory Board Consulting and Confidentiality Agreement (this "Agreement") is entered into as of the latest dated signature on the signature page hereto (the "Effective Date") by and between Merrimack Pharmaceuticals, Inc., a Delaware corporation (the "Company"), and George D. Demetri, M.D. (the "Consultant").

WHEREAS, the Company desires to have the Consultant serve on, and the Consultant desires to be a member of, the Scientific Advisory Board of the Company (the "SAB") and provide consulting services to the Company in such capacity, all as hereinafter provided in this Agreement.

NOW, THEREFORE, in consideration of the promises and mutual agreements hereinafter set forth, the sufficiency of which are hereby acknowledged, the Company and the Consultant hereby agree as follows:

Section 1. Services.

(a) Services; Performance. The Consultant shall serve under the terms of this Agreement as an advisor to the Company as a member of the SAB, including without limitation the rendering of the services described in Exhibit A (and, for any subsequent periods of service as a member of the SAB, as may be described in additional exhibits to this Agreement (each, an "Exhibit")), and shall provide such other consulting and advisory services as the Company may reasonably request from time to time (collectively, the "Services"). Each Exhibit shall describe in reasonable detail the Services to be provided, the fee to be paid for performance of the Services, and the time during which the Services shall be performed. The Consultant shall perform such Services in a professional manner and consistent with the highest industry standards at the Company's Cambridge, Massachusetts location and at such other reasonable places and at such reasonable times as the Company may from time to time request. The Consultant shall comply with all rules, procedures and standards promulgated from time to time by the Company and that are provided to Consultant with respect to the Consultant's access to and use of the Company's property, information, equipment and facilities in the course of the Consultant's provision of Services hereunder.

(b) Non-Exclusive. The parties agree that the Consultant shall provide the Company with the Services on a non-exclusive basis, and that, at all times during the term of this Agreement, the Consultant shall be free to provide, and the Company shall be free to obtain, consulting and advisory services to/from any third party, so long as the provision of such services does not conflict with or breach the Consultant's obligations described in Sections 5 through 8.

(c) Affiliation with Dana-Farber Cancer Institute. This Agreement is subject to the understanding that Consultant is employed at the Dana-Farber Cancer Institute ("DFCI") and that Consultant's provision of Services hereunder is subject to The Dana-Farber Cancer Institute Standard Consulting Agreement Provisions ("Standard Provisions"), which are attached hereto as Exhibit B and incorporated herein by reference. The parties agree to abide by such Standard Provisions and further agree that if any term in this Agreement is inconsistent with any term in the Standard Provisions, the terms of the Standard Provisions shall govern and prevail. The terms of the Standard Provisions shall survive the expiration or earlier termination of this Agreement.

Section 2. Compensation and Reimbursement.

(a) Compensation. As consideration for the performance of Services by the Consultant hereunder, the Company shall compensate the Consultant as described in the applicable Exhibit. The parties agree that such compensation represents the fair market value of the Services, negotiated in an arm's-length transaction, and has not been determined in a manner which takes into account the volume or value of referrals or business, if any, that may be generated between the Company and Consultant. Nothing contained in this Agreement shall be construed in any manner as an obligation or inducement for Consultant to refer or recommend any product manufactured or distributed by the Company.

(b) Expense Reimbursement. The Company shall reimburse the Consultant for all reasonable out-of-pocket expenses incurred by the Consultant in connection with the performance of the Services under this Agreement, so long as they are approved in writing and in advance by the Company. Such expenses include, by way of example, coach-class travel, lodging, transportation and long distance telephone charges. The Company shall also reimburse the Consultant for any unusual expenses incurred at the request, and with the prior approval, of the Company. The Consultant shall submit to the Company itemized statements of the expenses incurred, including appropriate and reasonable documentation, within thirty (30) days after such expenses are incurred. The Company shall reimburse the Consultant for such documented expenses within thirty (30) days after receipt of such itemized statement. The Consultant shall keep full, true and accurate books of account and other records containing all particulars that may be necessary to ascertain properly and verify the fees and expenses paid pursuant to this Agreement. During the term of this Agreement, and for one (1) year thereafter, the Company or its representatives shall have the right to inspect, during regular business hours, said books of account and other records for purposes of verifying such fees and expenses, provided, however, in no event will such inspection take place on Consultant's employer's premises (DFCI).

(c) No Employee Benefits. The Consultant shall not be entitled to any benefits, coverages or privileges, including without limitation social security, unemployment, medical or pension payments, made available to employees of the Company.

Section 3. Term and Termination.

(a) Consultation Period. Subject to the terms and conditions hereinafter set forth, the term of this Agreement shall expire upon termination or expiration of the term of the Consultant's consulting arrangement with the Company hereunder (the "Consultation Period"), which Consultation Period shall commence on the Effective Date and shall, unless earlier terminated, continue until the later of (i) December 31, 2018, (ii) the final date of the latest term described in any effective Exhibit hereto, or (iii) as otherwise provided by mutual written agreement of both parties. Notwithstanding the foregoing, the Consultation Period shall automatically terminate upon the death, physical incapacitation or mental incompetence of the Consultant.

(b) Termination by the Company.

(i) The Company may terminate the Consultation Period, with or without cause, upon thirty (30) days' prior written notice to the Consultant.

(ii) Notwithstanding the foregoing, the Company may terminate the Consultation Period, effective immediately upon the Consultant's receipt of written notice, if (A) the Company determines, in its sole discretion, that the Services, or the progress of the Services, are unsatisfactory, (B) the Consultant breaches or threatens to breach any provision of this Agreement or (C) without limiting clause (B), the Consultant becomes an employee, consultant or advisor, or otherwise provides similar professional services, to any for-profit entity that is or may be a competitor of Company.

(iii) The Company shall have the right to terminate the Consultation Period as set forth in this Section 3(b) without prejudice to any right or remedy it may have due to any failure of the Consultant to perform its obligations under this Agreement.

(c) Termination by the Consultant. The Consultant may terminate the Consultation Period, with or without cause, upon thirty (30) days' prior written notice to the Company. The Consultant shall have such right to terminate the Consultation Period as set forth in this Section 3(c) without prejudice to any right or remedy it may have due to any failure of the Company to perform its obligations under this Agreement.

(d) Effects of Termination. In the event of any termination under this Section 3, the Consultant shall be entitled to payment for Services performed and expenses incurred in accordance with Section 2(b) prior to the effective date of such termination. Except as otherwise explicitly provided herein, the provisions of this Section 3(d) and Sections 6, 7, 8, 10 and 11 shall survive the termination or expiration of this Agreement for any reason.

Section 4. Independent Contractor. The Consultant is not as of the Effective Date, nor shall the Consultant be deemed to be at any time during the term of this Agreement, an employee of the Company. The Consultant's status and relationship with the Company shall be that of an independent contractor and consultant. The Consultant is not authorized to assume or create any obligation or responsibility, express or implied, on behalf of, or in the name of, the Company or to bind the Company in any manner. Nothing herein shall create, expressly or by implication, a partnership, joint venture or other association between the parties. The Consultant shall be solely responsible for payment of all charges and taxes arising from its relationship to the Company as a consultant.

Section 5. Certain Representations, Warranties and Covenants of the Consultant. The Consultant represents, warrants and covenants to the Company that:

(a) All Services will be performed in a professional and workmanlike manner in accordance with the highest standards of performance in the industry, and in accordance with applicable laws and any policies established by the Company that have been provided to Consultant.

(b) No trade secrets or other confidential or proprietary information of any third party shall be disclosed to the Company or used by the Consultant in the performance of the Services hereunder, and, with respect to any information, know-how, knowledge or data disclosed to the Company or used by the Consultant in the performance of the Services, the Consultant has the full and unrestricted right to disclose or use the same.

(c) [Intentionally omitted]

(d) If the Consultant is a faculty member of, or otherwise affiliated with, an academic institution or other not-for-profit research institution (an "Academic Institution"), (i) the Consultant has disclosed such fact to the Company and upon request agrees to provide the Company with all patent, consulting or other applicable policies and procedures of such Academic Institution, and (ii) the Consultant has obtained any and all necessary consents and satisfied any other conditions or requirements imposed by such Academic Institution to enter into this Agreement and perform Services for the Company as contemplated hereunder.

(e) Consultant represents and warrants that to the best of Consultant's knowledge as of the Effective Date there are no agreements, arrangements or understandings to which the Consultant is a party, or by which the Consultant is bound, with any current or previous employer or any other party forbidding or restricting the Consultant from entering into this Agreement or performing the Services for the Company hereunder, or which would preclude Consultant from fully complying with the provisions hereof, nor shall the Consultant enter into any such third party agreements, provided that absent such conflict the Consultant is free to provide services to any other entity during the term of his Agreement.

(f) The Consultant's performance of the Services or any other obligations under this Agreement does not and will not conflict with or breach any agreement, arrangement or understanding with any current or previous employer or any other party to which the Consultant is a party or by which the Consultant is bound (including without limitation any non-disclosure or non-competition agreement).

(g) The Consultant has not been debarred and, to the best of the Consultant's knowledge, is not under consideration to be debarred, by the U.S. Food and Drug Administration from working in or providing consulting or advisory services to any pharmaceutical or biotechnology company.

Section 6. Confidentiality.

(a) Obligations of Confidentiality. The Consultant acknowledges and agrees that the relationship between the Company and the Consultant is one of high trust and confidence, and that, during the course of providing the Services, the Company may disclose to the Consultant certain confidential or proprietary information regarding the Company's products, technology, business and operations, including without limitation possible product development and marketing plans and strategies, non-public clinical and research and development information, non-public financial information (including projections), trade secrets, inventions, scientific or technical data, copies of non-publicly available agreements or documents (including patent applications), customer and supplier lists, information of third parties that the Company has an obligation to keep confidential and other confidential information as the Company may disclose to the Consultant (collectively, the "Confidential Information"). For the avoidance of doubt, Works (as defined in Section 7(a)) shall be deemed Confidential Information. The Consultant shall use its best efforts to maintain and protect any and all Confidential Information delivered to it and not to directly or indirectly publish, disseminate or otherwise disclose this Confidential Information to any third party. The Consultant further agrees to use the Confidential Information solely for the purposes of conducting the Services hereunder and not for the Consultant's own benefit or for the benefit of any third party. The Consultant shall not remove any Confidential Information or copies thereof from the Company's premises, except to the extent necessary to fulfill the Services. These obligations of confidentiality shall continue for five (5) years after the termination or expiration of this Agreement.

(b) Exceptions. The Consultant's obligations as to the Confidential Information shall not apply to any portion of the Confidential Information:

(i) which is already in the Consultant's possession at the time of disclosure by the Company, other than by previous disclosure by the Company, as demonstrated by prior written records;

(ii) which is or becomes publicly available or a matter of public knowledge generally, through no act or omission by the Consultant;

(iii) which is lawfully received by the Consultant from a third party who is or was not bound in any confidential relationship to the Company at the time of such disclosure to the Consultant;

(iv) which is independently developed by the Consultant without reference to or reliance upon the Confidential Information (and such independent development can be properly demonstrated by the Consultant by documentary evidence); or

(v) which is required to be disclosed by the Consultant to comply with applicable laws or governmental regulations, provided that the Consultant provides prior written notice to the Company, to the extent permitted by law, promptly upon learning of the requirement to make such disclosure, takes diligent, reasonable and lawful actions to avoid and/or minimize the extent of such disclosure and assists the Company in contesting such disclosure.

(c) Return of Confidential Information. Any Confidential Information, including data and materials, furnished by the Company for use by the Consultant in connection with the Services shall remain the sole property of the Company. The Consultant shall promptly return all such Confidential Information to the Company upon request by the Company or upon termination or expiration of this Agreement.

(d) Injunctive Relief. The restrictions contained in this Agreement are necessary for the protection of the business and goodwill of the Company and are considered by the Consultant to be reasonable for such purpose. The Consultant agrees that any breach of Section 6 or 7 may cause the Company substantial and irrevocable damage which is difficult to measure. Therefore, in the event of any such breach or threatened breach, the Consultant agrees that the Company, in addition to such other remedies as may be available, shall have the right to seek an injunction from a court restraining such a breach or threatened breach, and the right to seek specific performance of the provisions of this Agreement.

Section 7. Ownership of Work Product.

(a) Works. The Consultant shall promptly and fully disclose in writing to the Company all concepts, discoveries, improvements, inventions, formulae, molecules, organisms, chemical or biological materials, ideas, designs, processes, methods, products, computer programs, databases, trade secrets, know-how, technical or business innovations, writings or other works of authorship and patents or patent rights created, reduced to practice or conceived by the Consultant during the term of this Agreement and for six (6) months thereafter (whether or not patentable or copyrightable and whether made solely by the Consultant or jointly with others) which are a direct result of performing the Services or any Confidential Information of the Company (collectively, "Works"). The Consultant shall maintain adequate and current written records (in the form of notes, sketches, drawings and as may be specified by the Company) to document the conception and/or first actual reduction to practice of any Works. Such written records shall be available to and remain the sole and exclusive property of the Company at all times.

(b) Ownership of Works. The Works shall be and remain the sole and exclusive property of the Company or its nominees, whether or not patented or copyrighted and without regard to any termination of this Agreement. The Consultant hereby assigns to the Company all right, title and interest in and to all Works and any and all related patent rights, copyrights, trademarks, trade names and other industrial and intellectual property rights and applications, in the United States and throughout the world. Consultant agrees that if Company is unable because of Consultant's unavailability (after Company's reasonable attempt to contact) or mental or physical incapacity to secure Consultant's signature to apply for or to pursue any application or registration for any intellectual property rights covering any Works, then Consultant hereby irrevocably designates and appoints Company and its duly authorized officers and agents as Consultant's agent and attorney-in-fact, to act for and in Consultant's behalf to execute and file any such applications and to do all other lawfully permitted acts to further the prosecution and issuance of such intellectual property rights thereon with the same legal force and effect as if executed by Consultant. Upon the request of the Company and at the Company's expense, the Consultant shall execute such further assignments, documents and other instruments as may be necessary or desirable to fully and completely assign all right, title and interest in and to all Works to the Company and to assist the Company in applying for, obtaining and enforcing patents or copyrights or other rights in the United States and in any foreign country with respect to any such Works.

(c) Work at Third Party Facilities. The Consultant agrees not to make any use of any funds, space, personnel, facilities, equipment or other resources of a third party in performing the Services hereunder, nor willfully take any other action, that would result in a third party owning or having rights to any Works, unless agreed upon in writing in advance by the Company. The Company and the Consultant acknowledge and agree that the Consultant's use of a third party's telephones, fax machines or computers for communication purposes does not constitute an unauthorized use of such third party's facilities under this Section 7(c).

(d) Agreement with Academic Institution. This Agreement is made with the understanding that the Consultant, if affiliated with an Academic Institution, may have signed an agreement concerning inventions with such Academic Institution under which the Consultant may be obligated to assign to such Academic Institution certain inventions which arise out of or otherwise relate to the Consultant's work at or for such Academic Institution or from the Consultant's use of certain of its facilities or intellectual property. In performing the Services hereunder, the Consultant agrees that it is Consultant's intention to provide the Services strictly in a manner such they do not utilize Academic Institution facilities or intellectual property if the result of such use is that any Works would not be assignable solely to the Company as set forth in this Section 7.

Section 8. [Intentionally omitted]

Section 9. Use of Name. The Consultant consents to the use by the Company, in neutral circumstances that do not imply endorsement or advocacy, of the Consultant's name and likeness on the Company's website, in written materials and in oral presentations to current or prospective customers, partners, investors or others, provided that such use accurately describes the nature of the Consultant's relationship with or contribution to the Company.

Section 10. Notice. Any notice required or desired to be given shall be governed solely by this paragraph. Notice shall be deemed given only upon (a) mailing of any letter or instrument by overnight delivery with a reputable carrier or by registered mail, return receipt requested, postage prepaid by the sender, or (b) personal delivery.

If to the Consultant:

If to the Company:
Merrimack Pharmaceuticals, Inc.
One Kendall Square, Suite B7201
Cambridge, MA 02139
Attn: Legal Department

From time to time, either party may, by written notice to the other in accordance with this Section 10, designate another address that shall thereupon become the effective address of such party for the purpose of this Section 10.

Section 11. Miscellaneous. This Agreement, together with all exhibits hereto, constitutes the entire understanding of the parties hereto with respect to the matters contained herein and supersedes all proposals and agreements, written or oral, and all other communications between the parties relating to the subject matter of this Agreement. This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Massachusetts without regard to its conflict of laws rules. The headings contained in this Agreement are for the convenience of the parties and are not to be construed as a substantive provision hereof. This Agreement may not be modified or amended except in writing signed or executed by the Consultant and the Company. In the event any provision of this Agreement is held to be unenforceable or invalid, such unenforceability or invalidity shall not affect any other provisions of this Agreement and such other provisions shall remain in full force and effect. If any provision of this Agreement is held to be excessively broad, it shall be reformed and construed by limiting and reducing it so as to be enforceable to the maximum extent permitted by law. This Agreement shall be binding upon, and inure to the benefit of, both parties hereto and their respective successors and assigns, including any corporation with or into which the Company may be merged or which may succeed to its assets or business; provided, however, that the responsibility for actual performance of the Services is personal to the Consultant and may not be assigned or delegated by the Consultant to any other person or entity. This Agreement may be executed in counterparts and by facsimile, including via e-mail delivery of a portable document format (*.pdf) data file or similar electronic means, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

[Remainder of Page Intentionally Left Blank]

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed as of the dates set forth below.

CONSULTANT George D. Demetri, M.D.	COMPANY Merrimack Pharmaceuticals, Inc.
/s/ George D. Demetri, M.D. Signature	/s/ Daryl C. Drummond Signature
George D. Demetri, M.D. Printed Name	Daryl C. Drummond, Ph. D. Printed Name
	Head of Research Title
Date: 31 JAN 2018	Date: 2/6/2018

Exhibit A

Scientific Advisory Board - 2018

Description of Services

- *Serve as a member of the Company's SAB during calendar year 2018.*
- *Attend meetings of the SAB.*
    - *Approximately three (3) full day meetings per year*
- *Meet with the Company from time to time to discuss:*
    - *the goals and objectives of the Company; and*
    - *the Company's research programs and clinical trials*
- *Provide recommendations and advice to the Company regarding the above.*
- *Make recommendations to the Company about new opportunities that may be of interest to the Company.*

Term

- *Effective Date – December 31, 2018*

Compensation

- *Two thousand two hundred and fifty U.S. dollars ($2,250) per calendar quarter, payable in arrears*

CONSULTANT George D. Demetri, M.D.	COMPANY Merrimack Pharmaceuticals, Inc.
/s/ George D. Demetri, M.D. Signature	/s/ Daryl C. Drummond Signature
George D. Demetri, M.D. Printed Name	Daryl C. Drummond, Ph. D. Printed Name
	Head of Research Title
Date: 31 JAN 2018	Date: 2/6/2018

Exhibit B

DANA-FARBER CANCER INSTITUTE
STANDARD CONSULTING AGREEMENT PROVISIONS

1. It is the policy of Dana-Farber Cancer Institute Inc. (“DFCI”) that these Standard Consulting Agreement Provisions (“Standard Provisions”) must be attached to any written agreement (“Agreement”) to provide Consulting Services between an employee, student, or member of the professional staff (“Consultant”) of DFCI and any organization (“Company”) and must be signed by both parties to the Agreement.

2. Nothing in the Agreement shall limit or be construed to limit the right of Consultant to use or publish information which: (a) is or becomes available to the public through no breach of the Agreement by Consultant; (b) was known to Consultant before the Consulting Services were performed; (c) is acquired by Consultant from a third party that has the legal right to disclose the information to the Consultant; (d) was independently developed by the Consultant without reference to or reliance on the Confidential Information; or (e) Consultant is required to disclose by law, government regulation, court order, the DFCI Conflict of Interest and Conflict of Commitment Policy or the Faculty of Medicine of Harvard University Faculty Policies on Integrity in Science. In the event of any required disclosure under part (e) of the foregoing sentence, Consultant shall: (i) promptly inform the party requiring such disclosure of the existence of the Agreement; (ii) immediately notify Company of the disclosure requirement; and (iii) afford Company reasonable opportunity to oppose, limit or secure confidential treatment for the required disclosure. In addition, information generated by Consultant pursuant to the Agreement shall be proprietary to the Company only if: (a) such information is generated as a direct result of the performance of Consulting Services under the Agreement; and (b) is not generated in the course of the Consultant’s activities as a DFCI employee. Consultant agrees not to publish, disseminate or otherwise disclose any proprietary information of the Company, obtained in the course of providing Consulting Services to Company, to any third party for a period of five (5) years after the termination or expiration of the Agreement.

3. Consulting Services shall not involve any use of the funds, personnel, facilities, materials, or other resources of DFCI, provided that Consultant may use the library and the Consultant's office. Mere use of standard office equipment shall not constitute use of DFCI resources.

4. Neither the name of the Consultant nor that of DFCI, nor any variation thereon, nor adaptation thereof may be used in any advertising, promotional or sales literature, or other publicity without the prior written approval of the party whose name is to be used.

5. Consultant's rights, title and interest in inventions, discoveries and developments conceived or reduced to practice in the performance of Company funded Consulting Services made solely or jointly with Company employees or agents (“Consulting Inventions”) may be assigned to the Company, so long as the provisions in Paragraph 6 below are not applicable. Consultant shall disclose to DFCI's Belfer Office for Dana-Farber Innovations, in confidence, all Consulting Inventions which are related to Consultant's research, clinical, or educational activities at DFCI in order to provide DFCI an opportunity to assess, together with Company, whether the invention is subject to the provisions of Paragraph 6 below.

6. Notwithstanding Paragraph 5 above, Company agrees and understands that Consultant has a pre-existing obligation to assign to his or her employer, DFCI, all of Consultant’s rights in intellectual property which arise or are derived from Consultant’s employment at DFCI or which utilize the funds, including funding from any outside source awarded to or administered by DFCI, personnel, facilities, materials, or other resources of DFCI including resources provided in-kind by outside-sources. Company has no rights by reason of the Agreement in any publication, invention, discovery, improvement or other intellectual property, whether or not publishable, patentable or copyrightable that is subject to Consultant’s obligations

to DFCI. Company also acknowledges and agrees that it will enjoy no priority or advantage as a result of the consultancy created hereunder in gaining access, whether by license or otherwise, to any proprietary information or intellectual property of DFCI. Other than the inventions assigned to Company pursuant to Paragraph 5 above, Company shall have no rights or interests in any other inventions, discoveries or developments owned by or assignable to DFCI.

7. Nothing in the Agreement shall be construed to restrict or limit the duties Consultant is performing or may perform in the course of, or incidental to, Consultant's employment at DFCI, including but not limited to research sponsored by a third party commercial entity nor shall anything in the Agreement be construed to restrict or limit Consultant's right to serve as a Consultant to any hospital, or to any governmental or not-for-profit organization.

8. The Company shall indemnify, defend and hold harmless Consultant, Consultant's successors, heirs and assigns and DFCI and its trustees, employees and staff and their respective successors, heirs and assigns, (collectively "Indemnitees") against any liability, damage, loss or expense (including reasonable attorneys' fees and expenses of litigation) incurred by or imposed upon the Indemnitees or any one of them in connection with any claims, suits, actions, demands or judgments arising from the good faith performance of the Consulting Services by Consultant.

9. Each party to the Agreement acknowledges (i) that the Consultant is entering into the Agreement, and providing services to the Company, in the Consultant’s individual capacity and not as an employee or agent of DFCI, (ii) DFCI is not a party to the Agreement and has no liability or obligation hereunder, and (iii) DFCI is intended as a third party beneficiary of the Agreement and certain provisions to the Agreement are for the benefit of DFCI and are enforceable by DFCI in its own name.

10. Consultant shall control the final content of any presentations and any materials presented by or attributed to Consultant (“Presentation Materials”). Consultant agrees that in performance of the Services under the Agreement any of Consultant’s Presentation Materials will be objective, balanced and scientifically rigorous. Any Presentation Materials created by Consultant as a direct result of performance of Services cannot be edited by Company in any way to alter the scientific reliability and relevance. Consultant shall be provided the opportunity to review and approve the Presentation Materials prior to any re-use, broadcast, display or publishing of the Presentation Materials for internal communications or dissemination to third parties. Nothing herein is intended to, nor shall be construed to constitute, the giving or granting of permission or license to use the Presentation Materials for: (a) any activity which constitutes sales or marketing of any particular product, service, device, technology or process; or (b) any activity directed at the general public or which can reasonably be described as medical advice or care.

11. Company shall provide Consultant with any video or recordings of his/her image or voice (“Consulting Recordings”) made in connection with the Services and obtain his/her consent prior to any re-use, broadcast, display or publishing of the Consulting Recordings for internal communications or dissemination to third parties. Nothing herein is intended to, nor shall be construed to constitute, the giving or granting of permission or license to use the Consulting Recordings for: (a) any activity which constitutes sales or marketing of any particular product, service, device, technology or process; or (b) any activity directed at the general public or which can reasonably be described as medical advice or care.

12. By signing these Standard Provisions, the parties to the Agreement agree to abide by these Standard Provisions, and further agree that if any provision in the Agreement is inconsistent with these Standard Provisions, these Standard Provisions shall govern and prevail.

13. The Standard Provisions shall be and hereby are in force and effect for the entire term of any Agreement between Consultant and Company.

AGREED AND ACCEPTED:

/s/ Daryl C. Drummond Authorized Representative of Merrimack Pharmaceuticals, Inc. (Company)	2/6/2018 Date
Name: Daryl C. Drummond, Ph. D. Please print Title: Head of Research	
/s/ George D. Demetri, M.D. George D. Demetri, M.D. (Consultant)	31 JAN 2018 Date

SEVENTH AMENDMENT OF LEASE

This Seventh Amendment of Lease (this "**Seventh Amendment**") is made and entered into as of February 6, 2018 (the "**Effective Date**"), by and between **ARE-MA REGION NO. 59, LLC**, a Delaware limited liability company ("**Landlord**"), as successor-in-interest to DWF IV One Kendall, LLC, as successor-in-interest to RB Kendall Fee, LLC ("**Original Landlord**"), and **MERRIMACK PHARMACEUTICALS, INC.**, a Delaware corporation ("**Tenant**"), with reference to the following:

RECITALS

A. Pursuant to that certain Indenture of Lease dated as of August 24, 2012, as amended by (i) that certain First Amendment of Lease dated March 18, 2013, (ii) that certain Second Amendment of Lease dated September 12, 2013, (iii) that certain Third Amendment of Lease dated February 23, 2015, (iv) that certain Fourth Amendment of Lease dated July 22, 2015, (v) that certain Fifth Amendment of Lease dated as of April 3, 2017 (the "**Fifth Amendment**"), and (vi) that certain Sixth Amendment of Lease dated as of June 9, 2017 (as amended, the "**Lease**"), Tenant leases certain premises (the "**Existing Premises**") as more particularly described in the Lease, at the improved real property being Building 600/650/700 located at One Kendall Square, Cambridge, Massachusetts. The Existing Premises consists of approximately (a) 31,747 rentable square feet of space on a portion of the second (2nd) floor of Building 600/650/700 (the "**2nd Floor Space**"), (b) 4,773 rentable square feet of space on the fourth (4th) floor of Building 650/700 (the "**Additional Space**"), (c) 30,626 rentable square feet of space on the fourth (4th) floor of Building 600/700 (the "**4th Floor Space**"), (d) 7,245 rentable square feet of space on the mezzanine level of Building 700 (the "**Mezzanine Space**"), (e) 8,686 rentable square feet of space on the first (1st) floor of Building 600 (the "**1st Floor Space**"), (f) 132 rentable square feet in the basement of Building 700 (the "**Basement Premises**"), (g) 2,922 rentable square feet of space in the basement of Building 700 (the "**Storage Space**"), (h) 8,763 rentable square feet of space located on the fourth (4th) floor of Building 700 (the "**Expansion Space I**"), (i) 1,353 rentable square feet of space located on the fourth (4th) floor and the fourth (4th) floor mezzanine of Building 650 (the "**Expansion Space II**"), (j) intentionally omitted, (k) 491 rentable square feet of space on the first (1st) floor of Building 700 (the "**Chemical Storage Space**"), (l) 8,155 rentable square feet of space located on the second (2nd) floor of Building 600 (the "**600 Expansion Space**"), (m) 784 rentable square feet of space located on the second floor (2nd) of Building 600 (the "**Hallway Space**"), (n) intentionally omitted, (o) 21,912 rentable square feet of space on the fifth (5th) floor of Building 600/650/700 (the "**Third Amendment Premises**"), (p) 7,145 rentable square feet of space on the first (1st) floor of Building 700 (the "**Former Addgene Space**"), (q) 5,687 rentable square feet of space on the first (1st) floor of Building 700 (the "**Former OmniGuide Space**"), (r) 311 rentable square feet of space on the basement level of Building 700 (the "**Equipment Room**"), and (s) 700 rentable square feet of storage space in the basement of Building 700 (the "**Fourth Amendment Storage Space**"). Capitalized terms used herein without definition shall have the meanings defined for such terms in the Lease.

B. Landlord and Tenant desire, subject to the terms of this Seventh Amendment, to accelerate the Reduction Date (as defined in the Fifth Amendment) for a portion of the Reduction Space (as defined in the Fifth Amendment) consisting of approximately 5,373 rentable square feet as more particularly shown on Exhibit A attached hereto (the "**Early Reduction Space**").

NOW, THEREFORE, in consideration of the foregoing and of the mutual promises made herein, and for other good and valuable consideration the receipt of which is hereby acknowledged, Landlord and Tenant agree as follows:

1. **Early Reduction Space**. Effective as of the Lender Consent Date (as defined below), Landlord and Tenant hereby terminate the term of the Lease with respect to the Early Reduction Space. Accordingly, from and after the Lender Consent Date, the rentable square footage of the Reduction Space shall be reduced to approximately 23,784 rentable square feet, consisting collectively of (a) the remaining portion of the Third Amendment Premises in Building 700, containing approximately 16,539 rentable square feet, and (b) all of the Mezzanine Space, containing approximately 7,245 rentable square feet. Nothing herein shall affect or diminish Tenant's rights or obligations under the Lease with respect to the Reduction Premises remaining following the Lender Consent Date, nor shall anything herein alter or amend the Fifth Amendment except to the extent the square footage of the Reduction Space and the available parking passes are altered hereby.

2. **Definition of Premises**. As of the Lender Consent Date, the defined term "Premises" in Article 2 of Exhibit 1, Sheet 1 of the Lease shall be amended to remove the Early Reduction Space, and the rentable square footage of the Premises shall be accordingly reduced by approximately 5,373 rentable square feet and shall thereafter, through the Reduction Date (as defined in the Fifth Amendment), consist of approximately 136,059 rentable square feet. Notwithstanding anything to the contrary contained in the Fifth Amendment, Landlord and Tenant hereby agree that on the Reduction Date (as defined in the Fifth

Amendment), the square footage of the Premises shall be reduced by an additional approximately 23,784 rentable square feet (as identified in the Fifth Amendment) and shall thereafter consist of approximately 112,275 rentable square feet.

3. **Yearly Rent**. Commencing on the Lender Consent Date, Tenant shall have no further obligation to pay Yearly Rent, Operating Costs (including Building Operating Costs and Common Area Operating Costs), Taxes (including Building Taxes and Common Area Taxes) or other costs with respect to the Early Reduction Space and Article 9 of Exhibit 1, Sheet 1 of the Lease shall be amended to reflect the removal of the Early Reduction Space from the Existing Premises.

4. **Reduction and Surrender**. Tenant shall voluntarily surrender the Early Reduction Space on or before the Lender Consent Date in accordance with all surrender requirements contained in the Lease and in the condition required under the Lease.

5. **No Further Obligations**. Subject to Section 9 below, Landlord and Tenant each agree that the other is excused as of the Lender Consent Date from any further obligations with respect to the Early Reduction Space, excepting only such obligations under the Lease which expressly survive the termination of the Lease. In addition, nothing herein shall be deemed to limit or terminate any common law or statutory rights Landlord may have with respect to Tenant in connection with any Hazardous Materials or for violations of any governmental requirements or requirements of applicable law. Subject to Section 9 below, nothing herein shall excuse Tenant from its obligations under the Lease with respect to the Early Reduction Space prior to the Lender Consent Date.

7. **Removal of Personal Property**. Tenant agrees that, as of the date hereof, the Early Reduction Space is free and shall remain free of all personal property of Tenant. Any personal property of Tenant remaining in the Early Reduction Space after the date hereof is hereby agreed to be abandoned by Tenant and may be disposed of by Landlord, in Landlord's sole discretion, without obligation or liability of any kind to Tenant.

8. **Parking Spaces**. As of the Early Reduction Date, Tenant shall forfeit its right to use five (5) of the twenty-nine (29) parking passes in the OKS Garage that Tenant will be required to forfeit its right to use on the Reduction Date per <u>Section 8</u> of the Fifth Amendment. Subject to the foregoing, the number of parking passes in the OKS Garage that Tenant will forfeit its right to use on the Reduction Date shall be twenty-four (24).

9. **Early Access/Early Reduction Space Demising Work**. Landlord may, at its sole cost and expense and within a reasonable period of time (estimated to be approximately 2 months from the date hereof), complete and perform all of the work described in <u>Exhibit B</u> attached hereto (the "**Early Reduction Space Demising Work**"), provided that such Early Reduction Space Demising Work is conducted in accordance with the requirements contained in the Lease. Tenant agrees that Landlord and it contractors and agents shall have license, without any further notice to or consent required from Tenant, to enter the Early Reduction Space from and after the date hereof to begin the Early Reduction Space Demising Work, subject to (a) the Early Reduction Space Demising Work being without cost, expense or liability to Tenant (including with respect to any liabilities or obligations arising under the Lease, all of which are expressly assumed by Landlord to the extent related to the Early Reduction Demising Work), and (b) the Early Reduction Space Demising Work shall be conducted so as not to unreasonably interfere with IPSEN BIOSCIENCE, INC's use and enjoyment of its subleased premises. From and after the date hereof, neither Tenant nor any agents, contractors or invitees of Tenant shall enter into, use, sublease or otherwise occupy any of the Early Reduction Space, except that Tenant shall have unfettered access to the common freight elevator located within the Early Reduction Space. Except as provided for in the immediately following paragraph, Tenant waives any claims against Landlord for rent abatement that Tenant may have against Landlord related to the Early Reduction Space Demising Work.

Promptly after the Lender Consent Date, Landlord shall credit Tenant against future Yearly Rent for the Premises, the amount of Yearly Rent, Operating Costs (including Building Operating Costs and Common Area Operating Costs) and Taxes (including Building Taxes and Common Area Taxes) that have accrued or are otherwise due with respect to the Early Reduction Space from October 23, 2017 until the Lender Consent Date.

10. **Lender Consent Requirement**. Landlord and Tenant agree that this Seventh Amendment shall not be effective unless and until Landlord obtains consent to this Seventh Amendment from the lender that currently holds a mortgage secured by the Complex (the "**Lender**"). The date on which Landlord obtains Lender's consent, if at all, to this Seventh Amendment is referred to in this Seventh Amendment as the "**Lender Consent Date**". Landlord agrees to (a) use reasonable efforts to obtain Lender's consent to this Seventh Amendment as soon as reasonably possible following the full execution and delivery of this Seventh Amendment by Landlord and Tenant, (b) provide written notice to Tenant of Lender's approval or

disapproval of this Seventh Amendment promptly following Landlord's receipt of such written approval or disapproval from Lender, and (c) if Lender disapproves of this Seventh Amendment, to make such changes as are reasonably required by Lender for its approval of this Seventh Amendment and which are reasonably agreed to by each party to this Seventh Amendment in order to effect the intent of this Seventh Amendment to the extent possible

11. **OFAC**. Tenant and all beneficial owners of Tenant are currently (a) in compliance with and shall at all times during the Term of the Lease remain in compliance with the regulations of the Office of Foreign Assets Control ("**OFAC**") of the U.S. Department of Treasury and any statute, executive order, or regulation relating thereto (collectively, the "OFAC Rules"), (b) not listed on, and shall not during the term of the Lease be listed on, the Specially Designated Nationals and Blocked Persons List, Foreign Sanctions Evaders List or the Sectoral Sanctions Identifications List, which are all maintained by OFAC and/or on any other similar list maintained by OFAC or other governmental authority pursuant to any authorizing statute, executive order, or regulation, and (c) not a person or entity with whom a U.S. person is prohibited from conducting business under the OFAC Rules.

12. **Miscellaneous**.

a. This Seventh Amendment is the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior and contemporaneous oral and written agreements and discussions. This Seventh Amendment may be amended only by an agreement in writing, signed by the parties hereto.

b. This Seventh Amendment is binding upon and shall inure to the benefit of the parties hereto, and their respective successors and assigns.

c. This Seventh Amendment may be executed in any number of counterparts, each of which shall be deemed an original, but all of which when taken together shall constitute one and the same instrument. The signature page of any counterpart may be detached therefrom without impairing the legal effect of the signature(s) thereon provided such signature page is attached to any other counterpart identical thereto except having additional signature pages executed by other parties to this Seventh Amendment attached thereto.

d. Except as amended and/or modified by this Seventh Amendment, the Lease shall remain in full force and effect. In the event of any conflict between the provisions of this Seventh Amendment and the provisions of the Lease, the provisions of this Seventh Amendment shall prevail. Whether or not specifically amended by this Seventh Amendment, all of the terms and provisions of the Lease are hereby amended to the extent necessary to give effect to the purpose and intent of this Seventh Amendment.

SIGNATURES ON FOLLOWING PAGE

IN WITNESS WHEREOF, the parties have executed this Seventh Amendment as of the date first written above.

TENANT:

MERRIMACK PHARMACEUTICALS, INC.,
a Delaware corporation

By: /s/ Jeffrey A. Munsie
Its: General Counsel

LANDLORD:

ARE-MA REGION NO. 59, LLC,
a Delaware limited liability company.

By: Alexandria Real Estate Equities, L.P.,
a Delaware limited partnership,
managing member

By: ARE-QRS CORP.,
a Maryland Corporation,
general partner

By: /s/ Jackie Clem
Its: Senior Vice President, RE Legal Affairs

EXHIBIT A

Early Reduction Space

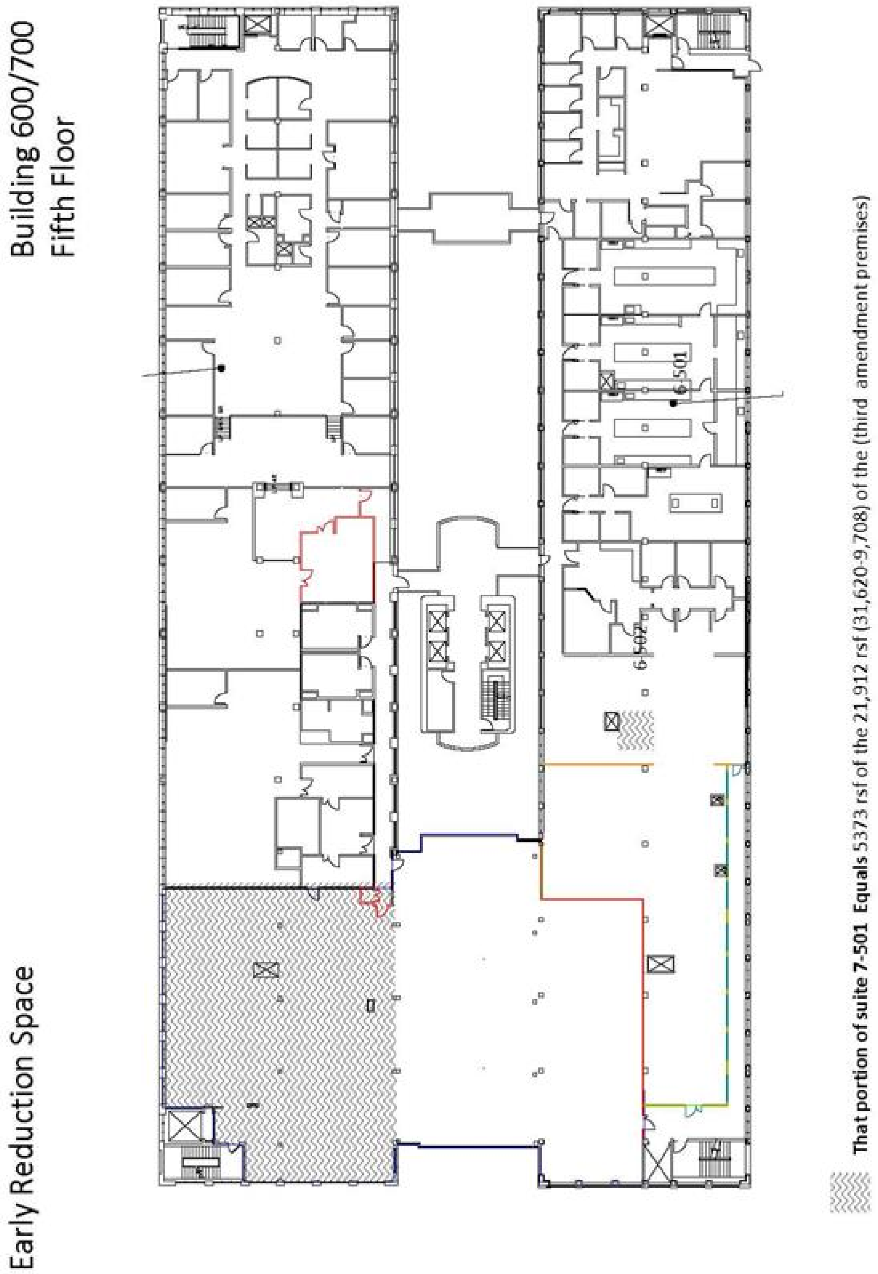


EXHIBIT B

Early Reduction Space Demising Work

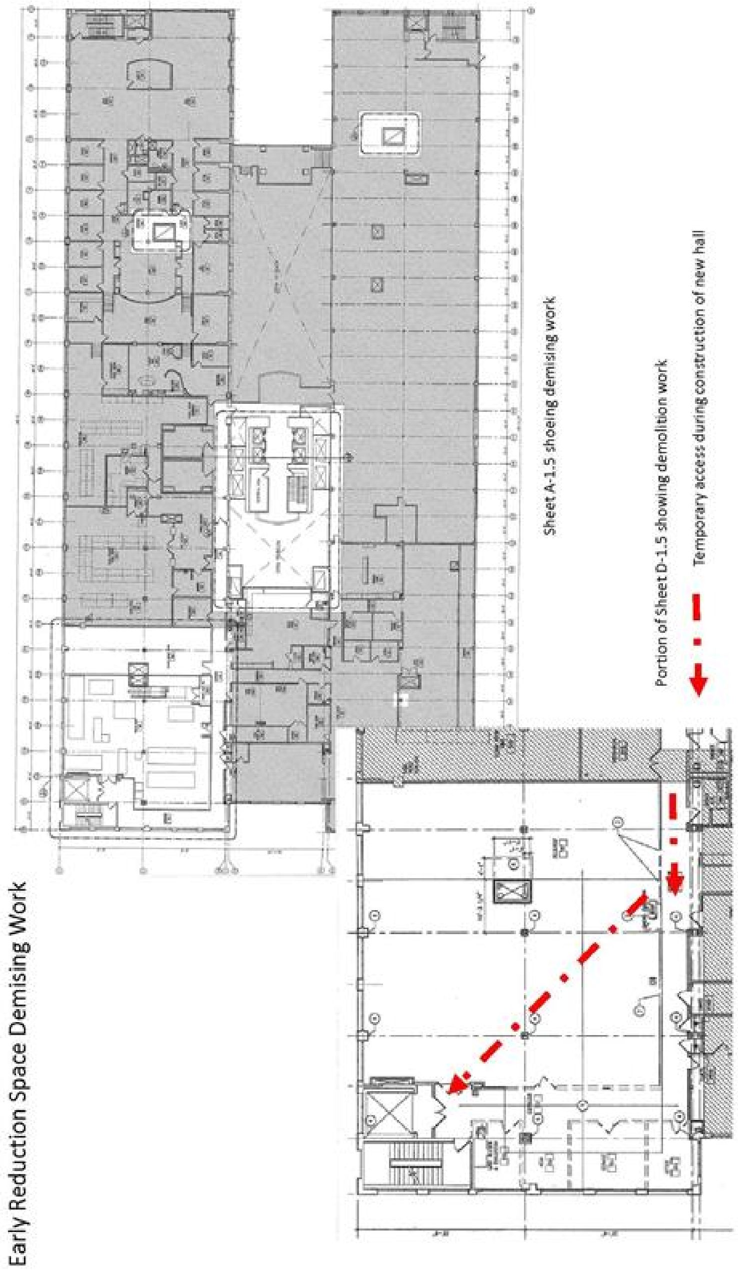


Exhibit 21.1

SUBSIDIARIES OF THE REGISTRANT

Name	**Jurisdiction of Incorporation**
Merrimack Pharmaceuticals UK Limited*	UK

* wholly owned

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Forms S-3 (No. 333-222093) and S-8 (Nos. 333-180996, 333-186370, 333-194313, 333-202346 and 333-209745) of Merrimack Pharmaceuticals, Inc. of our report dated March 12, 2018 relating to the financial statements and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP

Boston, Massachusetts
March 12, 2018

Exhibit 31.1

CERTIFICATIONS

I, Richard Peters, M.D., Ph.D., certify that:

1. I have reviewed this Annual Report on Form 10-K of Merrimack Pharmaceuticals, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer 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 and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 12, 2018

/s/ Richard Peters, M.D., Ph.D.
Richard Peters, M.D., Ph.D.
President and Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATIONS

I, Jean M. Franchi, certify that:

1. I have reviewed this Annual Report on Form 10-K of Merrimack Pharmaceuticals, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer 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 and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 12, 2018

/s/ Jean M. Franchi
Jean M. Franchi
Chief Financial Officer and Treasurer
(Principal Financial Officer)

Exhibit 32.1

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

In connection with the Annual Report on Form 10-K of Merrimack Pharmaceuticals, Inc. (the "Company") for the period ended December 31, 2017 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, Richard Peters, M.D., Ph.D., President and Chief Executive Officer of the Company, hereby certifies, pursuant to 18 U.S.C. Section 1350, that to his 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 12, 2018

/s/ Richard Peters, M.D., Ph.D.
Richard Peters, M.D., Ph.D.
President and Chief Executive Officer
(Principal Executive Officer)

Exhibit 32.2

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

In connection with the Annual Report on Form 10-K of Merrimack Pharmaceuticals, Inc. (the “Company”) for the period ended December 31, 2017 as filed with the Securities and Exchange Commission on the date hereof (the “Report”), the undersigned, Jean M. Franchi, Chief Financial Officer and Treasurer of the Company, hereby certifies, pursuant to 18 U.S.C. Section 1350, that to her 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 12, 2018

/s/ Jean M. Franchi
Jean M. Franchi
Chief Financial Officer and Treasurer
(Principal Financial Officer)