

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION**
Washington, D.C. 20549
FORM 10-K

(Mark One)

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

For the Fiscal Year Ended December 31, 2019

OR

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

For the Transition Period from _____ to _____

Commission File Number: 001-36065

ACCELERON PHARMA INC.

(Exact name of Registrant as specified in its charter)

Delaware

(State or other jurisdiction of incorporation or organization)

128 Sidney Street

Cambridge, MA

(Address of principal executive offices)

27-0072226

(I.R.S. Employer Identification No.)

02139

(Zip Code)

(617) 649-9200

(Registrant's telephone number, including area code)

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

Title of Class:	Trading Symbol(s)	Name of Each Exchange on Which Registered
Common Stock, \$0.001 par value	XLRN	Nasdaq Global Market

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

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

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Securities 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 the filing requirements for the past 90 days. Yes No

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

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the 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	<input checked="" type="checkbox"/>	Accelerated filer	<input type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/>	Smaller reporting company	<input type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

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 registrant's voting and non-voting common stock held by non-affiliates of the registrant (without admitting that any person whose shares are not included in such calculation is an affiliate) computed by reference to the price at which the common stock was last sold (based on the closing share price as quoted on the Nasdaq Global Market) as of the last business day of the registrant's most recently completed second fiscal quarter was approximately \$1.8 billion.

As of January 31, 2020, the registrant had 53,337,296 shares of Common Stock, \$0.001 par value per share, outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive Proxy Statement relating to its 2020 Annual Meeting of Stockholders are incorporated by reference into Part III of this Annual Report on Form 10-K where indicated. Such Proxy Statement will be filed with the U.S. Securities and Exchange Commission within 120 days after the end of the fiscal year to which this report relates.

ACCELERON PHARMA INC.

FORM 10-K

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FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K and the information incorporated herein by reference includes statements that are, or may be deemed, "forward-looking statements." In some cases, these forward-looking statements can be identified by the use of forward-looking terminology. The terms "anticipate", "believe," "contemplate," "continue," "could," "estimate," "expect," "forecast," "goal," "intend," "may," "plan," "potential," "predict," "project," "should," "strategy," "target," "will," "would," "vision," or, in each case, the negative or other variations thereon or other 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 regarding our intentions, beliefs, projections, outlook, analyses or current expectations concerning, among other things:

- our ongoing and planned preclinical studies and clinical trials;
- clinical trial data and the timing of results of our ongoing clinical trials;
- our plans to develop and commercialize sotatercept in pulmonary hypertension, ACE-083 and our other potential therapeutic candidates;
- our and Bristol-Myers Squibb Company's, or BMS's, plans to develop and commercialize REBLOZYL® (luspatercept-aamt) and sotatercept outside of pulmonary hypertension;
- the potential benefits of strategic partnership agreements and our ability to enter into selective strategic partnership arrangements;
- the timing of anticipated milestone payments under our collaboration agreements with BMS;
- the timing of, and our and/or BMS's ability to, obtain and maintain regulatory approvals for our therapeutic candidates;
- the rate and degree of market acceptance and clinical utility of any approved therapeutic candidate, particularly in specific patient populations;
- our ability to quickly and efficiently identify and develop therapeutic candidates;
- our manufacturing capabilities and strategy;
- our plans for commercialization and marketing;
- our intellectual property position; and
- our estimates regarding our results of operations, financial condition, liquidity, capital requirements, prospects, growth and strategies.

By their nature, forward-looking statements involve risks and uncertainties because they relate to events, competitive dynamics, and industry change and depend on the economic circumstances that may or may not occur in the future or may occur on longer or shorter timelines than anticipated. We caution you that forward-looking statements are not guarantees of future performance and that our actual results of operations, financial condition and liquidity, and events in the industry in which we operate may differ materially from the forward-looking statements contained herein.

Any forward-looking statements that we make in this Annual Report on Form 10-K speak only as of the date of such statement, and we undertake no obligation to update such statements to reflect events or circumstances after the date of this Annual Report on Form 10-K or to reflect the occurrence of unanticipated events.

You should also read carefully the factors described in the "Risk Factors" section of this Annual Report on Form 10-K to better understand the risks and uncertainties inherent in our business and underlying any forward-looking statements. You are advised, however, to consult any further disclosures we make on related subjects in our Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, press releases, and our website.

Trademarks

We own or have rights to trademarks, service marks and trade names that we use in connection with the operation of our business, including our corporate name, logos and website names. Other trademarks, service marks and trade names appearing in this report are the property of their respective owners. The trademarks that we own include Acceleron Pharma® and IntelliTrap™. Solely for convenience, some of the trademarks, service marks and trade names referred to in this report are listed without the ® and ™ symbols, but we will assert, to the fullest extent under applicable law, our rights to our trademarks, service marks and trade names.

PART I

Item 1. *Business*

We are a biopharmaceutical company dedicated to the discovery, development and commercialization of therapeutics to treat serious and rare diseases. Our research focuses on key natural regulators of cellular growth and repair, particularly the Transforming Growth Factor-Beta, or TGF-beta, protein superfamily. By combining our discovery and development expertise, including our proprietary knowledge of the TGF-beta superfamily, and our internal protein engineering and manufacturing capabilities, we have generated several innovative therapeutic candidates, all of which encompass novel potential first-in-class mechanisms of action. If successful, these candidates could have the potential to significantly improve clinical outcomes for patients across these areas of high, unmet need.

We have focused and prioritized our research and development activities within three key therapeutic areas: hematology, pulmonary and neuromuscular.

Hematology

In November 2019, the U.S. Food and Drug Administration, or FDA, approved our first commercial product, REBLOZYL® (luspatercept-aamt) for the treatment of anemia in adult patients with beta-thalassemia who require regular red blood cell, or RBC, transfusions. REBLOZYL is partnered with Bristol-Myers Squibb Company, or BMS (which acquired Celgene Corporation in November 2019), and is a first-in-class erythroid maturation agent designed to promote RBC production through a novel mechanism. The approval of REBLOZYL is based on the positive results from the Phase 3 BELIEVE trial evaluating the safety and efficacy of REBLOZYL for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions.

In addition to its approved indication, luspatercept-aamt is being developed to treat anemia in patients with myelodysplastic syndromes, or MDS, non-transfusion dependent beta-thalassemia, and myelofibrosis. We and BMS previously announced positive results for the Phase 3 MEDALIST trial evaluating the safety and efficacy of luspatercept-aamt for the treatment of anemia in adult patients with very low- to intermediate-risk MDS who have ring sideroblasts and require RBC transfusions. Based on these results, BMS submitted a supplemental Biologics License Application, or sBLA, in the United States for luspatercept-aamt for the treatment of anemia in adult patients with very low- to intermediate-risk MDS who have ring sideroblasts and require RBC transfusions. The FDA accepted the sBLA and set a target action date of April 4, 2020. BMS also submitted a Marketing Authorization Application, or MAA, to the European Medicines Agency, or EMA, in the BELIEVE and MEDALIST indications. The MAA has been successfully validated and we expect the EMA to issue a decision in the second half of 2020.

BMS is currently conducting a Phase 2 clinical trial with luspatercept-aamt in non-transfusion-dependent beta-thalassemia patients, referred to as the BEYOND trial, with preliminary topline results currently expected by the end of 2020, and a Phase 3 clinical trial, the COMMANDS trial, in first-line, lower-risk MDS patients. In myelofibrosis, BMS is conducting a Phase 2 clinical trial in patients with myelofibrosis-associated anemia, and initial results from this trial were presented in December 2019 at the 61st American Society of Hematology (ASH) Annual Meeting and Exposition showing that luspatercept-aamt improved anemia in patients receiving and not receiving RBC transfusions, with more profound effects in patients treated with ruxolitinib, a small molecule JAK inhibitor. Based on these data, we and BMS announced plans to initiate by the end of 2020 the Phase 3 INDEPENDENCE study in patients with myelofibrosis-associated anemia who are being treated with JAK inhibitor therapy and require RBC transfusions.

If approved in the United States and Europe, we believe that there is an annual peak sales opportunity for REBLOZYL in excess of \$2 billion in lower-risk MDS and beta-thalassemia, and upon successful development and approval in the United States and Europe, an additional \$1 billion in myelofibrosis and other future development opportunities. We and BMS are evaluating luspatercept-aamt for the treatment of anemia in potential new indications that could provide additional sales opportunities.

BMS is responsible for paying 100% of the development costs for all clinical trials for luspatercept-aamt. We may receive a maximum of \$125.0 million for remaining potential regulatory and commercial milestone payments. We have a co-promotion right in North America and our commercialization costs provided in the commercialization plan and budget approved by the Joint Commercialization Committee, or JCC, are entirely funded by BMS. Activities that we elect to conduct outside of the approved development or commercialization budgets to support REBLOZYL are at our own expense. We are eligible to receive tiered royalty payments from BMS on net sales of REBLOZYL in the low-to-mid 20% range.

Pulmonary

We are actively developing our lead pulmonary program, sotatercept, for the treatment of patients with pulmonary arterial hypertension, or PAH. Sotatercept is generally partnered with BMS, but we retain the exclusive rights to fund, develop, and lead the global commercialization of sotatercept in pulmonary hypertension, which we refer to as the PH field, and that includes PAH. PAH is a rare and chronic, rapidly progressing disorder characterized by the constriction of small pulmonary arteries, resulting in abnormally high blood pressure in the pulmonary arteries.

In January 2020, we announced that the PULSAR Phase 2 clinical trial of sotatercept for the treatment of patients with PAH met its primary and key secondary endpoints, as well as other secondary endpoints. The 18-month extension period of the PULSAR trial is ongoing. We are also currently enrolling an exploratory study called SPECTRA to provide us with greater understanding of sotatercept's potential impact on PAH, with preliminary results expected in 2020.

If sotatercept is commercialized to treat PAH and we recognize such revenue, then we will owe BMS a royalty in the low 20% range on global net sales. In certain circumstances, BMS may recognize revenue related to the commercialization of sotatercept in PAH, and in this scenario we will be eligible to receive a royalty from BMS such that the economic position of the parties is equivalent to the scenario in which we recognize such revenue.

Neuromuscular

We are independently developing our wholly-owned neuromuscular candidate, ACE-083. ACE-083 is designed for the treatment of focal muscle disorders. We are currently conducting a Phase 2 clinical trial with ACE-083 in patients with Charcot-Marie-Tooth disease, or CMT, and an extension study for eligible CMT patients who have completed treatment in the Phase 2 clinical trial with ACE-083. We previously announced results from part 1 of this Phase 2 clinical trial showing increases in mean total and contractile muscle volume, and reductions in fat fraction. The results also showed that ACE-083 was generally well tolerated. Enrollment is complete in part 2 of this trial and we expect to announce topline results from part 2 in the first quarter of 2020. In September 2019, we announced that ACE-083 did not achieve functional secondary endpoints in part 2 of a Phase 2 clinical trial in patients with facioscapulohumeral muscular dystrophy, or FSHD, and we are discontinuing development of ACE-083 in FSHD.

Funding

As of December 31, 2019 our operations have been funded primarily by \$105.1 million in equity investments from venture investors, \$773.8 million from public investors, \$154.1 million in equity investments from our collaboration partners and \$356.7 million in upfront payments, milestones, and net research and development payments from our collaboration partners.

Our Goals and Objectives in the Year 2020

By building on the milestones achieved in 2019, we intend to advance and expand our pipeline in 2020 while focusing on successfully commercializing REBLOZYL, and we plan to achieve the following goals and objectives:

Hematology

- **REBLOZYL® (*luspatercept-aamt*)**
 - Successful US commercial launch in its first indication to treat anemia in adult patients with beta-thalassemia who require regular RBC transfusions
 - FDA approval of the sBLA in the MDS indication by the target action date of April 4, 2020, and successful US commercial launch of its second indication
 - EMA approval of the MAA in the beta-thalassemia and MDS indications in the second half of 2020
 - Topline results for the BEYOND Phase 2 trial by year end
 - Continue enrollment of COMMANDS Phase 3 trial
 - Initiate the INDEPENDENCE Phase 3 trial by year end
 - Potential clinical development expansion into other disease states

Pulmonary

- **Sotatercept**
 - Present data from the PULSAR Phase 2 clinical trial at the American Thoracic Society's International Conference in May 2020
 - Announce preliminary results from the exploratory SPECTRA study by year end

Neuromuscular

- **ACE-083**
 - Announce preliminary results for part 2 of the Phase 2 clinical trial of ACE-083 in patients with CMT in the first quarter of 2020

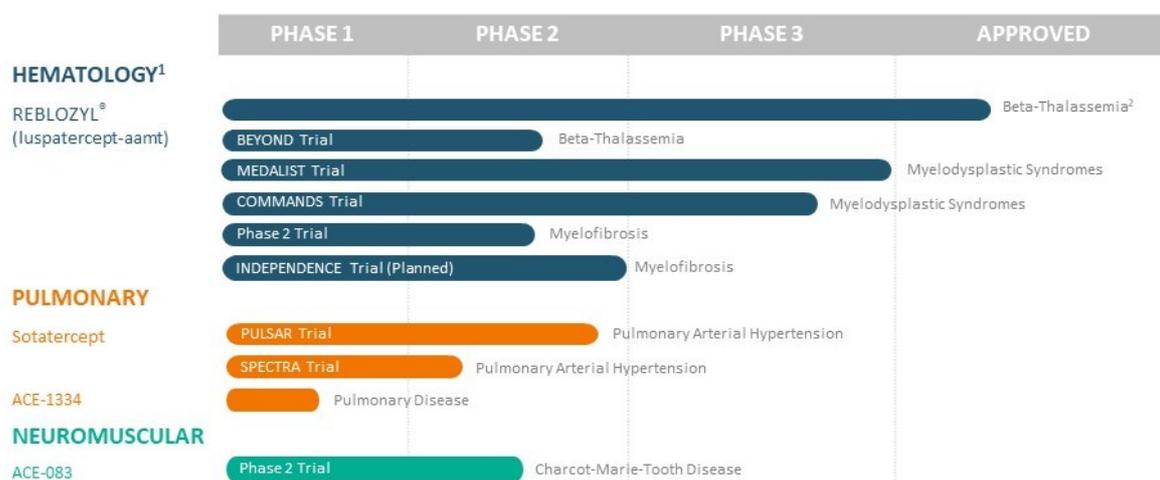
The Acceleron Discovery Platform: Novel Approaches to Potent Biology

Since our founding, we have focused on developing therapeutic candidates that regulate cellular growth and repair. We have targeted a group of approximately 30 secreted proteins, or ligands, that are collectively referred to as the TGF-beta superfamily. These ligands bind to subsets of 12 different receptors on the surface of cells, triggering intra-cellular changes in gene expression that guide cell growth and differentiation. The TGF-beta superfamily ligands and their receptors represent a diverse set of drug targets with the potential to yield potent therapeutics for the growth and repair of diseased cells and tissues.

Applying our proprietary discovery and development platform, including our knowledge of the biology of the TGF-beta superfamily and its receptors, we have generated multiple Fc-fusion protein ligand traps, our novel IntelliTrap™ platform technology and a robust pipeline of innovative clinical and preclinical therapeutic candidates targeting key mechanisms underlying serious and rare diseases. Additionally, we are conducting a multi-target antibody discovery collaboration with Adimab LLC, or Adimab, a leading antibody discovery company, under which Adimab is generating human antibodies against undisclosed targets that we select. This collaboration could expand our biologics platform and provide us with enhanced access to antibody therapeutic candidates in the future.

We use our integrated platform of research, development and manufacturing technologies to rapidly and cost-effectively create, test and advance our therapeutic candidates. Our leadership in the understanding of TGF-beta biology and protein engineering generates innovative compounds that engage the body's ability to regulate cellular growth and repair.

Our Pipeline



1. All REBLOZYL (luspatercept-aamt) activities are in collaboration with Bristol-Myers Squibb.
2. U.S. FDA approved for the treatment of anemia in adult patients with beta-thalassemia who require regular red blood cell transfusions.

REBLOZYL® (luspatercept-aamt)

REBLOZYL is a first-in-class erythroid maturation agent designed to promote RBC production through a novel mechanism. In November 2019, the FDA approved REBLOZYL for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions based on data from the Phase 3 BELIEVE trial. BMS has submitted an sBLA in the United States for luspatercept-aamt for the treatment of anemia in adult patients with very low- to intermediate-risk MDS who have ring sideroblasts and require RBC transfusions based on the Phase 3 MEDALIST trial, and the FDA accepted the sBLA and set a target action date of April 4, 2020. BMS also submitted an MAA to the EMA based on the BELIEVE and MEDALIST trials. The MAA has been successfully validated and we expect the EMA to issue a decision in the second half of 2020.

In addition to the BELIEVE and MEDALIST indications, luspatercept-aamt is being developed to treat anemia in patients with non-transfusion dependent beta-thalassemia, with myelofibrosis, and as a first-line treatment for patients with lower-risk MDS.

Beta-thalassemia

The thalassemias comprise a heterogeneous group of disorders arising from defects in the genes that encode the proteins that comprise hemoglobin. Hemoglobin is a four-subunit protein complex formed of two alpha-subunits and two beta-subunits, each with an iron-containing heme group that binds to and carries oxygen molecules within red blood cells. There are two main classifications of thalassemia, alpha-thalassemia and beta-thalassemia, depending on whether the genetic defect lies in the gene encoding the alpha-subunit or the beta-subunit, respectively. Beta-thalassemia is particularly prevalent throughout the Mediterranean region, Middle East, and Southeast Asia, and, due to migration and immigration, is increasingly a global disease. The Thalassaemia International Federation estimates that there are approximately 300,000 patients worldwide with beta-thalassemia, approximately 20,000 of which are in the United States and Europe, who are dependent on frequent blood transfusions. We estimate that there are at least as many beta-thalassemia patients in the same regions who are not transfusion dependent and not included in these estimates. Many of these patients have hemoglobin levels that are approximately half that of normal individuals and experience significant complications of the disease. Beta-thalassemia is treated primarily by RBC transfusions that, over time, cause a toxic accumulation of iron in the body. A central challenge for managing patients with beta-thalassemia is to restore the RBC levels while avoiding iron overload. Iron chelation therapy alone costs between \$35,000 and \$75,000 per year in the United States and certain countries in Europe and yet does not treat the underlying anemia. The course of the disease depends largely on whether patients are maintained on an adequate transfusion and iron chelation regimen. Poor compliance with transfusion and/or iron chelation is associated with a poor prognosis and shortened survival. However, even with the standard of care, patients are at risk of infection from transfusions as well as toxicities related to iron chelation therapy.

In addition to REBLOZYL, patients with beta-thalassemia are treated with hematopoietic stem cell transplantation, which is used as a potentially curative approach for beta-thalassemia, however this option is limited by the availability of appropriate donors and by risks, including death, associated with the bone marrow transplant procedure. Consequently this treatment is used only in the most severely affected patients. Bluebird bio's ZYNTEGLO™ (autologous CD34+ cells encoding β A-T87Q-globin gene), a gene-therapy program delivered after single-agent, myeloablative busulfan conditioning, was granted conditional marketing authorization by the European Commission, or EC, for patients with transfusion dependent beta-thalassemia in June 2019. Bluebird bio has disclosed plans to complete the submission of a Biologics License Application to the FDA in the second half of 2020.

BELIEVE

In December 2019, updated results from the BELIEVE trial were presented at the 61st ASH Annual Meeting and Exposition. BELIEVE is a Phase 3, randomized, double blind, placebo-controlled multicenter study comparing luspatercept-aamt + best supportive care (BSC) versus placebo + BSC in adult beta-thalassemia patients who require regular RBC transfusions. The median age of the patients was 30 years in both treatment arms. 336 patients were randomized 2:1 to receive either luspatercept-aamt 1.0 mg/kg + BSC (224 patients) or placebo + BSC (112 patients) every three weeks for up to 48 weeks. Patients in the luspatercept-aamt + BSC arm were able to be titrated up to 1.25 mg/kg of luspatercept-aamt every three weeks. BSC was defined as RBC transfusions and iron chelation therapy to maintain each patient's baseline hemoglobin level. Crossover to the luspatercept-aamt treatment group was allowed after unblinding and assessment by an independent Data Safety Monitoring committee; patients receiving luspatercept-aamt + BSC will be followed for up to three years. The study was conducted at 65 sites in 15 countries.

As of the clinical cutoff (January 7, 2019), 45.1% (101/224) of luspatercept-aamt patients and 2.7% (3/112) of placebo patients had achieved at least a 33% reduction in RBC transfusion burden over any 24-week period. Among the luspatercept-aamt patients who had a response, 73.3% (74/101) had at least 2 separate responses, with 59.4% (60/101) having 3 or more responses. The median duration of clinical benefit – defined as the time from first response of at least a 33% reduction in RBC transfusion over any 24-week interval to discontinuation due to any cause – for patients who responded to luspatercept-aamt was 76.3 weeks (24-128.1). The most commonly observed adverse events, or AEs, in the safety population (n=332) included in luspatercept-aamt and placebo patients, respectively, were bone pain (20.2% vs. 8.3%), arthralgia (21.1% vs. 14.7%) and dizziness (12.1% vs. 4.6%). These AEs typically occurred early on, and incidence decreased over time.

BEYOND

BMS is also conducting a Phase 2 clinical trial with luspatercept-aamt in non-transfusion-dependent beta-thalassemia patients, referred to as the BEYOND trial, with preliminary topline results currently expected by the end of 2020.

Myelodysplastic Syndromes (MDS)

MDS is a group of heterogeneous hematologic diseases characterized by abnormal proliferation and differentiation of blood precursor cells, including RBC precursors, in the bone marrow. This leads to peripheral reductions in red blood cells, often accompanied by decreases in white blood cells and platelets, as well as a risk of disease progression to acute myeloid

leukemia. Although MDS patients may have varying forms of the disease, anemia is present in the vast majority of MDS patients at the time of diagnosis. MDS is primarily a disease of the elderly, with 88% of cases diagnosed in individuals 60 years of age or older. Cancer surveillance databases estimate the annual incidence of MDS in the United States at over 15,000 cases and the overall U.S./EU prevalence to be at least 125,000 patients.

Hematopoietic stem cell transplantation represents the only treatment modality with curative potential, although the relatively high morbidity and mortality of this approach limits its use. Approximately 75% of the MDS patients in the United States and EU are classified as lower risk and 25% are classified as higher risk. High risk patients are typically treated with inhibitors of DNA methyltransferase such as Vidaza® or Dacogen®, or generic versions that are now available in some countries. Many categorized as lower-risk typically receive ESAs as first-line therapy, though ESAs are not approved by the FDA for the treatment of anemia in MDS patients. Therapeutic options following failure on ESAs are limited, and most patients end up receiving RBC transfusions to manage their anemia. Approximately 15% of patients with MDS have a specific chromosomal mutation and are treated with Revlimid®.

The chronic anemia in MDS is primarily due to ineffective erythropoiesis, and a significant number of MDS patients have serum erythropoietin levels substantially above the normal range, indicating that the chronic anemia in these MDS patients is not a consequence of erythropoietin deficiency. The ineffective erythropoiesis of MDS may be caused by excess signaling by members of the TGF-beta superfamily, which inhibits RBC maturation. For this reason, we believe that blocking this excess signaling by luspatercept-aamt may reverse this inhibition. More than half of MDS patients are unresponsive to the administration of recombinant erythropoietin and instead require RBC transfusions, which can increase the risk of infection and iron-overload related toxicities. Treatment-resistant chronic anemia resulting from ineffective erythropoiesis is a major cause of morbidity in MDS patients.

MEDALIST

In December 2019, updated results from the Phase 3 MEDALIST trial with luspatercept-aamt were presented at the 61st ASH Annual Meeting and Exposition. MEDALIST is a Phase 3, randomized, double blind, placebo-controlled, multi-center study evaluating the safety and efficacy of luspatercept-aamt in patients with very low-, low-, or intermediate-risk non-del(5q) MDS. All patients were RBC transfusion dependent and were either refractory or intolerant to prior erythropoiesis-stimulating agent (ESA) therapy, or were ESA naïve with endogenous serum erythropoietin ≥ 200 U/L, and had no prior treatment with disease modifying agents. The median age of the patients enrolled in the trial was 71 years in the luspatercept-aamt treatment group and 72 years in the placebo group. Median transfusion burden in both treatment arms was 5 RBC units/8 weeks. 229 patients were randomized to receive either luspatercept-aamt 1.0 mg/kg (153 patients) or placebo (76 patients) via subcutaneous injection once every 21 days. The study was conducted at 65 sites in 11 countries.

The updated analysis presented at ASH measured the achievement and number of individual periods of RBC-transfusion independence (RBC-TI) of at least 8 weeks throughout the course of the study. Additionally, clinical benefit (RBC-TI) of at least 8 weeks and/or modified hematologic improvement-erythroid (HI-E) was also assessed, along with the total duration of the clinical benefit, which was defined as time from achieving clinical benefit until discontinuation due to loss of benefit, adverse events or other causes.

In the analysis, the median baseline RBC transfusion burden for both the luspatercept-aamt and placebo arms was five units per eight weeks. As of the clinical cutoff (July 1, 2019), 47.7% (73/153) of luspatercept-aamt patients and 15.8% (12/76) of placebo patients achieved at least one episode of RBC-TI lasting at least 8 weeks at any point in the study. Sixty-nine point nine percent (51/73) of patients who responded to luspatercept-aamt experienced multiple episodes of at least 8 weeks of RBC-TI at any point, interceded by occasional transfusions. The median total duration of clinical benefit was 92.3 weeks for luspatercept-aamt responders (n=98) and 26.8 weeks for placebo (n=20), with 26.8% of luspatercept-aamt-treated patients remaining on treatment. No placebo-treated patients remained on treatment. The median treatment duration for all RBC-TI responders was 109.1 weeks for luspatercept-aamt-treated patients and 53.6 weeks for patients on placebo.

AEs occurring more frequently with luspatercept-aamt compared to placebo were fatigue, asthenia and headache. These occurred during cycles 1-4 and were mainly grade 1 or 2, with the incidence decreasing over time. Progression to acute myeloid leukemia was similar between the luspatercept-aamt (2%) and placebo (2.6%) arms.

COMMANDS

BMS is also currently conducting the COMMANDS Phase 3 trial in first-line, lower-risk MDS patients and enrollment is ongoing.

Myelofibrosis

Myelofibrosis is an acquired disease of the bone marrow that results in replacement of the bone marrow with fibrotic tissue leading to bone marrow failure and inability to make new blood cells, including red blood cells, which leads to anemia. Epidemiological databases suggest that there are approximately 30,000 myelofibrosis patients in the United States and Europe. Approximately 30% of myelofibrosis patients present primarily with anemia when diagnosed and nearly all patients will develop anemia with progression of the disease. There is no approved drug therapy to treat chronic anemia in myelofibrosis.

In December 2019, initial results from the Phase 2 clinical trial in patients with myelofibrosis associated anemia were presented at the 61st ASH Annual Meeting and Exposition. Seventy-six patients were enrolled in the trial in multiple cohorts of patients including two groups with anemia only (hemoglobin level equal to or below 9.5 grams per deciliter (g/dL) in a 12-week period prior to the first dose) and without concomitant ruxolitinib (Cohort 1; n=22) or with concomitant ruxolitinib (Cohort 3A; n=14). Two other groups included transfusion dependent (TD; received 2-4 RBC units per 28 days in the 12 weeks prior to the date of the first dose) patients without concomitant ruxolitinib (Cohort 2; n=21) and with concomitant ruxolitinib (Cohort 3B n=19).

Patients in Cohort 3A or 3B were required to be on a stable dose of ruxolitinib for at least 16 weeks prior to initiating luspatercept-aamt. All patients received luspatercept-aamt at a starting dose of 1 mg/kg subcutaneously in three-week treatment cycles and dose increases were allowed up to a maximum dose level of 1.75 mg/kg.

For anemia-only patients (Cohorts 1 and 3A), the primary endpoint was a hemoglobin (Hb) increase of at least 1.5 g/dL from baseline for at least 12 consecutive weeks at every assessment within the first 24 weeks on the study, in the absence of any RBC transfusions. An additional endpoint was the proportion of patients achieving a mean Hb increase of at least 1.5 g/dL over any consecutive 12-week period in absence of RBC transfusions. As of the clinical data cutoff (August 5, 2019), 14% (3/22) and 21% (3/14) of anemia-only patients met the primary endpoint in Cohorts 1 and 3A, respectively. Additionally, 18% (4/22) of Cohort 1 and 64% (9/14) of Cohort 3A patients achieved a mean Hb increase of at least 1.5 g/dL from baseline over any consecutive 12-week period.

For patients receiving RBC transfusions (Cohorts 2 and 3B), the primary endpoint was RBC transfusion independence (RBC-TI) for at least 12 consecutive weeks within the first 24 weeks of the study. An additional endpoint was the proportion of patients demonstrating at least a 50% reduction in their transfusion burden from baseline (minimum 4 RBC units) over at least any consecutive 12-week period. In Cohorts 2 and 3B, 10% (2/21) and 32% (6/19) of patients achieved the primary endpoint, respectively. Additionally, 38% (8/21) of Cohort 2 and 53% (10/19) of Cohort 3B patients achieved at least a 50% reduction in RBC transfusion burden from baseline (minimum 4 RBC units).

Four percent (3/76) of patients had grade 3 or higher treatment-emergent adverse events, or TEAEs. The most commonly occurring TEAEs of any grade greater than 3% were hypertension (12%), bone pain (9%) and diarrhea (5%). Treatment discontinuations as the result of TEAEs occurred in seven (9%) patients. There were no treatment-related deaths.

As a result of the phase 2 study, we and BMS announced plans to initiate in 2020 the pivotal Phase 3 INDEPENDENCE study in patients with myelofibrosis-associated anemia who are being treated with JAK inhibitor therapy and require RBC transfusions.

Sotatercept

Sotatercept is an activin receptor type IIA fusion protein that acts as a ligand trap for members in the TGF-beta protein superfamily involved in the remodeling of a variety of different tissues, including the vasculature and fibrotic tissue. In January 2020, we announced that the PULSAR Phase 2 trial of sotatercept met its primary and key secondary endpoints, and other secondary endpoints, in patients with PAH.

Pulmonary Arterial Hypertension (PAH)

Pulmonary hypertension is a group of diseases characterized by elevated blood pressure in the pulmonary circulation resulting from a variety of causes. PAH is a type of pulmonary hypertension. It is a rare, chronic, rapidly progressing disorder characterized by the constriction of small pulmonary arteries, resulting in abnormally high blood pressure in these vessels. Patients typically present with exercise fatigue and shortness of breath. Progressive obstruction and constriction of the pulmonary vasculature leads to elevated blood pressure in the pulmonary circulation and strain on the right side of the heart. In later stages of disease, right heart failure may develop, and heart failure is the major cause of death in PAH patients. The major classes of drugs used to treat PAH are: the phosphodiesterase 5 inhibitors (PDE5i), the endothelin receptor antagonists (ERAs), the soluble guanylate cyclase stimulators (sGCs) and the prostacyclins. Despite the availability of therapeutic options, the disease progresses rapidly and the five-year survival rate for patients is approximately 57%. All classes of currently approved therapies are designed to promote the dilation of blood vessels, a mechanism referred to as vasodilation. As evident from the

high mortality rate, therapies that promote vasodilation improve many aspects of the disease, but do not fundamentally modify or halt the progression of the disease. Accordingly, there is significant unmet need for therapies that address more fundamental aspects of the disease.

Heritable forms of PAH are known, and the underlying genetic defects have been identified. In most cases, the underlying mutations map to a gene that encodes the BMP receptor type II (BMPRII) or genes encoding other proteins that participate in the BMPRII signaling pathway. BMPRII is a key receptor for ligands referred to as the BMPs, and these are part of the TGF-beta superfamily. The BMP-BMPRII signaling pathway activates transcription factors called Smad1/5/8 that coordinate changes in the expression of certain genes. A deficiency in BMP-BMPRII signaling, and the attendant activation of Smad1/5/8, is thought to lead to increased proliferation of cell types that line the vessels, including endothelial cells, smooth muscle cells and fibroblasts. This increased proliferation leads to an overgrowth of smooth muscle and fibrotic tissue around the small arterioles, leading to the formation of muscularized vessels and so-called plexiform lesions. The vessels become constricted and obstructed. Plexiform lesions are arterioles that have become almost completely obstructed by an over-proliferation of endothelial cells, smooth muscle cells and fibrotic tissue. Although the association between BMP-BMPRII signaling and PAH was first identified through the study of patients with heritable forms of the disease, it is now understood that BMP-BMPRII signaling is deficient in patients with non-heritable forms of the disease, including idiopathic and associated forms of PAH. For these reasons, it is expected that a therapeutic agent that improves the signaling deficits in the BMP-BMPRII pathway, activating Smad1/5/8, could rectify key defective molecular signaling events causing the disease, with the potential to modify the course of disease.

It has been reported that a group of proteins targeted by sotatercept, the activins, are present at increased levels in PAH patients. Recently, we and others have found that activins can suppress signaling through the BMP-BMPRII pathway, as measured by assessing Smad1/5/8 activation. We further found that sotatercept, by inhibiting activins, can stimulate the BMP-BMPRII signaling pathway in isolated cells. We evaluated sotatercept for its effects on the establishment of PAH in two mouse models of the disease, and we found that sotatercept had a more profound benefit than representatives of any of the classes of standard-of-care therapies. As a result, we believe that sotatercept has the potential to correct the BMP-BMPRII signaling deficit that is fundamental to disease in PAH patients and thereby modify the course of disease. Further, because sotatercept works by a distinct mechanism from the available vasodilator agents, we believe that sotatercept can be used in combination with these other agents.

The worldwide PAH patient population is expanding, with more than 80,000 patients living with PAH in the United States and European Union combined. PAH represents one of the largest specialty pharmaceutical markets with approximately \$4.5 billion in sales in the United States in 2018.

PULSAR and SPECTRA

The PULSAR trial is Phase 2, randomized, double-blind, placebo-controlled study designed to evaluate the efficacy and safety of sotatercept in PAH patients. The primary endpoint of the PULSAR trial is the change from baseline in pulmonary vascular resistance, or PVR, over a 24-week treatment period. The key secondary endpoint is change from baseline in six-minute walk distance, or 6MWD. A total of 106 patients were randomized 3:3:4 into three treatment arms with standard-of-care vasodilator therapies in combination with sotatercept or placebo. Following the 6-month double-blind treatment period, participants in the trial were eligible to enroll into the 18-month extension period, which is currently ongoing.

In January 2020, we announced that the PULSAR trial met its primary and key secondary endpoints in patients with PAH. In patients on stable background PAH-specific therapies, sotatercept demonstrated a statistically significant reduction in PVR, the trial's primary endpoint, at week 24 versus placebo. The PULSAR trial also achieved a statistically significant improvement in the key secondary endpoint of 6MWD, as well as other secondary endpoints, including amino-terminal brain natriuretic propeptide, or NT-proBNP, and World Health Organization functional class. Sotatercept was generally well tolerated in the PULSAR trial and AEs were consistent with previously published data on sotatercept in other diseases. We plan to present a detailed review of the topline results from the PULSAR trial at the American Thoracic Society's International Conference in May 2020.

We are also currently enrolling an exploratory study called SPECTRA to provide us with greater understanding of sotatercept's potential impact on PAH, with preliminary results expected in 2020.

ACE-083

Our third clinical stage therapeutic candidate, ACE-083, is designed to promote muscle growth and function in specific, targeted muscles. ACE-083 uses the Myostatin + approach to promote muscle growth, meaning that ACE-083 inhibits myostatin, a well-characterized regulator of muscle size, as well as other factors that suppress muscle growth. Through the inhibition of multiple suppressors of muscle growth, ACE-083 promotes a substantially greater muscle mass increase than selective myostatin antagonists. We are currently conducting a Phase 2 clinical trial with ACE-083 in patients with CMT, and

an extension study for eligible CMT patients who have completed treatment in the Phase 2 clinical trial with ACE-083. In September 2019, we announced that ACE-083 did not achieve functional secondary endpoints in part 2 of a Phase 2 clinical trial in patients with FSHD and we are discontinuing development of ACE-083 in FSHD.

CMT

CMT is one of the most common inherited neurologic diseases, estimated to affect more than 125,000 people in the United States. The primary clinical manifestations of CMT include muscle weakness in the lower legs and hands. The lower leg muscle weakness can result in foot drop and a high-stepped gait leading to frequent tripping or falls. The disease is typically diagnosed by the presence of a characteristic pattern of muscle weakness, neurologic symptoms, and family history, as well as through genetic testing.

In 2018, we announced preliminary results for part 1 of the Phase 2 clinical trial with ACE-083 in patients with CMT. These preliminary results included data from 18 patients evaluable for magnetic resonance imaging, or MRI, among three different cohorts with patients receiving ACE-083 as a bilateral injection into the tibialis anterior muscle once every three weeks for 12 weeks. The cohorts consisted of 18 patients with tibialis anterior weakness treated bilaterally with 150mg, 200mg or 240mg/muscle (6 patients each). Mean total muscle volume increases (plus or minus standard error mean, or \pm SEM) and mean decreases (\pm SEM), or improvements, in fat fraction percentage relative to baseline were measured by MRI at 3 weeks after the last dose of ACE-083, and were as follows:

Muscle	ACE-083 Dose/Muscle	Number of Patients	Total Muscle Volume Increase (percent change) (mean \pm SEM)	Decrease in Fat Fraction, % (absolute change) (mean \pm SEM)
Tibialis Anterior	150mg bilateral	6	12.6 (2.9)	-1.7 (1.2)
Tibialis Anterior	200mg bilateral	6	13.3 (1.5)	-3.5 (1.0)
Tibialis Anterior	240mg bilateral	6	14.2 (3.2)	-3.3 (1.2)

ACE-083 was well tolerated in part 1 of the CMT Phase 2 clinical trial and no study-drug related serious adverse events were reported. The most common adverse events were injection site reactions, muscle spasms and myalgia and were grades 1-2. We expect to announce preliminary results from the randomized, double blind, placebo-controlled part 2 of the CMT Phase 2 clinical trial in the first quarter of this year.

Preclinical Programs

In addition to our clinical development activities, we are expanding our research capabilities in order to increase the rate at which our highly productive research group can identify and advance new, internally discovered, therapeutic candidates for clinical development. Our discovery efforts are primarily focused on identifying new protein therapeutic candidates from our fusion protein platform, which includes the IntelliTrap™ platform, and identifying novel antibodies.

Our Strategic Partnerships

Collaborations with corporate partners have provided us with significant funding and access to our partners' scientific, development, regulatory and commercial capabilities. We have received more than \$510.9 million from our collaborations with BMS and our prior collaborations with Alkermes plc (Alkermes) and Shire AG (Shire).

BMS

On February 20, 2008 we entered into an agreement with Celgene, which was acquired by BMS in 2019 and which we now refer to as BMS, relating to sotatercept, which we refer to as the Original Sotatercept Agreement. We amended the Original Sotatercept Agreement on August 2, 2011, which we refer to as the Amended Sotatercept Agreement. We further amended and restated the Amended Sotatercept Agreement in its entirety on September 18, 2017, and refer to the amended and restated agreement as the Restated Sotatercept Agreement. On August 2, 2011 we entered into a second agreement with BMS for REBLOZYL, which we refer to as the REBLOZYL Agreement.

Restated Sotatercept Agreement. The Restated Sotatercept Agreement provides BMS with an exclusive license to sotatercept outside of the PH field, and provides us with the worldwide exclusive rights to develop and commercialize sotatercept in the PH field. We also granted BMS an option to license discovery stage compounds against three specified targets. BMS paid \$45.0 million and bought \$5.0 million of equity upon execution of the Original Sotatercept Agreement and, as of December 31, 2019, we have received \$44.7 million in research and development funding and milestone payments for the sotatercept program.

In connection with the Restated Sotatercept Agreement, BMS agreed not to develop or commercialize in the PH field any compound developed under the Restated Sotatercept Agreement or the REBLOZYL Agreement, and we agreed not to develop or commercialize any compound developed under the Restated Sotatercept Agreement or the REBLOZYL Agreement in any field outside of the PH field. We have the right to license, transfer or sell our rights to develop and commercialize sotatercept in the PH field, subject to BMS's right of first negotiation.

We are responsible for 100% of the costs related to our development and commercialization of sotatercept in the PH field. If sotatercept is commercialized to treat PAH and we recognize such revenue, then we will owe BMS a royalty in the low 20% range on global net sales. In certain circumstances, BMS may recognize revenue related to the commercialization of sotatercept in PAH, and in this scenario we will be eligible to receive a royalty from BMS such that the economic position of the parties is equivalent to the scenario in which we recognize such revenue. With respect to the development and commercialization of sotatercept outside of the PH field or the development and commercialization of any other compound under the Restated Sotatercept Agreement, the terms of the Amended Sotatercept Agreement remained unchanged.

Since January 1, 2013, BMS has been responsible for paying 100% of worldwide development costs for the sotatercept program outside of the PH field and BMS will be responsible for all commercialization costs worldwide, as approved in budgets agreed to between us and BMS. We will be eligible to receive tiered royalty payments in the low-to-mid 20% range on net sales of sotatercept outside of the PH field. We are obligated to co-promote sotatercept outside of the PH field and future products in all fields, in each case if approved, in North America, and BMS will pay all costs related thereto pursuant to the commercialization plan and budget. Outside the PH field, BMS will be responsible for any sotatercept Phase 3 clinical trials, as well as any additional Phase 2 clinical trials, and is responsible for manufacturing or overseeing the manufacture of Phase 3 and commercial supplies.

Pursuant to the Restated Sotatercept Agreement, BMS has provided us with certain quantities of BMS's existing clinical supply of sotatercept for development in the PH field at no cost to us. For clinical supply of sotatercept in excess of that which is agreed to under the Restated Sotatercept Agreement, BMS had the option to provide us with such clinical supply of sotatercept, but has declined this option, and we are responsible for manufacturing future clinical supply of sotatercept in the PH field. BMS may elect, however, to provide us with commercial supply of sotatercept at a negotiated price or provide a tech transfer to us to enable us to manufacture on our own behalf. The conduct of the collaboration is managed by a Joint Development Committee and Joint Commercialization Committee. In the event of a deadlock of a committee, we shall determine the resolution of issues specifically related to the PH field (other than pricing which shall be determined by consensus), and BMS shall determine the resolution of all other issues. The Joint Commercialization Committee will oversee commercialization of sotatercept and sotatercept pricing will be determined by mutual agreement of us and BMS in the Joint Commercialization Committee.

The Restated Sotatercept Agreement will expire on a country-by-country basis on the latest to occur of the following: (1) the expiration of the royalty term with respect to all license products outside the PH field in such country, (2) the expiration of the royalty term with respect to all sotatercept licensed products in the PH field in such country, and (3) the exercise or forfeiture by BMS of its option with regard to each option compound. In the PH field, the royalty term for each licensed product in each country is the period commencing with first commercial sale of the applicable licensed product in the applicable country and ending on the latest of expiration of specified patent coverage or a specified period of years. Outside the PH field, the royalty term for each licensed product in each country outside North America is the period commencing with first commercial sale of the applicable licensed product in the applicable country and ending on the latest of expiration of specified patent coverage or a specified period of years, and the royalty term for each licensed product in North America is the period commencing with the first commercial sale in North America and ending, on a licensed product and country-by-country basis, on the date which commercialization of such licensed product has ceased. The term for each option compound runs for a specified period of years unless BMS exercises its option, in which case the compound becomes a licensed product, or forfeits its option by failing to make certain payments following the achievement of certain milestones in early clinical development of the option compound.

The Restated Sotatercept Agreement is terminable by either party upon a breach that is uncured and continuing or by BMS for convenience on a country-by-country or product-by-product basis, or in its entirety. BMS may also terminate the Restated Sotatercept Agreement, in its entirety or on a product-by-product basis, for failure of a product to meet a development or clinical trial endpoint. Termination for cause by us or termination by BMS for convenience or failure to meet an endpoint will have the effect of terminating the applicable license to BMS and the rights granted to us with respect to the development of sotatercept in the PH field shall become irrevocable. Termination for cause by either party shall result in reducing the remaining royalties due to the breaching party by a certain percentage. Upon termination by BMS for convenience or for failure to meet an endpoint, we and BMS will enter into a termination agreement pursuant to which, among other things, BMS will continue to be eligible to receive a royalty in the low 20% range on global net sales of sotatercept in the PH field.

We are eligible to receive future development, regulatory and commercial milestones of up to \$360.0 million for the sotatercept program outside of the PH field and up to an additional \$348.0 million for each of the three discovery stage programs. None of the three discovery stage programs has advanced to the stage to achieve payment of a milestone, nor do we expect any such milestone payments in the near future. We were not required to make any upfront payments to BMS upon execution of the Restated Sotatercept Agreement, and we will not be required to make any milestone payments to BMS in connection with our development and commercialization of sotatercept in the PH field.

REBLOZYL Agreement. The REBLOZYL Agreement provides BMS with an exclusive license to REBLOZYL in all indications and we and BMS are collaborating in the development and commercialization of REBLOZYL. We also granted BMS an option to license products for which we file an investigational new drug application for the treatment of anemia. BMS paid \$25.0 million to us upon execution of the REBLOZYL Agreement in August 2011 and, as of December 31, 2019, we have received \$181.9 million in research and development funding and milestone payments for the REBLOZYL program.

Under the REBLOZYL Agreement, the conduct of the collaboration is managed by a Joint Development Committee and Joint Commercialization Committee. Other than with respect to certain matters related to our conduct of Phase 2 trials, in the event of a deadlock of a committee, the resolution of the relevant issue is determined by BMS. Since January 1, 2013, BMS has been responsible for paying 100% of worldwide development costs for the REBLOZYL program and BMS will be responsible for all commercialization costs worldwide, as approved in the budgets agreed to between us and BMS. We are obligated to co-promote REBLOZYL and future products, in each case if approved, in North America, and BMS will pay all costs related thereto. Activities that we elect to conduct outside of the approved budgets to support REBLOZYL are at our own expense. We are eligible to receive tiered royalty payments in the low-to-mid 20% range on net sales of REBLOZYL.

The REBLOZYL Agreement is terminable by either party upon a breach that is uncured and continuing or by BMS for convenience on a country-by-country or product-by-product basis, or in its entirety. BMS may also terminate the REBLOZYL Agreement in its entirety or on a product-by-product basis for failure of a product to meet a development or clinical trial endpoint. Termination for cause by us or termination by BMS for convenience or failure to meet an endpoint will have the effect of terminating the applicable license, while termination for cause by BMS will have the effect of reducing remaining royalties by a certain percentage.

Under the REBLOZYL Agreement, we retained responsibility for research, development through the end of Phase 1 and the two ongoing Phase 2 clinical trials in MDS and beta-thalassemia, as well as manufacturing the clinical supplies for these studies. BMS may supply additional clinical supplies for our ongoing Phase 2 clinical trials in MDS and beta-thalassemia if needed. BMS will conduct any subsequent Phase 2 and Phase 3 clinical trials. We were responsible for manufacturing REBLOZYL for all Phase 1 and Phase 2 clinical trials, and BMS has responsibility for the manufacture of REBLOZYL for any additional Phase 2 and Phase 3 clinical trials and commercial supplies. We are eligible to receive future regulatory and commercial milestones of up to \$125.0 million for the REBLOZYL program.

Competition

The development and commercialization of new drugs is highly competitive. We and our collaborators will face competition with respect to all therapeutic candidates we may develop or commercialize in the future from pharmaceutical and biotechnology companies worldwide. Many of the entities developing and marketing potentially competing products have significantly greater financial resources and expertise than we do in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals and marketing. Our commercial opportunity will be reduced or eliminated if our competitors develop and commercialize products that are more effective, have fewer side effects, are more convenient or are less expensive than any products that we may develop.

If our clinical stage therapeutic candidates are approved, they will compete with currently marketed drugs and therapies used for treatment of the following indications, and potentially with drug candidates currently in development for the same indications:

Beta-thalassemia

Now that REBLOZYL is approved for the treatment of patients with beta-thalassemia, it may compete with:

- RBC transfusions, which are used to treat anemia in patients with beta-thalassemia, and iron chelation therapy, such as Novartis's oral iron chelating agents Exjade® and Jadenu™, which are used to treat iron overload in patients with beta-thalassemia.
- Fetal hemoglobin stimulating agents, such as hydroxyurea, which are primarily used to treat patients with anemia from sickle cell disease, and are sometimes used to treat patients with beta-thalassemia.

- Hematopoietic stem cell transplant treatment, which is given to a small percentage of patients with beta-thalassemia, since it requires a sufficiently well-matched source of donor cells. Certain academic centers around the world are seeking to develop improvements to this approach.
- Bluebird bio's gene therapy program, ZYNTEGLO™ (autologous CD34+ cells encoding β A-T87Q-globin gene), a gene-therapy program delivered after single-agent, myeloablative busulfan conditioning, which was granted conditional marketing authorization by the European Commission for patients with transfusion dependent beta-thalassemia in June 2019. Bluebird bio has disclosed plans to complete the submission of a Biologics License Application to the FDA in the second half of 2020.
- Other therapies in development, including gene therapy and genome editing, that are being developed by several different groups, including Orchard Therapeutics, Sangamo BioSciences Inc. in collaboration with Sanofi, and CRISPR Therapeutics in collaboration with Vertex. Agios Pharmaceuticals is also developing mitapivat (AG-348), a small molecule allosteric activator of wild-type and a variety of mutated pyruvate kinase-R (PKR) enzymes, for the treatment of anemia in patients with non-transfusion dependent thalassemia.

MDS

If luspatercept-aamt is approved for the treatment of patients with MDS, it would compete with the following:

- Recombinant erythropoietin and other erythropoiesis stimulating agents. Although these agents are not approved to treat anemia in MDS in the United States, current practice guidelines include the use of erythropoiesis stimulating agents and granulocyte colony stimulating factor agents (G-CSF) to treat patients with MDS. Eprex® from Janssen Pharmaceuticals was recently approved in Europe to treat symptomatic anemia in certain patients with lower risk MDS.
- Red blood cell transfusions, which are used to treat anemia in patients with MDS, and iron chelation therapy, such as Novartis's oral iron chelating agents Exjade® and Jadenu™, which are used to treat iron overload in patients with MDS.
- Immunomodulators, including BMS's approved product, Revlimid® (lenalidomide), for the treatment of anemia of certain MDS patients.
- The hypomethylating agent azacitidine, which is approved by the FDA to treat certain French-American-British MDS subtypes, which includes some lower risk MDS patients.
- Roxadustat (FG-4592), a hypoxia-inducible factor prolyl hydroxylase inhibitor that Fibrogen is studying in a Phase 3 study in lower risk MDS patients with anemia and low transfusion burden.
- Other therapies in development, including: an oral form of the hypomethylating agent azacitidine, known as CC-486, being developed by BMS to treat patients with transfusion dependent anemia and thrombocytopenia due to lower risk MDS, which is currently in Phase 3 clinical trials in the United States and Europe; an anti-cancer therapy being developed by Onconova to treat patients with high risk MDS; a telomerase inhibitor, imetelstat, being studied by Geron in a Phase 2/3 study in lower risk MDS patients; and a CD95 ligand inhibitor, Asunercept, formerly APG101, being studied by Apogenix, completed a Phase 1 study in transfusion dependent, lower risk MDS patients.

Myelofibrosis

If luspatercept-aamt is approved for the treatment of patients with myelofibrosis, it would compete with:

- Red blood cell transfusions, which are used to treat anemia in patients with myelofibrosis, and iron chelation therapy, such as Novartis's oral iron chelating agents Exjade® and Jadenu™, which are used to treat iron overload in patients with myelofibrosis.
- Recombinant erythropoietin, other erythropoiesis stimulating agents, androgen therapy, and immunomodulatory drugs. Although these agents are not approved to treat anemia in myelofibrosis in the United States, current practice guidelines include the use of these agents to treat anemia in patients with myelofibrosis.
- A telomerase inhibitor, imetelstat, being studied by Geron in a Phase 2 study to treat intermediate-2 or high-risk in patients with myelofibrosis.
- Momelotinib, a JAK1, JAK2, ACVR1 inhibitor acquired by Sierra Oncology from Gilead Inc., which is in development for treatment of myelofibrosis. Momelotinib has been investigated in two completed Phase 3 trials for

the treatment of myelofibrosis and is currently moving forward in a new Phase 3 trial in patients with myelofibrosis who have been treated previously with a JAK inhibitor.

- Constellation Pharmaceuticals's BET inhibitor, CPI-0610, which is in Phase 2 clinical development to treat patients with myelofibrosis in a first-line setting, second-line JAK refractory, and second-line JAK combination. Constellation has announced plans to conduct a Phase 3 trial in treatment-naïve or post-polycythemia and post-essential thrombocythemia myelofibrosis patients.

Pulmonary Arterial Hypertension

We recently announced positive topline results from the PULSAR Phase 2 clinical trial of sotatercept for the treatment of patients with PAH, and enrollment is ongoing in an exploratory study called SPECTRA to provide us with further understanding of sotatercept's impact on PAH. PAH is a rare and chronic, rapidly progressing disorder characterized by the constriction of small pulmonary arteries, resulting in abnormally high blood pressure in the pulmonary arteries.

If sotatercept is approved for the treatment of patients with PAH, it may compete with four distinct classes of vasodilator therapies:

- Phosphodiesterase type 5 (PDE5) inhibitors Adcirca® (tadalafil, Eli Lilly) and Revatio® (sildenafil, Pfizer), which are orally available small molecules. PDE5 inhibitors prevent degradation of intracellular cGMP released in response to nitric oxide (NO), resulting in relaxation of pulmonary vessels.
- Soluble guanylate cyclase (sGC) stimulator Adempas® (riociguat, Bayer), which targets different molecules in the same biological pathway as PDE5 inhibitors and is also an oral small molecule.
- Endothelin receptor antagonists (ERA) Letairis® (ambrisentan, Gilead), Opsumit® (macitentan, Actelion/J&J), and Tracleer® (bosentan, Actelion/J&J), which are all orally available small molecules. ERAs block activity of endothelin-1, which causes constriction of pulmonary vessels.
- Prostacyclin analogues relax pulmonary vessels, which prevent platelet aggregation, and inhibit smooth muscle proliferation. They are the most potent therapies for treating PAH and are available orally (Orenitram® (trepostinil, United Therapeutics), Upravi® (selexipag, Actelion/J&J)); for inhalation (Tyvaso® (trepostinil, United Therapeutics), Ventavis® (iloprost, Actelion/J&J)); and for infusion (Remodulin® (trepostinil, United Therapeutics), Veletri® (epoprostenol, Actelion/J&J)).

In addition, agents with novel mechanisms of action are being investigated for treatment of patients with PAH:

- Reata Pharmaceuticals and Complexa Inc. are developing Nrf2 modulators bardoxolone and CXA-10, respectively. Reata is evaluating bardoxolone in a phase 3 trial in patients with PAH associated with connective tissue disease. Complexa is evaluating CXA-10 in a phase 2 trial in patients with PAH.
- PhaseBio is evaluating a VPAC peptide PB1046 in a phase 2 trial in patients with PAH.
- Two companies are evaluating agents that are intended to enhance BMP2 signaling in patients with PAH. Vivus Inc. is evaluating tacrolimus in a phase 2 trial in patients with PAH. Morphogen IX Ltd. is in the process of preclinical development of a protein-engineered variant of BMP9, MGX292, for eventual clinical evaluation in patients with PAH.

The key competitive factors affecting the success of any approved product will be its efficacy, safety profile, price, method of administration and level of promotional activity.

Therapies for Treating Muscle Loss

We are currently studying ACE-083 in a Phase 2 clinical trial for the treatment of patients with CMT. A potential competitor of ACE-083 in CMT is PXT3003, which is an investigational pleotherapy being developed by Pharnext. Pharnext has reported that although PXT3003 met the primary endpoint in a Phase 3 trial in patients with CMT1A, based on feedback from the FDA, Pharnext is planning a new Phase 3 trial in patients with CMT1A.

We are also aware of approaches to treat other muscle loss diseases that are in clinical trials. Regeneron is studying two drugs in combination, REGN2477 (garetosmab, an activin A antibody, combined with trevogromab, a myostatin antibody), in a Phase 1 clinical trial to treat muscle wasting diseases. Roche is studying RO7239361, a myostatin fusion protein, in a Phase 1/2 clinical trial of Duchenne muscular dystrophy (DMD). Other approaches to myostatin inhibition, including monoclonal antibodies (such as SRK-015 in Phase 1/2 clinical trials by Scholar Rock), and ligand traps (such as RG6206 in Phase 2/3

clinical trial by Roche and ALG-801 in Phase 1 by Alvegen in partnership with Biogen), are being studied to treat a number of neuromuscular diseases, including muscular dystrophies, disuse muscle atrophy, cancer-related cachexia, and sarcopenia. Nationwide Children's Hospital, in collaboration with The Myositis Association, Parent Project Muscular Dystrophy and Milo Biotechnology, have completed a Phase 1 clinical trial of a gene therapy delivery of follistatin (FS344) to muscle in patients with Becker muscular dystrophy (BMD) and sporadic inclusion body myositis (sIBM) and have a second clinical trial in Duchenne muscular dystrophy underway. There are also other programs in early stage development that focus on gene editing and next generation antisense that could compete with our therapies for treating muscle loss.

Commercialization

We retain co-promotion rights in North America with our collaboration partner, BMS, for both REBLOZYL and, outside of the PH field, sotatercept, and under the terms of our agreements with BMS our commercialization costs will be entirely funded by BMS as approved in the budget agreed to between us and BMS. We also currently retain worldwide commercialization rights for sotatercept in the PH field and ACE-083. We intend to build hematology, neuromuscular and pulmonary disorder focused, specialty sales forces in North America, and have already established a hematology specialty sales force in the United States to support the launch of REBLOZYL. In the future, we may expand to other markets to effectively support the commercialization of these and future products. We believe that a specialty sales force will be sufficient to target key prescribing physicians in these areas. Now with the launch of REBLOZYL in its first indication, we have limited sales and marketing capabilities and experience through our co-promote with BMS, but we will need to establish additional required capabilities within an appropriate time frame ahead of other product approvals and commercialization to support other products. If we are not able to establish sales and marketing capabilities or are not successful in commercializing our future products, either on our own or through collaborations, any future product revenue will be materially adversely affected.

Intellectual Property

Our commercial success depends in part on our ability to obtain and maintain proprietary protection for our therapeutic candidates, novel biological discoveries, screening and drug development technology, to operate without infringing on the proprietary rights of others and to prevent others from infringing our proprietary rights. Our policy is to seek to protect our proprietary position by, among other methods, filing U.S. and foreign patent applications related to our proprietary technology, inventions and improvements that are important to the development and implementation of our business. We also rely on trade secrets, know-how, continuing technological innovation and potential in-licensing opportunities to develop and maintain our proprietary position. Additionally, we expect to benefit from a variety of statutory frameworks in the United States, Europe and other countries that relate to the regulation of biosimilar molecules and orphan drug status. These statutory frameworks provide periods of non-patent-based exclusivity for qualifying molecules. See "Government Regulation".

Our patenting strategy is focused on our therapeutic candidates. We seek composition-of-matter and method-of-treatment patents for each such protein in key therapeutic areas. We also seek patent protection with respect to companion diagnostic methods and compositions and treatments for targeted patient populations. We have sought patent protection alone or jointly with our collaborators, as dictated by our collaboration agreements.

Our patent estate, on a worldwide basis, includes approximately 788 issued patents and approximately 637 pending patent applications, with pending and issued claims relating to all of our current advanced clinical stage therapeutic candidates, sotatercept and ACE-083, and our approved product, REBLOZYL. These figures include in-licensed patents and patent applications to which we hold exclusive commercial rights.

Individual patents extend for varying periods of time depending on the date of filing of the patent application or the date of patent issuance and the legal term of patents in the countries in which they are obtained. Generally, patents issued from applications filed in the United States are effective for twenty years from the earliest non-provisional filing date. In addition, in certain instances, a patent term can be extended to recapture a portion of the term effectively lost as a result of the FDA regulatory review period, however, the restoration period cannot be longer than five years and the total patent term including the restoration period must not exceed 14 years following FDA approval. The duration of foreign patents varies in accordance with provisions of applicable local law, but typically is also twenty years from the earliest international filing date. Our issued patents and pending applications with respect to our clinical stage therapeutic candidates will expire on dates ranging from 2026 to 2037, exclusive of possible patent term extensions. However, the actual protection afforded by a patent varies on a product-by-product basis, from country to country and depends upon many factors, including the type of patent, the scope of its coverage, the availability of extensions of patent term, the availability of legal remedies in a particular country and the validity and enforceability of the patent.

National and international patent laws concerning therapeutic candidates remain highly unsettled. No consistent policy regarding the patent-eligibility or the breadth of claims allowed in such patents has emerged to date in the United States, Europe or other countries. Changes in either the patent laws or in interpretations of patent laws in the United States and other

countries can diminish our ability to protect our inventions and enforce our intellectual property rights. Accordingly, we cannot predict the breadth or enforceability of claims that may be granted in our patents or in third-party patents. The biotechnology and pharmaceutical industries are characterized by extensive litigation regarding patents and other intellectual property rights. Our ability to maintain and solidify our proprietary position for our drugs and technology will depend on our success in obtaining effective claims and enforcing those claims once granted. We do not know whether any of the patent applications that we may file or license from third parties will result in the issuance of any patents. The issued patents that we own or may receive in the future, may be challenged, invalidated or circumvented, and the rights granted under any issued patents may not provide us with sufficient protection or competitive advantages against competitors with similar technology. Furthermore, our competitors may be able to independently develop and commercialize similar drugs or duplicate our technology, business model or strategy without infringing our patents. Because of the extensive time required for clinical development and regulatory review of a drug we may develop, it is possible that, before any of our therapeutic candidates can be commercialized, any related patent may expire or remain in force for only a short period following commercialization, thereby reducing any advantage of any such patent. The patent positions for our most advanced programs are summarized below:

REBLOZYL Patent Coverage

We hold two issued patents covering the REBLOZYL composition of matter in the United States, one issued patent in Europe (registered in most countries of the European Patent Convention) and additional patents issued or pending in many other major jurisdictions worldwide, including Europe, Australia, Canada, Japan, China, South Korea, Brazil, Mexico, Russia and India. The expected expiration dates for these composition of matter patents are 2028 and 2029, exclusive of possible patent term extensions.

We hold two issued patents covering the treatment of anemia by administration of REBLOZYL in the United States and similar patents issued or pending in other major jurisdictions worldwide, including Europe, Australia, Canada, Japan, China, South Korea, Brazil, Mexico, Russia and India. The expected expiration date for these method of treatment patents is 2029, exclusive of possible patent term extensions.

We also hold patent applications directed to a variety of other uses for REBLOZYL. The expected expiration date for these method of treatment patents ranges from 2029 to 2037 exclusive of possible patent term extensions.

Sotatercept Patent Coverage

We hold two issued patents covering the sotatercept composition of matter in the United States, one issued patent in Europe (registered in most countries of the European Patent Convention) and additional patents issued or pending in many other major jurisdictions worldwide, including Australia, Canada, Japan, China, South Korea, Brazil, Mexico, Russia, Israel and India. The expected expiration date for these composition of matter patents is 2026, exclusive of possible patent term extensions.

We hold one pending patent application covering the treatment of PAH by administration of sotatercept in the United States and similar pending applications in other major jurisdictions worldwide, including Europe, Australia, Canada, Japan, South Korea, Brazil, Mexico and Russia. If issued, the expected expiration date for these method of treatment patents is 2037, exclusive of possible patent term extensions.

We also hold patents and patent applications directed to a variety of other uses for sotatercept, including the treatment of anemia. The expected expiration date for these method of treatment patents ranges from 2026 to 2029 exclusive of possible patent term extensions.

ACE-083 Patent Coverage

We hold two issued patents covering the ACE-083 composition of matter in the United States, which are expected to expire in 2029 and 2035, respectively, exclusive of possible patent term extensions. We hold additional pending patent applications covering the ACE-083 composition of matter in many other major jurisdictions worldwide, including Europe, Australia, Canada, Japan, China, South Korea, Brazil, Mexico, Russia and India. The expected expiration date for these patent applications, should they issue as patents, is 2035, exclusive of possible patent term extensions.

We also hold patent applications directed to a variety of uses for ACE-083, including the treatment of CMT. The expected expiration date for these method of treatment patent applications, should they issue as patents, is 2035, exclusive of possible patent term extensions.

Trade Secrets

In addition to patents, we rely upon unpatented trade secrets and know-how and continuing technological innovation to develop and maintain our competitive position. We seek to protect our proprietary information, in part, using confidentiality

agreements with our commercial partners, collaborators, employees and consultants and invention assignment agreements with our employees. These agreements are designed to protect our proprietary information and, in the case of the invention assignment agreements, to grant us ownership of technologies that are developed through a relationship with a third party. These agreements 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 commercial partners, collaborators, employees and consultants 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.

In-Licenses

Salk

In August 2010, we entered into two amended and restated license agreements with the Salk Institute for Biological Studies, or Salk, providing rights under U.S. patent filings solely owned by Salk. The agreements for the licensed patent rights relate to the first cloning of the type II activin receptors, human ActRIIA and frog ActRIIB, respectively, and include claims to vertebrate homolog nucleic acids and proteins with respect to each of the foregoing. These patent rights expired between the years 2016 and 2017. One of these agreements relates to ActRIIA and sotatercept; the other agreement relates to ActRIIB, REBLOZYL and the discontinued program ACE-031, which we refer to as the ActRIIB Agreement. The licenses granted are exclusive as to the therapeutic products that are covered by the patents and non-exclusive as to diagnostic products and other products that are developed using the Salk patent rights. If we sublicense the Salk patent rights, we will owe Salk a percentage of sublicensing revenue, excluding payments based on sales. Under the agreements, Salk retained rights, on behalf of itself and other non-profit academic institutions, to practice under the licensed rights for non-profit purposes. We agreed to pay Salk specified development milestone payments totaling up to \$2.0 million for sotatercept and \$0.7 million for REBLOZYL. In addition, we are required to pay Salk royalties in the low single-digits on worldwide net product sales by us or our sublicensees of products claimed in the licensed patents, or derived from use of the licensed patent rights, with royalty obligations continuing at a reduced rate for a period of time after patent expiration. The agreements terminate upon the expiration of royalty obligations. We may terminate either agreement at any time by giving Salk advance written notice. Either agreement may also be terminated by Salk in the event of a material breach by us or in the event we become subject to bankruptcy or similar circumstances.

In October 2012, Salk filed a lawsuit against us alleging that we breached the ActRIIB Agreement. In July 2014, we settled the Salk lawsuit and entered into an amendment to the ActRIIB Agreement with Salk. Pursuant to the settlement, we made a one-time total payment of \$5 million, inclusive of interest, to Salk and we agreed to pay Salk 6% of future development milestone payments received under the agreement with BMS relating to REBLOZYL. Finally, we and Salk have further agreed that the royalty percentage on net sales of REBLOZYL will remain at 1% as provided in the ActRIIB Agreement with Salk, and that such royalty will be payable until June 2022.

Fulcrum

In December 2019, we entered into a license and collaboration agreement with Fulcrum Therapeutics, or Fulcrum, to identify small molecules designed to modulate specific pathways associated with a targeted indication within the pulmonary disease space. We paid an upfront research fee of \$10.0 million upon execution of the agreement. We also agreed to pay specified research, development and commercial milestone payments of up to \$295.0 million for a first product commercialized and up to a maximum of \$143.5 million in additional milestone payments for all subsequent products commercialized. Fulcrum will additionally receive tiered royalty payments in the mid-single-digit to low double-digit range on net sales, as well as reimbursement for relevant R&D costs.

The agreement will continue on a target-by-target and country-by-country basis until the expiration of the last to expire royalty obligation, unless earlier terminated pursuant to the agreement. The agreement is terminable by either party upon a breach that is uncured or insolvency of the other party and continuing, or by us for convenience on a country-by-country or collaboration molecule-by-collaboration molecule basis.

Government Regulation

The preclinical studies and clinical testing, manufacture, labeling, storage, record keeping, advertising, promotion, export, marketing and sales, among other things, of our therapeutic candidates and future products, are subject to extensive regulation by governmental authorities in the United States and other countries. In the United States, pharmaceutical products are regulated by the FDA under the Federal Food, Drug, and Cosmetic Act and other laws, including, in the case of biologics, the Public Health Service Act. REBLOZYL is, and we expect sotatercept and ACE-083 to be, regulated by the FDA as biologics and reviewed by the Center for Drug Evaluation and Research (CDER) as proteins intended for therapeutic use. Therapeutic candidates require the submission of a Biologics License Application, or BLA, and approval by the FDA prior to

being marketed in the U.S. Manufacturers of therapeutic candidates may also be subject to state regulation. Failure to comply with FDA requirements may subject us or our partners, contract manufacturers, and suppliers to administrative or judicial sanctions, including FDA refusal to approve applications, warning letters, product recalls, product seizures, total or partial suspension of production or distribution, fines and/or criminal prosecution.

As part of the Patient Protection and Affordable Care Act of 2010, under the subtitle of Biologics Price Competition and Innovation Act of 2009, or the BPCIA, a statutory pathway has been created for licensure, or approval, of biological products that are biosimilar to, and possibly interchangeable with, earlier biological products licensed under the Public Health Service Act. Under the BPCIA, innovator manufacturers of original reference biological products are granted 12 years of exclusivity before biosimilars can be approved for marketing in the United States. The objectives of the BPCIA are conceptually similar to those of the Drug Price Competition and Patent Term Restoration Act of 1984 (the "Hatch-Waxman Act"), which established abbreviated pathways for the approval of drug products. The implementation of an abbreviated approval pathway for biological products is under the direction of the FDA. The approval of a biologic product biosimilar to one of our products could have a material adverse impact on our business as it may be significantly less costly to bring to market and may be priced significantly lower than our products.

The steps required before a biologic may be approved for marketing of an indication in the United States generally include:

- completion of preclinical laboratory tests, animal studies and formulation studies conducted according to Good Laboratory Practices, or GLPs, and other applicable regulations;
- submission to the FDA of an Investigational New Drug application, or IND, which must become effective before human clinical trials may commence;
- completion of adequate and well-controlled human clinical trials in accordance with Good Clinical Practices, or GCPs, to establish the safety and efficacy of the biological product for its intended use;
- submission to the FDA of a BLA;
- satisfactory completion of an FDA pre-approval inspection of the facility or facilities at which the product is manufactured to assess compliance with applicable current Good Manufacturing Practice requirements, or cGMPs; and
- FDA review of the BLA and issuance of a biologics license which is the approval necessary to market a therapeutic candidate.

Preclinical studies include laboratory evaluation of product chemistry, toxicity and formulation as well as animal studies to assess the potential safety and efficacy of the biologic candidate. Preclinical studies must be conducted in compliance with FDA regulations regarding GLPs. The results of the preclinical tests, together with manufacturing information and analytical data, are submitted to the FDA as part of an IND. Some preclinical testing may continue even after the IND is submitted. The IND will also include a protocol detailing, among other things, the objectives of the clinical trial, the parameters to be used in monitoring safety and the effectiveness criteria to be evaluated if the first phase or phases of the clinical trial lends themselves to an efficacy determination. The IND will automatically become effective 30 days after receipt by the FDA, unless the FDA within the 30-day time period places the IND on clinical hold because of its concerns about the drug candidate or the conduct of the trial described in the clinical protocol. The IND sponsor and the FDA must resolve any outstanding concerns before clinical trials can proceed.

All clinical trials must be conducted under the supervision of one or more qualified principal investigators in accordance with GCPs and under protocols detailing the objectives of the applicable phase of the trial, dosing procedures, research subject selection and exclusion criteria and the safety and effectiveness criteria to be evaluated. Each protocol must be submitted to the FDA as part of the IND, and progress reports detailing the status of the clinical trials must be submitted to the FDA annually. Sponsors also must timely report to the FDA serious and unexpected adverse reactions, any clinically important increase in the rate of a serious suspected adverse reaction over that listed in the protocol or investigator's brochure, or any findings from other studies or animal or in vitro testing that suggest a significant risk in humans exposed to the drug. An institutional review board, or IRB, at each institution participating in the clinical trial must review and approve the protocol before a clinical trial commences at that institution, approve the information regarding the trial and the consent form that must be provided to each research subject or the subject's legal representative, and monitor the study until completed.

Clinical trials are typically conducted in three sequential phases, but the phases may overlap and different trials may be initiated with the same drug candidate within the same phase of development in similar or differing patient populations. Phase 1 trials may be conducted in a limited number of patients, but are usually conducted in healthy volunteer subjects. The drug

candidate is initially tested for safety and, as appropriate, for absorption, metabolism, distribution, excretion, pharmacodynamics and pharmacokinetics.

Phase 2 trials usually involve a larger, but still limited, patient population to evaluate preliminarily the efficacy of the drug candidate for specific, targeted indications to determine dosage tolerance and optimal dosage and to identify possible short-term adverse effects and safety risks.

Phase 3 trials further evaluate clinical efficacy of a specific endpoint and test further for safety within an expanded patient population at geographically dispersed clinical trial sites. Phase 1, Phase 2, or Phase 3 testing might not be completed successfully within any specific time period, if at all, with respect to any of our therapeutic candidates. Results from one trial are not necessarily predictive of results from later trials. Furthermore, the FDA or the sponsor may suspend clinical trials at any time on various grounds, including a finding that subjects or patients are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution if such trial is not being conducted in accordance with the IRB's requirements or if the drug candidate has been associated with unexpected serious harm to patients.

The results of the preclinical studies and clinical trials, together with other detailed information, including information on the manufacture and composition of the product, are submitted to the FDA as part of a BLA requesting approval to market the drug candidate for a proposed indication. Under the Prescription Drug User Fee Act (PDUFA), as re-authorized most recently in August 2017 (PDUFA VI), the fees payable to the FDA for reviewing a BLA, as well as annual program fees for approved products, can be substantial and typically increase each year. For fiscal years 2018-2022, user fees for review of an application that requires clinical data, such as a BLA, plus prescription drug program fees, are estimated at approximately \$2.7 million, subject to certain limited deferrals, waivers, and reductions that may be available, including waiver of the application fee for a product designated for an orphan indication. Each BLA submitted to the FDA for approval is reviewed for administrative completeness and reviewability within 60 days following FDA's receipt of the application. If the BLA is found complete, the FDA will file the BLA, triggering a full review of the application. The FDA may refuse to file any BLA that it deems incomplete or not properly reviewable at the time of submission.

The outcome of FDA's review, even if generally favorable, may not be an actual approval but a "complete response letter" that describes additional work that must be done before the application can be approved. Before approving a BLA, the FDA may inspect the facility or facilities at which the product is manufactured and will not approve the BLA unless the facility complies with cGMPs. The FDA may deny approval of a BLA if applicable statutory or regulatory criteria are not satisfied, or may require additional testing or information, which can extend the review process. FDA approval of any application may include many delays or never be granted. Any FDA approval may impose limitations on the uses for which the product may be marketed, may require that warning statements be included in the product labeling, may require that additional post-approval studies be conducted as a condition of the approval, and may impose restrictions and conditions on product distribution, prescribing, or dispensing in the form of a Risk Evaluation and Mitigation Strategy, or REMS, or otherwise limit the scope of any approval. The FDA must approve a BLA supplement or a new BLA before a product may be marketed for other uses or before certain manufacturing or other changes may be made. Further post-marketing testing and surveillance to monitor the safety or efficacy of a product is required. Also, product approvals may be withdrawn if compliance with regulatory standards is not maintained or if safety or manufacturing problems occur following initial marketing. In addition, new government requirements may be established that could delay or prevent regulatory approval of our therapeutic candidates under development.

After BLA approval by the FDA, the manufacturer and the holder(s) of the BLA for the product continue to be subject to comprehensive regulatory oversight. For example, quality control and manufacturing procedures must conform, on an ongoing basis, to cGMP requirements, and the FDA periodically inspects manufacturing facilities to assess compliance with cGMPs. Accordingly, manufacturers must continue to spend time, money and effort to maintain cGMP compliance.

Orphan Drug Act

The Orphan Drug Act provides incentives to manufacturers to develop and market drugs for rare diseases and conditions affecting fewer than 200,000 persons in the United States at the time of application for orphan drug designation. Orphan drug designation does not convey any advantage in, or shorten the duration of, the regulatory review and approval process. If a product that has orphan drug designation subsequently receives the first FDA approval for the disease for which it has such designation, the holder of the approval is entitled to a seven years of market exclusivity in the United States for that product except in very limited circumstances. For example, a drug that the FDA considers to be clinically superior to, or different from, another approved orphan drug, even though for the same indication, may also obtain approval in the United States during the seven-year exclusive marketing period. In addition, holders of orphan drug exclusivity are expected to assure the availability of sufficient quantities of their orphan drugs to meet the needs of patients. Failure to do so could result in the withdrawal of marketing exclusivity for the drug. REBLOZYL has orphan drug designation in the United States for the treatment of beta-thalassemia and for the treatment of MDS.

Legislation similar to the Orphan Drug Act has been enacted outside the U.S., including in the EU. The orphan legislation in the EU is available for therapies addressing chronic debilitating or life-threatening conditions that affect five or fewer out of 10,000 persons or are financially not viable to develop. The market exclusivity period is for ten years, although that period can be reduced to six years if, at the end of the fifth year, available evidence establishes that the product is sufficiently profitable not to justify maintenance of market exclusivity. The market exclusivity may be extended to 12 years if sponsors complete a pediatric investigation plan agreed upon with the relevant committee of the EMA.

Expedited Review and Approval

The FDA has various programs, including Fast Track, priority review, and accelerated approval, which are intended to expedite or simplify the process for reviewing drugs, and/or provide for the approval of a drug on the basis of a surrogate endpoint (a laboratory measurement or physical sign used as an indirect or substitute measurement representing a clinically meaningful outcome). Even if a drug qualifies for one or more of these programs, the FDA may later decide that the drug no longer meets the qualifications or that the time period for FDA review or approval will be shortened. Generally, drugs that are eligible for these programs are those for serious or life-threatening conditions, those with the potential to address unmet medical needs and those that offer meaningful benefits over existing treatments. For example, Fast Track is a process designed to facilitate the development and expedite the review of drugs to treat serious or life-threatening diseases or conditions and fill unmet medical needs. Priority review is designed to give drugs that offer major advances in treatment or provide a treatment where no adequate therapy exists an initial review within six months as compared to a standard review time of ten months. Although Fast Track and priority review do not affect the standards for approval, the FDA will attempt to facilitate early and frequent meetings with a sponsor of a Fast Track designated drug and expedite review of the application for a drug designated for priority review. Accelerated approval provides for an earlier approval for a new drug that is intended to treat a serious or life-threatening disease or condition and that fills an unmet medical need based on a surrogate endpoint, but the FDA may require post-marketing clinical trials as a condition of approval.

In the Food and Drug Administration Safety and Innovation Act, or FDASIA, which was signed into law in July 2012, Congress encouraged the FDA to utilize innovative and flexible approaches to the assessment of products under accelerated approval. In addition to the Fast Track, accelerated approval and priority review programs discussed above, the FDA also provided guidance on a new program for Breakthrough Therapy designation. A request for Breakthrough Therapy designation should be submitted concurrently with, or as an amendment to an IND.

Reimbursement

In both domestic and foreign markets, sales and reimbursement of any approved products will depend, in part, on the extent to which the costs of such products will be covered by third-party payers, such as government health programs, commercial insurance and managed healthcare organizations. These third-party payers are increasingly challenging the prices charged for medical products and services and imposing controls to manage costs. The containment of healthcare costs has become a priority of federal and state governments and the prices of drugs have been a focus in this effort. Governments have shown significant interest in implementing cost-containment programs, including price controls, restrictions on reimbursement and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit our net revenue and results. In addition, there is significant uncertainty regarding the reimbursement status of newly approved healthcare products. We may need to conduct expensive pharmacoeconomic studies in order to demonstrate the cost-effectiveness of our products. If third-party payers do not consider our products to be cost-effective compared to other therapies, the payers may not cover our products after approved as a benefit under their plans or, if they do, the level of payment may not be sufficient to allow us to sell our products on a profitable basis.

Within the United States, if we obtain appropriate approval in the future to market any of our current therapeutic candidates, we may seek approval and coverage for those products under Medicaid, Medicare and the Public Health Service (PHS) pharmaceutical pricing program and also seek to sell the products to federal agencies.

Medicaid is a joint federal and state program administered by the states for low income and disabled beneficiaries. Under the Medicaid Drug Rebate Program, manufacturers are required to pay a rebate for each unit of product reimbursed by the state Medicaid programs. The amount of the rebate for each product is set by law and may be subject to an additional discount if manufacturer-reported average manufacturer price increases more than inflation and if a manufacturer enters into a supplemental rebate agreement with a specific state Medicaid program.

Medicare is a federal program administered by the federal government that covers individuals age 65 and over as well as those with certain disabilities. Medicare Part D provides coverage to enrolled Medicare patients for self-administered drugs (i.e., drugs that do not need to be administered by a physician). Medicare Part D is administered by private prescription drug

plans approved by the U.S. government and each drug plan establishes its own Medicare Part D formulary for prescription drug coverage and pricing, which the drug plan may modify from time-to-time.

Medicare Part B covers most injectable and infused drugs administered by a licensed medical provider in hospital outpatient departments and in the physician office setting. Medicare Part B is administered by Medicare Administrative Contractors, which generally have the responsibility of making coverage decisions. Subject to certain payment adjustments and limits, Medicare generally pays for Part B covered drugs based on a percentage of manufacturer-reported average sales price.

Drug products are subject to discounted pricing when purchased by federal agencies via the Federal Supply Schedule (FSS). FSS participation is required for a drug product to be covered and paid for by certain federal agencies and for coverage under Medicaid, Medicare Part B and the PHS pharmaceutical pricing program. FSS pricing is negotiated periodically with the Department of Veterans Affairs and is intended to not exceed the price that a manufacturer charges its most-favored non-federal customer for its product. In addition, prices for drugs purchased by the Veterans Administration, Department of Defense (including drugs purchased by military personnel and dependents through the TRICARE retail pharmacy program), Coast Guard, and PHS are subject to a cap on pricing (known as the "federal ceiling price") and may be subject to an additional discount if pricing increases more than inflation.

To maintain Medicaid Drug Rebate Program coverage, manufacturers must extend discounts to certain purchasers under the PHS pharmaceutical pricing program. Purchasers eligible for discounts include hospitals that serve a disproportionate share of financially needy patients, community health clinics and other entities that receive health services grants from the PHS.

The United States and state governments continue to propose and pass legislation designed to reform delivery of, or payment for, health care, which include initiatives to reduce the cost of healthcare. For example, in March 2010, the United States Congress enacted the Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act ("Healthcare Reform Act") which includes changes to the coverage and reimbursement of drug products under government health care programs. Under the Trump administration, there have been ongoing efforts to modify or repeal all or certain provisions of the Healthcare Reform Act. The Trump administration may also take executive action in the absence of legislative action. For example, in October 2017, the President announced that his administration will withhold the cost-sharing subsidies paid to health insurance exchange plans serving low-income enrollees. Tax reform legislation was also enacted at the end of 2017 that includes provisions that will affect healthcare insurance coverage and payment, such as the elimination of the tax penalty for individuals who do not maintain sufficient health insurance coverage beginning in 2019 (the so-called "individual mandate").

Recently, there has been considerable public and government scrutiny in the U.S. of pharmaceutical pricing and proposals to address the perceived high cost of pharmaceuticals. There have also been several recent state legislative efforts to address drug costs, which generally have focused on increasing transparency around drug costs or limiting drug prices or price increases. Adoption of new legislation at the federal or state level could affect demand for, or pricing of, our product candidates if approved for sale.

We cannot predict the ultimate content, timing or effect of any changes to the Healthcare Reform Act or other federal and state reform efforts. There is no assurance that federal or state health care reform will not adversely affect our future business and financial results.

Outside the United States, ensuring adequate coverage and payment for our products will face challenges. Pricing of prescription pharmaceuticals is subject to governmental control in many countries. Pricing negotiations with governmental authorities can extend well beyond the receipt of regulatory marketing approval for a product and may require us to conduct a clinical trial that compares the cost effectiveness of our therapeutic candidates or products to other available therapies, which could be expensive and result in delays in our commercialization efforts. Third-party payers are challenging the prices charged for medical products and services, and many third-party payers limit reimbursement for newly-approved healthcare products. Recent budgetary pressures in many European Union countries are also causing governments to consider or implement various cost-containment measures, such as price freezes, increased price cuts and rebates. If budget pressures continue, governments may implement additional cost-containment measures. Cost-control initiatives could decrease the price we might establish for products that we may develop or sell, which would result in lower product revenues or royalties payable to us. There can be no assurance that any country that has price controls or reimbursement limitations for pharmaceutical products will allow favorable reimbursement and pricing arrangements for any of our products.

Foreign Regulation

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

Certain countries outside of the United States have a process that requires the submission of a clinical trial application much like an IND prior to the commencement of human clinical trials. In Europe, for example, a clinical trial application, or CTA, must be submitted to the competent national health authority and to independent ethics committees in each country in which a company intends to conduct clinical trials. Once the CTA is approved in accordance with a country's requirements, clinical trial development may proceed in that country. In all cases, the clinical trials must be conducted in accordance with good clinical practices, or GCPs, and other applicable regulatory requirements.

Under European Union regulatory systems, a company may submit marketing authorization applications either under a centralized or decentralized procedure. The centralized procedure is compulsory for medicinal products produced by biotechnology or medicinal products containing new active substances for specific indications, and optional for other medicines which are highly innovative. Under the centralized procedure, a marketing application is submitted to the EMA where it will be evaluated by the Committee for Medicinal Products for Human Use and a favorable opinion typically results in the grant by the EC of a single marketing authorization that is valid for all European Union member states within 67 days of receipt of the opinion. The initial marketing authorization is valid for five years, but once renewed is usually valid for an unlimited period. The decentralized procedure provides for approval by one or more "concerned" member states based on an assessment of an application performed by one member state, known as the "reference" member state. Under the decentralized approval procedure, an applicant submits an application, or dossier, and related materials to the reference member state and concerned member states. The reference member state prepares a draft assessment and drafts of the related materials within 120 days after receipt of a valid application. Within 90 days of receiving the reference member state's assessment report, each concerned member state must decide whether to approve the assessment report and related materials. If a member state does not recognize the marketing authorization, the disputed points are eventually referred to the EC, whose decision is binding on all member states.

As in the United States, we may apply for designation of a product as an orphan drug for the treatment of a specific indication in the European Union before the application for marketing authorization is made. Orphan drugs in Europe enjoy economic and marketing benefits, including up to 10 years of market exclusivity for the approved indication unless another applicant can show that its product is safer, more effective or otherwise clinically superior to the orphan designated product.

Fraud and Abuse Laws

We are be subject to various federal and state laws pertaining to health care "fraud and abuse," including anti-kickback and false claims laws. Anti-kickback laws generally prohibit a prescription drug manufacturer from soliciting, offering, receiving, or paying any remuneration to generate business, including the purchase or prescription of a particular drug. Although the specific provisions of these laws vary, their scope is generally broad and there may not be regulations, guidance or court decisions that apply the laws to particular industry practices. There is therefore a possibility that our practices might be challenged under such anti-kickback laws. False claims laws prohibit anyone from knowingly and willingly presenting, or causing to be presented, any claims for payment for reimbursed drugs or services to third party payers (including Medicare and Medicaid) that are false or fraudulent. Violations of fraud and abuse laws may be punishable by criminal or civil sanctions, including fines and civil monetary penalties, and/or exclusion from federal health care programs (including Medicare and Medicaid).

Laws and regulations enacted by the federal government and various states to regulate the sales and marketing practices of pharmaceutical manufacturers with marketed products generally limit financial interactions between manufacturers and health care providers and/or require disclosure to the government and public of such interactions. Many of these laws and regulations contain ambiguous requirements or require administrative guidance for implementation. Given the lack of clarity in laws and their implementation, any future activities (if we obtain approval and/or reimbursement from federal healthcare programs for our product candidates) could be subject to the penalty provisions of the pertinent laws and regulations.

Additional Regulation

We are also subject to regulation under the Occupational Safety and Health Act, the Environmental Protection Act, the Toxic Substances Control Act, the Resource Conservation and Recovery Act and other present and potential federal, state or local regulations. These and other laws govern our use, handling and disposal of various biological and chemical substances

used in, and waste generated by our operations. Our research and development involves the controlled use of hazardous materials, chemicals and viruses. Although we believe that our safety procedures for handling and disposing of such materials comply with the standards prescribed by state and federal regulations, the risk of accidental contamination or injury from these materials cannot be completely eliminated. In the event of such an accident, we could be held liable for any damages that result and any such liability could exceed our resources.

There have been a number of federal and state proposals during the last few years regarding the pricing of pharmaceutical and biological products, government control and other changes to the U.S. healthcare system. It is uncertain what legislative proposals will be adopted or what actions federal, state or private payers for medical goods and services may take in response to any healthcare reform proposals or legislation. We cannot predict the effect medical or healthcare reforms may have on our business, and no assurance can be given that any such reforms will not have a material adverse effect.

Manufacturing

We currently have the capability to manufacture drug substance for our preclinical studies, Phase 1 clinical trials and Phase 2 clinical trials. We manufacture material compliant to U.S. and European cGMP at our 12,000 square foot multi-product facility located at our corporate headquarters in Cambridge, Massachusetts. We have the capabilities to manufacture receptor fusion proteins, monoclonal antibodies, and other therapeutic candidates.

Our manufacturing facility is based on single use, disposable technology to maximize the focus of personnel and other resources on the production process, minimizing the need for cleaning and sterilization while optimizing the efficiency of product change-over. The facility consists of four independent clean rooms totaling 4,000 square feet. The facility includes one 250 liter and one 1,000 liter single use bioreactor and has space for two additional 1,000 liter bioreactors.

Approximately 49 full time employees focus on our process development and manufacturing activities. We believe that our strategic investment in manufacturing capabilities allows us to advance our therapeutic candidates at a more rapid pace and provides us with more portfolio flexibility than if we used a contract manufacturer. The facility produces drug substance in a cost-effective manner while allowing us to retain control over the process and provides an ability to balance the requirements of multiple programs and avoid costly commitments of funds before clinical data are available.

Our manufacturing capabilities encompass the full manufacturing process through quality control and quality assurance. This structure enables us to efficiently transfer preclinical stage lead molecules into manufacturing. We have designed our manufacturing facility and processes to provide maximum flexibility and rapid change over for the manufacture of different therapeutic candidates. We outsource fill-finish, packaging, labeling, shipping, and distribution.

We manufacture our therapeutic candidates using readily available raw materials and well established manufacturing procedures based on a standardized process modified for each of our therapeutic candidates. We produce our proteins in bioreactors using Chinese hamster ovary cells that have been genetically engineered to produce our specific therapeutic candidates. We then purify the proteins using industry standard methods, which include affinity chromatography and ultrafiltration operations.

For our early phase therapeutic candidates, we intend to continue to manufacture drug substance for preclinical testing and Phase 1 and Phase 2 clinical development at our current facilities, and use third-party contract manufacturers as needed. For the REBLOZYL Phase 3 clinical trials and commercial supply, we have transferred the process for production to BMS under the terms of our collaboration agreement, and BMS uses third-party contract manufacturers. For any future sotatercept Phase 3 clinical trials in the PH field, we intend to use third-party contract manufacturers. For commercial supply of sotatercept if BMS waives its right to manufacture, we intend to use third-party contract manufacturers. For ACE-083, we intend use third party manufacturers for any future Phase 3 clinical or commercial supply.

Employees

As of December 31, 2019, we had 237 full-time employees, 152 of whom are involved in research, development or manufacturing, and 52 of whom have Ph.D. or M.D. degrees. We have no collective bargaining agreements with our employees and we have not experienced any work stoppages. We consider our relations with our employees to be good.

Corporate Information

We were incorporated in the state of Delaware in June 2003 as Phoenix Pharma, Inc., and we subsequently changed our name to Acceleron Pharma Inc. and commenced operations in February 2004. Our principal executive offices are located at 128 Sidney Street, Cambridge, Massachusetts 02139, and our telephone number is (617) 649-9200. Our Internet address is www.acceleronpharma.com. The contents of our website are not part of this Annual Report on Form 10-K. We make available free of charge through our website our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to these reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act

of 1934, as amended, or the Exchange Act, as soon as reasonably practicable after we electronically file or furnish such materials to the Securities and Exchange Commission.

Item 1A. Risk Factors

Investing in our common stock involves a high degree of risk. You should carefully consider the risks and uncertainties described below in addition to the other information included or incorporated by reference in this Annual Report on Form 10-K before purchasing our common stock. If any of the following risks actually occurs, our business, financial condition or results of operations would likely suffer, possibly materially. In that case, the trading price of our common stock could fall, and you may lose all or part of the money you paid to buy our common stock. 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 currently believe to be immaterial may also adversely affect our business.

Risks Related to Our Financial Position and Need for Additional Capital

We have incurred net operating losses since our inception and anticipate that we may continue to incur substantial operating losses for the foreseeable future. We may never achieve or sustain profitability.

We have incurred net losses during most fiscal periods since our inception. As of December 31, 2019, we had an accumulated deficit of \$711.4 million. We do not know whether or when we will become profitable. To date, we have only generated limited revenue from royalties on the sale of our first and only commercial product, REBLOZYL® (luspatercept-aamt), since receiving regulatory approval from the U.S. Food and Drug Administration, or FDA, in November 2019 for the treatment of anemia in adult patients with beta-thalassemia who require regular red blood cell, or RBC, transfusions.

Our losses have resulted principally from costs incurred in our research and development activities, and we anticipate that our expenses will increase in the future as we expand these activities as well as our manufacturing and commercialization activities. In particular, we anticipate that our expenses will increase substantially if and as we:

- initiate and continue clinical trials for our therapeutic candidates, including sotatercept in pulmonary hypertension, which we refer to as the PH field, and ACE-083;
- continue our research and preclinical development of our therapeutic candidates;
- seek to identify and validate additional therapeutic candidates;
- require the manufacture of larger quantities of therapeutic candidates for clinical development and, potentially, for commercialization;
- establish and maintain a sales, marketing and distribution infrastructure to commercialize any products for which we have or may obtain regulatory approval;
- acquire or in-license other therapeutic candidates and technologies;
- maintain, protect and expand our intellectual property portfolio;
- attract and retain skilled personnel; and
- experience any delays or encounter issues with any of the above.

Although we anticipate that these increased expenses will be partially offset by royalty and milestone payments we expect to receive under our agreements with Bristol-Myers Squibb Company, or BMS (which acquired Celgene Corporation in November 2019), if we do not receive the anticipated royalty or milestone payments or do not enter into partnerships for ACE-083 or other therapeutic candidates on acceptable terms, our operating losses will substantially increase over the next several years as we execute our plan to expand our research, development, manufacturing and commercialization activities. As such, there can be no assurance that our losses will not increase prohibitively in the future.

For us to become and remain profitable, we and BMS must succeed in executing our development plans pursuant to our collaboration agreements, including manufacturing, marketing and selling our approved product, REBLOZYL, and obtaining regulatory approval for luspatercept-aamt in additional target indications, including myelodysplastic syndromes, or MDS. In addition, we or our other current or future partners must succeed in developing our other therapeutic candidates, obtaining regulatory approval for them, and manufacturing, marketing and selling any other products for which we or our partners may obtain regulatory approval. We or they may not succeed in these activities, and we may never generate revenue from product sales that is significant enough to achieve profitability. Even if we achieve profitability in the future, we may not be able to sustain profitability in subsequent periods.

We may require substantial additional financing to achieve our goals, and a failure to obtain this necessary capital when needed could force us to delay, limit, reduce or terminate our product development or commercialization efforts.

As of December 31, 2019, our cash, cash equivalents and investments were \$453.8 million. We believe that we will continue to expend substantial resources for the foreseeable future developing sotatercept in the PH field, ACE-083 and new therapeutic candidates. These expenditures will include costs associated with research and development, potentially acquiring new technologies, conducting preclinical studies and clinical trials, manufacturing therapeutic candidates, potentially obtaining regulatory approvals, as well as manufacturing, marketing and selling future products approved for sale, if any. In addition, other unanticipated costs may arise. Because the outcome of our planned and anticipated clinical trials is highly uncertain, we cannot reasonably estimate the actual amounts necessary to successfully complete the development and commercialization of our therapeutic candidates.

BMS generally pays development, manufacturing and commercialization and certain patent costs for REBLOZYL and for sotatercept outside of the PH field as approved in the budgets agreed to between us and BMS for each program. Activities that we elect to conduct to support REBLOZYL outside of the approved budgets with BMS are at our own expense. Other than those costs, our future capital requirements depend on many factors, particularly in connection with the development of our other therapeutic candidates including sotatercept in the PH field and ACE-083:

- the scope, progress, results and costs of researching and developing our other therapeutic candidates, and conducting preclinical studies and clinical trials;
- the timing of, and the costs involved in, obtaining regulatory approvals for our other therapeutic candidates if clinical trials are successful;
- the cost of commercialization activities for our other therapeutic candidates, if any of these therapeutic candidates is approved for sale, including marketing, sales and distribution costs;
- the cost of manufacturing our other therapeutic candidates for clinical trials in preparation for regulatory approval and in preparation for commercialization;
- our ability to establish and maintain strategic partnerships, licensing or other arrangements and the financial terms of such agreements;
- the costs involved in preparing, filing, prosecuting, maintaining, defending and enforcing patent claims, including litigation costs and the outcome of such litigation; and
- the timing, receipt, and amount of sales of, or royalties on, our future products, if any.

Our current operating plan may change as a result of many factors currently unknown to us, and we may need additional funds sooner than planned. In addition, we may seek additional capital due to favorable market conditions or strategic considerations even if we believe that we have sufficient funds for our current or future operating plans. Additional funds may not be available when we need them on terms that are acceptable to us, or at all. If adequate funds are not available to us on a timely basis, we may be required to delay, limit, reduce or terminate preclinical studies, clinical trials or other development activities for one or more of our therapeutic candidates or delay, limit, reduce or terminate our establishment of sales and marketing capabilities or other activities that may be necessary to commercialize our therapeutic candidates.

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

We may seek additional capital through a variety of means, including through private and public equity offerings and debt financings. To the extent that we raise additional capital through the sale of equity or convertible debt securities, your ownership interest will be diluted, and the terms may include liquidation or other preferences that adversely affect your rights as a stockholder. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take certain actions, such as incurring additional debt, making capital expenditures or declaring dividends. If we raise additional funds through strategic partnerships with third parties, we may have to relinquish valuable rights to our technologies or therapeutic candidates, or grant licenses on terms that are not favorable to us. If we are unable to raise additional funds through equity or debt financing when needed, we may be required to delay, limit, reduce or terminate our product development or commercialization efforts for sotatercept in the PH field, ACE-083 or other therapeutic candidates, or grant rights to develop and market therapeutic candidates that we would otherwise prefer to develop and market ourselves.

If the estimates we make, or the assumptions on which we rely, in preparing our consolidated financial statements are

incorrect, our actual results may vary from those reflected in our projections and accruals.

Our consolidated financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America, or GAAP. The preparation of these consolidated financial statements requires us to make estimates and judgments that affect the reported amounts of our assets, liabilities, revenues and expenses, the amounts of charges accrued by us and related disclosure of contingent assets and liabilities. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances. We cannot assure you, however, that our estimates, or the assumptions underlying them, will be correct. Actual results may differ materially from those estimated amounts used in the preparation of our consolidated financial statements if these results differ from our historical experience, or other assumptions do not turn out to be substantially accurate, even if such assumptions are reasonable when made.

Further, we rely on BMS to report REBLOZYL sales data and our related royalty revenue to us in a timely and accurate manner. If BMS fails to do so, we may under- or over-state our collaboration revenue.

From time to time we may issue financial guidance relating to our expectations for our royalty revenue or our cash, cash equivalents and investments available for operations, which guidance is based on estimates and the judgment of management. If, for any reason, our expenses or royalty revenue differ materially from our guidance or we utilize our cash more quickly than anticipated, we may have to adjust our publicly announced financial guidance. If we fail to meet, or if we are required to change or update any element of, our publicly disclosed financial guidance or other expectations about our business, our stock price could decline.

Our operating results may fluctuate significantly, which makes our future operating results difficult to predict and could cause our operating results to fall below expectations or cause any guidance we may provide to be inaccurate.

Our operating results are difficult to predict and will likely fluctuate from quarter to quarter and year to year. Due to the recent approval by the FDA of REBLOZYL and the absence of historical sales data, our royalty revenue from product sales will be difficult to predict from period to period. Our revenues will also depend on the receipt of development, regulatory and commercial milestone payments under our agreements with BMS, as well as payments we may receive under new collaboration arrangements we may enter into with third parties. These payments may vary significantly from quarter to quarter and any such variance could cause a significant fluctuation in our revenue from one quarter to the next.

Further, changes in our operations, such as increased development, manufacturing and clinical trial expenses in connection with our expanding pipeline programs, or our undertaking of additional programs, business activities, or entry into strategic transactions, including potential future acquisitions of products, technologies or businesses may also cause significant fluctuations in our expenses.

The cumulative effects of these factors could result in large fluctuations and unpredictability in our quarterly and annual operating results. As a result, comparing our operating results on a period-to-period basis may not be meaningful. Our past results may not be a reliable indication of our future performance. This variability and unpredictability could also result in our failing to meet the expectations of industry or financial analysts or investors for any period. If our revenue or operating results fall below the expectations of analysts or investors or below any forecasts we may provide to the market, or if the forecasts we provide to the market are below the expectations of analysts or investors, the price of our common stock could decline substantially. Such a stock price decline could occur even when we have met any previously publicly stated revenue or earnings guidance we may provide.

Risks Related to Regulatory Review and Approval of REBLOZYL and Our Therapeutic Candidates

If we or our partners do not obtain regulatory approval for luspatercept-aamt in MDS or other target indications, or for our other current and future therapeutic candidates, our business will be adversely affected.

REBLOZYL and our therapeutic candidates are subject to extensive governmental regulations relating to development, clinical trials, manufacturing and commercialization, among other things. In order to obtain regulatory approval for the commercial sale of any therapeutic candidates, we or our partners must demonstrate through extensive preclinical studies and clinical trials that the therapeutic candidate is safe and effective for use in each target indication. Clinical testing is expensive, time-consuming and uncertain as to outcome. We or our partners may gain regulatory approval for REBLOZYL, sotatercept, ACE-083 or any other therapeutic candidate in some but not all of the territories available or some but not all of the target indications or may receive approval with limited labeling or boxed warnings, resulting in limited commercial opportunity for the approved products, or we or they may never obtain regulatory approval for these therapeutic candidates. For example, although the FDA approved REBLOZYL in November 2019 for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions, a supplemental Biologics License Application, or sBLA, for luspatercept-aamt remains

under review by the FDA for the treatment of anemia in adult patients with very low- to intermediate-risk MDS who have ring sideroblasts and require RBC transfusions. In addition, regulatory applications for luspatercept-aamt remain under review by the European Medicines Agency, or EMA, in both beta-thalassemia and MDS. Further, luspatercept-aamt is also in clinical development in myelofibrosis. There can be no assurance that the FDA or EMA will approve any of these regulatory applications or that luspatercept-aamt will gain regulatory approval in MDS, myelofibrosis or any other potential future target indication.

Delays in the commencement, enrollment or completion of clinical trials of our therapeutic candidates could result in increased costs to us as well as a delay or failure in obtaining regulatory approval, or prevent us from commercializing our therapeutic candidates on a timely basis, or at all.

We cannot guarantee that our or our partners' clinical trials will be conducted as planned or completed on schedule, if at all. A failure of one or more clinical trials can occur at any stage of testing. Events that may prevent successful or timely commencement, enrollment or completion of clinical development include:

- delays by us or our current or future partners in reaching a consensus with regulatory agencies on trial design;
- delays in reaching agreement on acceptable terms with prospective clinical research organizations, or CROs, and clinical trial sites;
- delays in obtaining required Institutional Review Board, or IRB, approval at each clinical trial site;
- delays in recruiting suitable patients to participate in clinical trials;
- imposition of a clinical hold by regulatory agencies for any reason, including safety or manufacturing concerns or after an inspection of clinical operations or trial sites;
- failure by CROs, other third parties or us or our current or future partners to adhere to clinical trial requirements;
- failure to perform in accordance with the FDA's good clinical practices, or GCP, or applicable regulatory guidelines in other countries;
- delays in the testing, validation, manufacturing and delivery of the therapeutic candidates to the clinical sites;
- delays caused by patients not completing participation in a trial or not returning for post-treatment follow-up;
- clinical trial sites or patients dropping out of a trial;
- occurrence of serious adverse events in clinical trials that are associated with the therapeutic candidates that are viewed to outweigh its potential benefits;
- delays resulting from the FDA's inability to timely review and process any submissions we or BMS have filed during the pendency of a whole or partial U.S. government shutdown; or
- changes in regulatory requirements and guidance that require amending or submitting new clinical protocols.

Delays, including delays caused by the above factors, can be costly and could negatively affect our or BMS's ability to complete a clinical trial. If we or BMS are not able to successfully complete clinical trials of our therapeutic candidates, we will not be able to obtain regulatory approval and will not be able to commercialize such therapeutic candidates or expand our products into additional indications.

There is a high risk of clinical failure at any stage of clinical development, and, as a result, we may not succeed in developing our therapeutic candidates into marketable products.

Our encouraging preclinical and clinical results to date for luspatercept-aamt, sotatercept, and ACE-083 in Charcot-Marie-Tooth disease, or CMT, are not necessarily predictive of the results of our ongoing or future clinical trials. Promising results in preclinical studies of a drug candidate may not be predictive of similar results in humans during clinical trials, and successful results from early clinical trials of a drug candidate may not be replicated in later and larger clinical trials or in clinical trials for different indications. If the results of our or our current or future partners' ongoing or future clinical trials are inconclusive with respect to the efficacy of our therapeutic candidates or if we or they do not meet the clinical endpoints with statistical significance or if there are safety concerns or adverse events associated with our therapeutic candidates, we or our partner may be prevented or delayed in obtaining regulatory approval for our therapeutic candidates. We routinely develop our therapeutic candidates in multiple indications and our therapeutic candidates are at multiple stages of development at any given time, and any data, including safety or efficacy data, from any of our clinical trials could have a negative effect on our other clinical trials for the same or different therapeutic candidates. For example, if we or BMS observe negative data in any one or more of our luspatercept-aamt clinical trials, this data could have an adverse effect on our ability to market REBLOZYL in its currently approved indication or to obtain regulatory approval for luspatercept-aamt in MDS or any other new indication.

In addition, data obtained from trials and studies, including extension studies, are susceptible to varying interpretations, and regulators may not interpret our data as favorably as we do, which may delay or prevent regulatory approval. Alternatively, regulators may ask us to conduct more rigorous studies or trials or studies with endpoints that are different from the studies we are currently conducting. Successful achievement of study endpoints does not guarantee progression to further clinical development, receipt of regulatory approval or commercialization. Even if we or our partners obtain regulatory approval, that approval may be for indications or patient populations that are not as broad as intended or desired or may require labeling that includes significant use or distribution restrictions or safety warnings. We or our partners may also be required to perform additional or unanticipated clinical trials to obtain approval or be subject to additional post-marketing testing requirements to maintain regulatory approval. In addition, regulatory authorities may withdraw their approval of a product or impose restrictions on its distribution, such as in the form of a risk evaluation and mitigation strategy.

If we or our current or future partners fail to obtain regulatory approval in jurisdictions outside the United States, we and they will not be able to market our products in those jurisdictions.

We and our current or future partners intend to market REBLOZYL and our therapeutic candidates, if approved, in international markets. Such marketing will require separate regulatory approvals in each market and compliance with numerous and varying regulatory requirements. The approval procedures vary from country-to-country and may require additional testing. Moreover, the time required to obtain approval may differ from that required to obtain FDA approval. In addition, in many countries outside the United States, a therapeutic candidate must be approved for reimbursement before it can be approved for sale in that country. Approval by the FDA does not ensure approval by regulatory authorities in other countries or jurisdictions, and approval by one foreign regulatory authority does not ensure approval by regulatory authorities in other foreign countries or by the FDA. The foreign regulatory approval process may include all of the risks associated with obtaining FDA approval. We or our current or future partners may not obtain foreign regulatory approvals on a timely basis, if at all. In particular, although BMS has submitted a marketing authorization application, or MAA, to the EMA for luspatercept-aamt for the treatment of adult patients with MDS-associated anemia and for the treatment of adult patients with beta-thalassemia-associated anemia, BMS may not be successful in obtaining EMA approval of luspatercept-aamt in either indication on a timely basis, or ever. We or our partners may not be able to file for regulatory approvals and may not receive necessary approvals to commercialize our products in any market.

We and, for our BMS partnered programs, BMS, regularly request and receive guidance from the FDA and foreign regulators regarding the design or conduct of clinical trials with luspatercept-aamt and our therapeutic candidates. This guidance is not binding on these agencies and their policies and guidance could change substantially and unpredictably, potentially in a way that makes our clinical trials or our path to regulatory approval longer, more expensive or otherwise more difficult.

Any guidance that we or BMS receive from the FDA or foreign regulators regarding the design or conduct of our or BMS's clinical trials is not necessarily indicative of what these regulators will eventually require from us or BMS to obtain regulatory approval of our therapeutic candidates or luspatercept-aamt in any new indications. These regulators typically caution that any guidance received from them represents their then-current thinking, does not create or confer any rights to us or BMS, and does not operate to bind the regulator. If later guidance that we or BMS receive from the FDA or foreign regulators regarding our clinical trial design or conduct is materially different than the current guidance we have received from these regulators, we may need to change our clinical development plans and it may take longer, be more expensive or otherwise be more difficult to obtain FDA or foreign regulatory approval of our therapeutic candidates and our business may be materially harmed.

We undertake no obligation to disclose guidance that we or BMS may receive from the FDA or foreign regulators. Any guidance from the FDA or foreign regulators that we may disclose publicly speaks only as of the date of such disclosure. We undertake no obligation to update any disclosure we make regarding regulator guidance to reflect additional regulatory guidance received after the date of such disclosure or to reflect the occurrence of unanticipated events that may affect the guidance.

REBLOZYL and any of our therapeutic candidates that receive regulatory approval will remain subject to ongoing regulatory review, which may result in significant additional expense. Additionally, REBLOZYL and our therapeutic candidates, if approved, could be subject to labeling and other restrictions, and we or our current or future partners may be subject to penalties if we fail to comply with regulatory requirements or experience unanticipated problems with our products.

Any regulatory approvals that we or our current or future partners receive for REBLOZYL or our therapeutic candidates may also be subject to limitations on the approved indicated uses for which the product may be marketed or to conditions of approval, or contain requirements for potentially costly post-marketing testing, including Phase 4 clinical trials, and surveillance to monitor safety and efficacy. In addition, the manufacturing processes, labeling, packaging, distribution, adverse event reporting, storage, advertising, promotion and recordkeeping for REBLOZYL and any other therapeutic candidate that receives FDA approval will be subject to extensive and ongoing regulatory requirements. These requirements include submissions of safety and other post-marketing information and reports, registration, as well as continued compliance with current good manufacturing practice, or cGMP, and GCP, for any clinical trials that we or our partners conduct post-approval.

The FDA and other agencies, including the Department of Justice, or the DOJ, closely regulate and monitor the post-approval marketing and promotion of products to ensure that they are marketed and distributed only for the approved indications and in accordance with the provisions of the approved labeling. The FDA and DOJ impose stringent restrictions on manufacturers' communications regarding off-label use. If we do not market REBLOZYL or any other therapeutic candidate that receives FDA approval for their approved indications, we may be subject to enforcement action for off-label marketing. Violations of the federal Food, Drug and Cosmetic Act and other statutes, including the False Claims Act, relating to the promotion and advertising of prescription drugs may lead to investigations and enforcement actions alleging violations of federal and state health care fraud and abuse laws, as well as state consumer protection laws, which violations may result in the imposition of significant administrative, civil and criminal penalties.

Later discovery of previously unknown problems with REBLOZYL or another approved therapeutic candidate, including adverse events of unanticipated severity or frequency, or with manufacturing operations or processes, or failure to comply with regulatory requirements, may result in, among other things:

- restrictions on the marketing or manufacturing of the product, withdrawal of the product from the market, or voluntary or mandatory product recalls;
- fines, warning letters, or holds on clinical trials;
- refusal by the FDA to approve pending applications or supplements to approved applications filed by us or our partners, or suspension or revocation of product license approvals;
- product seizure or detention, or refusal to permit the import or export of products; and
- injunctions or the imposition of civil or criminal penalties.

The policies of the FDA and other regulatory agencies may change and additional government regulations may be enacted that could prevent, limit or delay regulatory approval of our therapeutic candidates. We cannot predict the likelihood, nature or extent of government regulation that may arise from future legislation or administrative action, either in the United States or abroad. If we or our partners are slow or unable to adapt to changes in existing requirements or the adoption of new requirements or policies, or not able to maintain regulatory compliance, we or our partners may lose any marketing approval that may have been obtained and we may not achieve or sustain profitability, which would adversely affect our business.

A Fast Track designation by the FDA may not actually lead to a faster development or regulatory review or approval process.

The FDA grants Fast Track designation to therapies that are considered capable of addressing unmet medical needs and possess the potential to treat serious or life-threatening disease conditions in order to facilitate its development and expedite the review procedure. The FDA has broad discretion in granting Fast Track designation, so even if we believe that a particular product candidate is eligible for such designation, the FDA could decide not to grant it. Even though luspatercept-aamt has

received Fast Track designation in certain indications, we may not experience a faster development process, review or approval, or receive FDA approval at all, in any of those indications compared to conventional FDA procedures. A Fast Track designation does not change the standards for approval. The FDA may also withdraw Fast Track designation if it believes that the designation is no longer supported by data from our clinical development program.

The ongoing clinical trials with luspatercept-aamt may be delayed, suspended or terminated, or may not lead to marketing approval.

For luspatercept-aamt, BMS is currently conducting a Phase 2 clinical trial in non-transfusion-dependent beta-thalassemia patients, referred to as the BEYOND trial, with preliminary topline results currently expected by the end of 2020, and a Phase 3 clinical trial, the COMMANDS trial, in first-line, lower-risk MDS patients. BMS is also conducting a Phase 2 clinical trial in patients with myelofibrosis-associated anemia. Based on data from this trial that were presented in December 2019, we and BMS announced our intent to initiate in 2020 a pivotal phase 3 INDEPENDENCE trial of luspatercept-aamt in patients with myelofibrosis-associated anemia who are being treated with JAK inhibitor therapy and require RBC transfusions. We are also currently conducting two long-term Phase 2 extension studies with luspatercept-aamt - one in patients with MDS and another in patients with beta-thalassemia. BMS or we may experience delays in the conduct of these clinical trials, including delays related to patients withdrawing from the trial, or drug supply. If patients experience adverse events while in clinical trials with luspatercept-aamt, then one or more of these trials may be delayed, suspended or terminated. BMS may not achieve any of the endpoints in these ongoing trials. Additionally, we and BMS have announced that we are planning to evaluate luspatercept-aamt in one or more indications beyond MDS, beta-thalassemia and myelofibrosis. Even though the primary endpoint and key secondary endpoints were achieved in the Phase 3 MEDALIST and BELIEVE trials, and the FDA approved REBLOZYL for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions, one or more health authorities may not approve luspatercept-aamt for all of the desired indications. The MEDALIST and BELIEVE trials were designed with input from health authorities in many different countries, but this guidance is not binding on these regulators, and it may be necessary to conduct one or more additional clinical trials in order to achieve marketing authorization in one or more regulatory jurisdictions. Guidance that we or BMS receive from the FDA or foreign regulators regarding the design or conduct of the MEDALIST or BELIEVE clinical trials is not necessarily indicative of what these regulators will eventually require from us or BMS to obtain regulatory approval of luspatercept-aamt in these indications. Any regulatory approvals that we or BMS receive for luspatercept-aamt may also be subject to limitations on the approved indicated uses for which the product may be marketed or to conditions of approval, or contain requirements for potentially costly post-marketing testing, including Phase 4 clinical trials, and surveillance to monitor safety and efficacy.

If we or any of our current or future partners violate the guidelines pertaining to promotion and advertising of REBLOZYL or any of our therapeutic candidates, if approved, we or they may be subject to disciplinary action by the FDA's Office of Prescription Drug Promotion (OPDP) or other regulatory authorities.

The FDA's Office of Prescription Drug Promotion, or OPDP, is responsible for reviewing prescription drug advertising and promotional labeling to ensure that the information contained in these materials is not false or misleading. There are specific disclosure requirements, and the applicable regulations mandate that advertisements cannot be false or misleading or omit material facts about the product. Prescription drug promotional materials must present a fair balance between the drug's effectiveness and the risks associated with its use. Most warning letters from OPDP cite inadequate disclosure of risk information.

OPDP prioritizes its actions based on the degree of risk to the public health, and often focuses on newly introduced drugs and those associated with significant health risks. There are two types of letters that OPDP typically sends to companies that violate its drug advertising and promotional guidelines: untitled letters and warning letters. In the case of an untitled letter, OPDP typically alerts the drug company of the violation and issues a directive to refrain from future violations, but does not typically demand other corrective action. A warning letter is typically issued in cases that are more serious or where the company is a repeat offender. Although we have not received any such letters from OPDP, we or any of our current or future partners may inadvertently violate OPDP's guidelines in the future and be subject to an OPDP untitled letter or warning letter, which may have a negative impact on our business.

Risks Related to Our Reliance on Third Parties

We are dependent on BMS for the successful development and commercialization of our first approved product, REBLOZYL, and for sotatercept outside of the PH field. If BMS does not devote sufficient resources to the development and commercialization of REBLOZYL, discontinues development or commercialization of REBLOZYL, is unsuccessful in its efforts, or chooses to terminate the REBLOZYL agreement with us, our business will be materially harmed.

We have entered into collaboration agreements with BMS to develop and commercialize sotatercept and REBLOZYL. Pursuant to the sotatercept agreement, responsibility for all clinical and other product development activities for sotatercept for all indications outside of the PH field and for manufacturing sotatercept for such indications has been transferred to BMS. Pursuant to the REBLOZYL agreement, following FDA approval of REBLOZYL in November 2019 for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions, BMS is solely responsible for all product development activities for REBLOZYL. We have a co-promotion right in North America and our commercialization costs provided in the commercialization plan and budget approved by the Joint Commercialization Committee, or JCC, are entirely funded by BMS. Activities that we elect to conduct outside of the commercialization plan and budget to support the commercialization of REBLOZYL are at our own expense.

Our ability to generate royalty and milestone revenues from sales of REBLOZYL and, if approved, sotatercept outside of the PH field, is largely dependent on BMS's performance of its development and commercialization obligations. Under our collaboration agreements, when BMS takes over development activities of a therapeutic candidate, it may determine the development plan and activities for that therapeutic candidate. We may disagree with BMS about the development strategy it employs, but we will have no rights to impose our development strategy on BMS. Similarly, BMS may decide to seek regulatory approval for, and limit commercialization of, either or both of REBLOZYL and, outside of the PH field, sotatercept, to narrower indications than we would pursue. We would be prevented from developing or commercializing a candidate in an indication that BMS has chosen not to pursue, other than sotatercept in the PH field. More broadly, if BMS elects to discontinue the development of sotatercept outside of the PH field and/or REBLOZYL, we may be unable to advance the products ourselves. Further, on review of the safety and efficacy data available to date, the FDA may impose requirements on a clinical trial program that would render the program commercially nonviable. In the event of any such decision, we would be unable to advance such program ourselves.

Pursuant to our collaboration agreement with BMS for the development of sotatercept in the PH field, we will rely on BMS for many aspects of our development of sotatercept in the PH field, including, for example, regulatory support. If BMS fails to perform its obligations under the sotatercept agreement, our ability to develop sotatercept in the PH field may be materially harmed.

This partnership may not be scientifically or commercially successful due to a number of important factors, including the following:

- BMS has wide discretion in determining the efforts and resources that it will apply to its partnership with us. The timing and amount of any development, regulatory and commercial milestones and royalties that we may receive under such partnership will depend on, among other things, the efforts, allocation of resources and successful development and commercialization of these therapeutic candidates by BMS.
- BMS may develop and commercialize, either alone or with others, products that are similar to or competitive with the therapeutic candidates that are the subject of its partnerships with us.
- BMS may terminate its partnership with us without cause and for circumstances outside of our control, which could make it difficult for us to attract new strategic partners or adversely affect how we are perceived in scientific and financial communities.
- BMS may develop or commercialize our product or therapeutic candidates in such a way as to elicit litigation that could jeopardize or invalidate our intellectual property rights or expose us to potential liability.
- BMS may not comply with all applicable regulatory requirements, or may fail to report safety data in accordance with all applicable regulatory requirements.
- If BMS were to breach its arrangements with us, we may need to enforce our right to terminate the agreement in legal proceedings, which could be costly and cause delay in our ability to receive rights back to the relevant product or therapeutic candidates. If we were to terminate an agreement with BMS due to BMS's breach or BMS terminated the agreement without cause, the development and commercialization of sotatercept and REBLOZYL could be delayed, curtailed or terminated because we may not have sufficient financial resources or capabilities to continue development and commercialization of REBLOZYL and sotatercept on our own if we choose not to, or are unable to, enter into a new collaboration for them.
- BMS may enter into one or more transactions with third parties, including a merger, consolidation, reorganization, sale of substantial assets, sale of substantial stock or other change in control, which could divert the attention of its management and adversely affect BMS's ability to retain and motivate key personnel who are important to the

continued development of the programs under the strategic partnership with us. In addition, the third-party to any such transaction could determine to reprioritize BMS's development programs such that BMS ceases to diligently pursue the development of our programs and/or cause the respective partnership with us to terminate.

Although we are continuing to build out our commercial infrastructure, we currently have limited marketing, sales and distribution experience and capabilities and we are dependent upon BMS for commercialization of REBLOZYL and will be dependent upon BMS for commercialization of sotatercept outside of the PH field.

For REBLOZYL and, outside of the PH field, sotatercept, we and BMS share commercialization obligations in North America and we are solely dependent on BMS for commercialization outside of North America. In connection with the recent launch of REBLOZYL as our first commercial product, and to meet our co-promotion obligations in the United States, in 2019 we hired a limited sales force and continued to build out our commercial infrastructure. However, as a company with only one recently approved commercial product, our marketing, sales and distribution experience and capabilities in the United States remain very limited. To successfully commercialize REBLOZYL and, outside of the PH field, sotatercept, in the United States, we rely extensively on BMS, and we will need to continue to establish and maintain our own adequate marketing, sales and distribution capabilities. In addition, to successfully commercialize our wholly-owned therapeutic candidates and sotatercept in the PH field in jurisdictions where they may be approved, we will need to expand our own marketing, sales and distribution capabilities. Failure to continue to establish and further expand these capabilities, whether due to insufficient resources or some other cause, will limit or potentially halt our ability to successfully commercialize any therapeutic candidates, and will adversely affect our financial results. Even if we do develop such capabilities, we will compete with other companies that have more experienced and well-funded marketing, sales and distribution operations.

We and BMS routinely publicly disclose information about REBLOZYL and sotatercept, and if our and BMS's public disclosures are inconsistent, this could materially harm public and market perception of REBLOZYL and sotatercept and the value of our common stock.

Through a variety of public forums and media, such as press releases, conference calls, filings with the Securities and Exchange Commission, or SEC, and scientific/medical conferences, we and BMS routinely disclose information about REBLOZYL and sotatercept. We and BMS may not agree on information that is disclosed or the interpretation of that information, and our disclosures may be inconsistent with BMS's disclosures. If our and BMS's public disclosures are inconsistent, public and market perception of REBLOZYL and sotatercept and the value of our common stock could be materially adversely affected.

We and BMS rely on third parties to conduct preclinical studies and clinical trials for our therapeutic candidates, and if they do not properly and successfully perform their obligations to us, we may not be able to obtain regulatory approvals for our therapeutic candidates.

We design the clinical trials for sotatercept in the PH field and ACE-083, and will do so for any future unpartnered therapeutic candidates, and we will continue to work with BMS on any ongoing or future trials for luspatercept-aamt and sotatercept outside of the PH field. However, we and BMS rely on CROs and other third parties to assist in managing, monitoring and otherwise carrying out many of these trials. We and BMS compete with many other companies for the resources of these third parties. The third parties on whom we and BMS rely generally may terminate their engagements at any time, and having to enter into alternative arrangements would delay development and commercialization of our therapeutic candidates.

The FDA and foreign regulatory authorities require compliance with regulations and standards, including GCP, for designing, conducting, monitoring, recording, analyzing, and reporting the results of clinical trials to assure that the data and results are credible and accurate and that the rights, integrity and confidentiality of trial participants are protected. Although we and BMS rely on third parties to conduct many of our and their clinical trials, we and BMS are responsible for ensuring that each of these clinical trials is conducted in accordance with its general investigational plan, protocol and other requirements.

If these third parties do not successfully carry out their duties under their agreements, if the quality or accuracy of the data they obtain is compromised due to their failure to adhere to clinical trial protocols or to regulatory requirements, or if they otherwise fail to comply with clinical trial protocols or meet expected deadlines, the clinical trials of our therapeutic candidates may not meet regulatory requirements or may be delayed. If clinical trials do not meet regulatory requirements or if these third parties need to be replaced, preclinical development activities or clinical trials may be extended, delayed, suspended or terminated. If any of these events occur, we or BMS may not be able to obtain regulatory approval of our therapeutic candidates on a timely basis or at all.

In addition to our internal manufacturing, we rely on third-party manufacturers in the production and testing of our therapeutic candidates, and any failure by a third-party manufacturer may delay or impair our ability to complete clinical trials or commercialize our therapeutic candidates.

Manufacturing biologic drugs is complicated and is tightly regulated by the FDA, the EMA and comparable regulatory authorities around the world. For our early phase therapeutic candidates, we intend to continue to manufacture drug substance for preclinical testing and Phase 1 and Phase 2 clinical development at our current facilities, and use third-party contract manufacturing organizations as needed. For Phase 3 clinical trials of sotatercept in the PH field and for Phase 3 clinical trials and commercial supply of our products that we have not partnered, we expect to use contract manufacturing organizations. Successfully transferring complicated manufacturing techniques to contract manufacturing organizations and scaling up these techniques for commercial quantities will be time consuming and we may not be able to achieve such transfer. Moreover, the market for contract manufacturing services for therapeutic candidates is highly cyclical, with periods of relatively abundant capacity alternating with periods in which there is little available capacity. If any need we have for contract manufacturing services increases during a period of industry-wide tight capacity, we may not be able to access the required capacity on a timely basis or on commercially viable terms.

In addition, we contract with fill & finishing providers with the appropriate expertise, facilities and scale to meet our needs. Failure to maintain cGMP can result in a contractor receiving FDA sanctions, which can impact our contractors' ability to operate or lead to delays in our clinical development programs. We believe that our current fill & finish contractors are operating in accordance with cGMP, but we can give no assurance that FDA or other regulatory agencies will agree. In addition, any delay in contracting for fill & finish services, or failure of the contract manufacturer to perform the services as needed, may impair or render unusable the patient data from then-ongoing clinical trials and/or delay clinical trials, registration and launches. Any such issues may have a substantial negative effect on our business.

We rely on our collaboration partner, BMS, to manufacture, or contract for the manufacture of, bulk drug substance and finished drug product for use in late stage clinical trials and for commercial supplies of REBLOZYL and sotatercept. Any failure by BMS or by third parties with which BMS contracts may delay or impair the ability to complete late stage clinical trials or commercialize either or both of sotatercept, if approved, and REBLOZYL.

BMS is responsible for manufacturing all commercial supplies of REBLOZYL. Further, BMS is responsible for manufacturing REBLOZYL and sotatercept for all BMS-sponsored clinical trials. BMS generally does not perform the manufacture of the drug substance or drug product for either REBLOZYL or sotatercept itself. BMS has used and may continue to use contract manufacturers for the manufacture of drug substance and drug product for REBLOZYL and sotatercept, and we have no expectation that BMS plans to perform the manufacture of bulk drug substance or drug product for either REBLOZYL or sotatercept in the future. However, BMS would have the right to manufacture REBLOZYL or sotatercept outside of the PH field for clinical and commercial supply and in the PH field for commercial supply, itself or through the use of contract manufacturers. We understand that BMS has entered into manufacturing arrangements for clinical and commercial supplies of sotatercept and REBLOZYL bulk drug substance with contract manufacturers with considerable biotherapeutics manufacturing experience, including manufacturing monoclonal antibodies through processes similar to those used for sotatercept. If any of these manufacturers is unwilling or unable to manufacture sufficient quantities of sotatercept and/or REBLOZYL to meet clinical or commercial demand, either for technical or business reasons, the development and commercialization of sotatercept and/or REBLOZYL may be delayed, and sales of REBLOZYL, as well as sotatercept, if approved, may be materially harmed.

We may not be successful in establishing and maintaining additional strategic partnerships, which could adversely affect our ability to develop and commercialize products, negatively impacting our operating results.

In addition to our current collaborations with BMS, part of our strategy is to evaluate and enter into additional partnerships in the future for our other product candidates when strategically attractive, including potentially with major biotechnology or pharmaceutical companies. We face significant competition in seeking appropriate partners for our therapeutic candidates, and the negotiation process is time-consuming and complex. In order for us to successfully partner our therapeutic candidates, potential partners must view these therapeutic candidates as economically valuable in markets they determine to be attractive in light of the terms that we are seeking and other available products for licensing by other companies. Even if we are successful in our efforts to establish new strategic partnerships, the terms that we agree upon may not be favorable to us, and we may not be able to maintain such strategic partnerships if, for example, development or approval of a therapeutic candidate is delayed or sales of an approved product are disappointing. Any delay in entering into new strategic partnership agreements related to our other therapeutic candidates could delay the development and commercialization of these therapeutic candidates and reduce their competitiveness even if they reach the market.

If we fail to establish and maintain additional strategic partnerships related to ACE-083 or other therapeutic candidates, we will bear all of the risk and costs related to the development of any such therapeutic candidate, and we may need to seek

additional financing, hire additional employees and otherwise develop expertise for which we have not budgeted. This could negatively affect the development of any unpartnered therapeutic candidate.

Risks Related to Our Intellectual Property

If we are unable to obtain or protect intellectual property rights related to REBLOZYL or our therapeutic candidates, we may not be able to compete effectively.

We rely upon a combination of patents, trade secret protection and confidentiality agreements to protect the intellectual property related to our platform technology, our product, REBLOZYL, and our therapeutic candidates. The patent position of biotechnology companies is generally uncertain because it involves complex legal and factual considerations. The standards applied by the United States Patent and Trademark Office, or USPTO, and foreign patent offices in granting patents are not always applied uniformly or predictably. For example, there is no uniform worldwide policy regarding patentable subject matter or the scope of claims allowable in biotechnology patents. The patent applications that we own or in-license may fail to result in issued patents with claims that cover our product or our therapeutic candidates in the United States or in other countries. There is no assurance that all potentially relevant prior art relating to our patents and patent applications has been found. We may be unaware of prior art that could be used to invalidate an issued patent or prevent our pending patent applications from issuing as patents. Even if patents do successfully issue and even if such patents cover our product or our therapeutic candidates, third parties may challenge their validity, enforceability or scope, which may result in such patents being narrowed or invalidated. Furthermore, even if they are unchallenged, our patents and patent applications may not adequately protect our intellectual property, provide exclusivity for our product or our therapeutic candidates or prevent others from designing around our claims. Any of these outcomes could impair our ability to prevent competition from third parties, which may have an adverse impact on our business.

If patent applications we hold or have in-licensed with respect to our platform, our product or our therapeutic candidates fail to issue, if their breadth or strength of protection is threatened, or if they fail to provide meaningful exclusivity for our product or therapeutic candidates, it could dissuade companies from collaborating with us. We regularly file patent applications to cover our product and our therapeutic candidates. We cannot offer any assurances about which, if any, patents will issue, the breadth of any such patents or whether any issued patents will be found invalid and unenforceable or will be threatened by third parties. Any successful challenge to these patents or any other patents owned by or licensed to us could deprive us of rights necessary for the successful commercialization of our product or any therapeutic candidate that we or our current or future partners may develop. Since patent applications in the United States and most other countries are confidential for a period of time after filing, and some remain so until issued, we cannot be certain that we were the first to file any patent application related to our product or a therapeutic candidate. Furthermore, if third parties have filed such patent applications, an interference proceeding in the United States can be initiated by the USPTO or a third party to determine who was the first to invent any of the subject matter covered by the patent claims of our applications. In addition, patents have a limited lifespan. In the United States, the natural expiration of a patent is generally 20 years after it is filed. Various extensions may be available; however, the life of a patent and the protection it affords is limited. If we encounter delays in obtaining regulatory approvals, the period of time during which we or our current or future partners could market our product or a therapeutic candidate under patent protection could be reduced. Even if patents covering our product or therapeutic candidates are obtained, once the patent life has expired for a product, we may be open to competition from biosimilar products.

Any loss of patent protection could have a material adverse impact on our business. We and our current or future partners may be unable to prevent competitors from entering the market with a product that is similar to or the same as our product or our therapeutic candidates. In addition, the royalty we would receive under our collaboration agreements with BMS for sotatercept and REBLOZYL would be reduced by 50% if such product ceases to be covered by a valid claim of our patents even if no competitor with a similar product has entered the market.

Third-party claims of intellectual property infringement or misappropriation may prevent or delay our development and commercialization efforts.

Our commercial success depends in part on us and our current or future partners not infringing the patents and proprietary rights of third parties. There is a substantial amount of litigation, both within and outside the United States, involving patent and other intellectual property rights in the biotechnology and pharmaceutical industries, including patent infringement lawsuits, interferences, oppositions and *inter partes* reexamination proceedings before the USPTO and corresponding foreign patent offices. Numerous U.S. and foreign issued patents and pending patent applications owned by third parties exist in the fields in which we and our current or future partners are commercializing our product and developing and may develop our therapeutic candidates. As the biotechnology and pharmaceutical industries expand and more patents are issued, the risk increases that our product or our therapeutic candidates may be subject to claims of infringement of the patent rights of third parties.

Third parties may assert that we are employing their proprietary technology without authorization. There may be third-party patents or patent applications with claims to materials, formulations, methods of manufacture or methods for treatment related to the use or manufacture of our product or our therapeutic candidates, that we failed to identify. For example, applications filed before November 29, 2000 and certain applications filed after that date that will not be filed outside the United States remain confidential until issued as patents. Except for the preceding exceptions, patent applications in the United States and elsewhere are generally published only after a waiting period of approximately 18 months after the earliest filing. Therefore, patent applications covering our platform technology, our product, or our therapeutic candidates could have been filed by others without our knowledge. Additionally, pending patent applications which have been published can, subject to certain limitations, be later amended in a manner that could cover our platform technologies, our product, our therapeutic candidates or the use or manufacture of our product or our therapeutic candidates.

If any third-party patents were held by a court of competent jurisdiction to cover aspects of our materials, formulations, methods of manufacture or methods for treatment, the holders of any such patents would be able to block our ability to develop and commercialize the applicable product or therapeutic candidate until such patent expired or unless we or our partners obtain a license. These licenses may not be available on acceptable terms, if at all. Even if we or our partners were able to obtain a license, the rights may be nonexclusive, which could result in our competitors gaining access to the same intellectual property. Ultimately, we or our partners could be prevented from commercializing a product or therapeutic candidate, or be forced to cease some aspect of our business operations, if, as a result of actual or threatened patent infringement claims, we or our partners are unable to enter into licenses on acceptable terms. If BMS is required to enter a license agreement with a third party in order to import, develop, manufacture or commercialize sotatercept or REBLOZYL, the royalty rate and sales milestone payments that we could receive may be reduced by up to 50%. This could harm our business significantly.

Parties making claims against us or our partners may obtain injunctive or other equitable relief, which could effectively block our or our partners' ability to further develop and commercialize our product or one or more of our therapeutic candidates. Defending against claims of patent infringement or misappropriation of trade secrets could be costly and time consuming, regardless of the outcome. Thus, even if we were to ultimately prevail, or to settle at an early stage, such litigation could burden us with substantial unanticipated costs. In addition, litigation or threatened litigation could result in significant demands on the time and attention of our management team, distracting them from the pursuit of other company business. In the event of a successful claim of infringement against us or our partners, we may have to pay substantial damages, including treble damages and attorneys' fees for willful infringement, pay royalties, redesign our infringing products or obtain one or more licenses from third parties, which may be impossible or require substantial time and monetary expenditure.

We may face a claim of misappropriation if a third party believes that we inappropriately obtained and used trade secrets of such third party. If we are found to have misappropriated a third party's trade secrets, we may be prevented from further using such trade secrets, limiting our ability to develop and commercialize our product or our therapeutic candidates, and we may be required to pay damages.

During the course of any patent or other intellectual property litigation, there could be public announcements of the results of hearings, rulings on motions, and other interim proceedings in the litigation. If securities analysts or investors regard these announcements as negative, the perceived value of our product, therapeutic candidates, programs, or intellectual property could be diminished. Accordingly, the market price of our common stock could decline.

We have in-licensed, and may in the future in-license, a portion of our intellectual property, and, if we fail to comply with our obligations under these arrangements, we could lose such intellectual property rights or owe damages to the licensor of such intellectual property.

We are a party to a number of license agreements that are important to our business, and we may enter into additional license agreements in the future. As part of our discovery and development activities, we routinely evaluate in-licenses from

academic and research institutions. See "Business–Intellectual Property–In-Licenses" for a description of our license agreements.

Our existing license agreements impose, and we expect that future license agreements will impose, various diligence, milestone payment, royalty and other obligations on us. If there is any conflict, dispute, disagreement or issue of non-performance between us and our licensing partners regarding our rights or obligations under the license agreements, including any such conflict, dispute or disagreement arising from our failure to satisfy payment obligations under any such agreement, we may owe damages, our licensor may have a right to terminate the affected license, and our and our partners' ability to utilize the affected intellectual property in our drug discovery and development efforts, and our ability to enter into collaboration or marketing agreements for an affected product or therapeutic candidate, may be adversely affected.

If we do not obtain patent term extension and data exclusivity for any therapeutic candidates we may develop, our business may be materially harmed.

Depending upon the timing, duration and specifics of any FDA marketing approval of any therapeutic candidates we may develop, one or more of our owned or licensed U.S. patents may be eligible for limited patent term extension under the Hatch-Waxman Act. Similar extensions as compensation for patent term lost during regulatory review processes are also available in certain foreign countries and territories, such as in Europe under a Supplementary Patent Certificate. However, we may not be granted an extension in the United States and/or foreign countries and territories because of, for example, failing to exercise due diligence during the testing phase or regulatory review process, failing to apply within applicable deadlines, failing to apply prior to expiration of relevant patents, or otherwise failing to satisfy applicable requirements. Moreover, the applicable time period or the scope of patent protection afforded could be less than we request. If we are unable to obtain patent term extension or the term of any such extension is shorter than what we request or we fail to choose the most optimal patents to extend, our competitors may obtain approval of competing products following our patent expiration, and our business, financial condition, results of operations and prospects could be materially harmed.

Confidentiality agreements with employees and third parties may not prevent unauthorized disclosure of trade secrets and other proprietary information.

In addition to the protection afforded by patents, we rely on trade secret protection and confidentiality agreements to protect proprietary know-how that is not patentable or that we elect not to patent, processes for which patents are difficult to enforce and any other elements of our platform technology and discovery and development processes that involve proprietary know-how, information or technology that is not covered by patents. However, trade secrets can be difficult to protect. We seek to protect our proprietary technology and processes, in part, by entering into confidentiality agreements with our employees, consultants, and outside scientific advisors, contractors and collaborators. Although we use reasonable efforts to protect our trade secrets, our employees, consultants, contractors, or outside scientific advisors might intentionally or inadvertently disclose our trade secret information to competitors. In addition, competitors may otherwise gain access to our trade secrets or independently develop substantially equivalent information and techniques.

Enforcing a claim that a third party illegally obtained and is using any of our trade secrets is expensive and time consuming, and the outcome is unpredictable. In addition, courts outside the United States sometimes are less willing than U.S. courts to protect trade secrets. Misappropriation or unauthorized disclosure of our trade secrets could impair our competitive position and may have a material adverse effect on our business.

Risks Related to Development and Commercialization of REBLOZYL and Our Therapeutic Candidates

Our future commercial success depends upon attaining significant market acceptance of REBLOZYL and our therapeutic candidates, if approved, among physicians, patients, healthcare payers and acceptance by the operators of major medical providers.

REBLOZYL or any of our therapeutic candidates that receive regulatory approval may not gain market acceptance among physicians, healthcare payers, patients and the medical community. Market acceptance of any approved products depends on a number of factors, including:

- the efficacy and safety of the product, as demonstrated in clinical trials;
- the clinical indications for which the product is approved and the label approved by regulatory authorities for use with the product, including any warnings that may be required on the label;
- acceptance by physicians and patients of the product as a safe and effective treatment;

- decisions by healthcare organizations to utilize the product;
- the cost, safety and efficacy of treatment in relation to alternative treatments;
- the availability of adequate reimbursement and pricing by third party payers and government authorities;
- the continued projected growth of drug markets in our various indications;
- relative convenience and ease of administration;
- the prevalence and severity of adverse side effects; and
- the effectiveness of our and our current or future partners' sales and marketing efforts.

Market acceptance is critical to our ability to generate significant revenue. REBLOZYL and any therapeutic candidate, if approved and commercialized, may be accepted in only limited capacities or not at all. If REBLOZYL or any future approved products are not accepted by the market to the extent that we expect, we may not be able to generate significant revenue and our business would suffer.

Reimbursement may be limited or unavailable in certain market segments for REBLOZYL or our therapeutic candidates, which could make it difficult for us to sell our products profitably.

Market acceptance and sales of REBLOZYL and any other approved therapeutic candidates will depend significantly on the availability of adequate coverage and reimbursement from third-party payers and may be affected by existing and future healthcare reform measures. Government authorities and third-party payers, such as private health insurers and health maintenance organizations, decide which drugs they will pay for and establish reimbursement levels. Reimbursement by a third-party payer may depend upon a number of factors, including the third-party payer's determination that use of a product is:

- a covered benefit under its health plan;
- safe, effective and medically necessary;
- appropriate for the specific patient;
- cost-effective; and
- neither experimental nor investigational.

Obtaining coverage and reimbursement approval for a product from a government or other third party payer is a time consuming and costly process that could require us to provide supporting scientific, clinical and cost-effectiveness data for the use of our products to the payer. We or our current or future partners may not be able to provide data sufficient to gain acceptance with respect to coverage and reimbursement. We cannot be sure that coverage or adequate reimbursement will be available for REBLOZYL or any of our therapeutic candidates. Also, we cannot be sure that reimbursement amounts will not reduce the demand for, or the price of, our products. If reimbursement is not available or is available only to limited levels, we may not be able to commercialize certain of our products. In addition, in the United States, third-party payers are increasingly attempting to contain healthcare costs by limiting both coverage and the level of reimbursement of new drugs. As a result, significant uncertainty exists as to whether and how much third-party payers will reimburse patients for their use of newly approved drugs, which in turn will put pressure on the pricing of drugs.

The market opportunities for REBLOZYL or any of our therapeutic candidates may be smaller than we believe them to be, and even if we are able to achieve significant market share for an approved product within a particular indication, we may not achieve profitability.

We focus our research and product development on treatments for serious and rare diseases. Our projections of both the number of people who have the diseases that we are targeting, as well as the subset of people with these diseases who have the potential to benefit from treatment with REBLOZYL or any of our therapeutic candidates, are based on estimates. These estimates have been derived from a variety of sources and may prove to be incorrect. Further, new studies may change the estimated incidence or prevalence of these diseases. The number of patients may turn out to be lower or more difficult to identify than expected, which could result in the market opportunities for REBLOZYL or our therapeutic candidates being smaller than we expect.

In addition, even if we obtain significant market share for a product within an approved indication, if the potential target population for the related product is small, we may never achieve profitability without obtaining regulatory approval for additional indications. For instance, REBLOZYL is currently only approved for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions. We may never achieve profitability without obtaining regulatory approval for luspatercept-aamt in additional indications, such as MDS.

Price controls and price pressure may be imposed in foreign and U.S. markets, which may adversely affect our future profitability.

In some countries, particularly member states of the European Union, the pricing of prescription drugs is subject to governmental control. In these countries, pricing negotiations with governmental authorities can take considerable time after receipt of marketing approval for a product. In addition, there can be considerable pressure by governments and other stakeholders, including those in the United States, on prices and reimbursement levels, including as part of cost containment measures. Political, economic and regulatory developments may further complicate pricing negotiations, and pricing negotiations may continue after reimbursement has been obtained. Reference pricing used by various European Union member states and parallel distribution, or arbitrage between low-priced and high-priced member states, can further reduce prices. In some countries, we or our current or future partners may be required to conduct a clinical trial or other studies that compare the cost-effectiveness of REBLOZYL or our therapeutic candidates to other available therapies in order to obtain or maintain reimbursement or pricing approval. Publication of discounts by third-party payers or authorities may lead to further pressure on the prices or reimbursement levels within the country of publication and other countries. If reimbursement of our products is unavailable or limited in scope or amount, or if pricing is set at unsatisfactory levels, our business could be adversely affected.

Recent and future healthcare reform legislation and other changes in the healthcare industry and in healthcare spending may adversely affect our business model.

Our revenue prospects could be affected by changes in healthcare spending and policy in the United States and abroad. We operate in a highly regulated industry and new laws, regulations or judicial decisions, or new interpretations of existing laws, regulations or decisions, related to healthcare availability, the method of delivery or payment for healthcare products and services could negatively impact our business, operations and financial condition. There is significant interest in promoting healthcare reform, as evidenced by public discourse on the topic. See "Business–Government Regulation" for a detailed description on recent developments in healthcare regulations. It is likely that federal and state legislatures within the United States and foreign governments will continue to consider changes to existing healthcare legislation. We cannot predict the reform initiatives that may be adopted in the future or whether initiatives that have been adopted will be repealed or modified. The continuing efforts of the government, insurance companies, managed care organizations and other payers of healthcare services to contain or reduce costs of healthcare may adversely affect:

- public and market perceptions of our future business prospects, including future revenue and profitability;
- the demand for any drug products for which we may obtain regulatory approval;
- our ability to set a price that we believe is fair for our products;
- our ability to obtain coverage and reimbursement approval for a product;
- our ability to generate revenues and achieve or maintain profitability; and
- the level of taxes that we are required to pay.

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

Our future success depends on our or our partners' ability to demonstrate and maintain a competitive advantage with respect to the design, development and commercialization of REBLOZYL and our therapeutic candidates. Our objective is to design, develop and commercialize new products with superior efficacy, convenience, tolerability and safety. In many cases, REBLOZYL and the other products that we commercialize with our strategic partners or on our own will compete with existing, market-leading products. See "Business–Competition" for a detailed description of the competitive landscape for REBLOZYL and our therapeutic candidates.

Many of our potential competitors have significantly greater financial, manufacturing, marketing, drug development, technical and human resources than we do. Large pharmaceutical companies, in particular, have extensive experience in clinical testing, obtaining regulatory approvals, recruiting patients and in manufacturing pharmaceutical products. These companies

also have significantly greater research and marketing capabilities than we do and may also have multiple products that have been approved or are in late stages of development, and have collaborative arrangements in our target markets with leading companies and research institutions. Established pharmaceutical companies may also invest heavily to accelerate discovery and development of novel compounds or to in-license novel compounds that could make REBLOZYL or the therapeutic candidates that we develop obsolete. As a result of all of these factors, our competitors may succeed in obtaining patent protection and/or FDA approval or discovering, developing and commercializing therapeutic candidates before we do. In addition, any new product like REBLOZYL that competes with an approved product must demonstrate compelling advantages in efficacy, convenience, tolerability and safety in order to overcome price competition and to be commercially successful. If we are not able to compete effectively against potential competitors, our business will not grow and our financial condition and operations will suffer.

If our clinical trials fail to demonstrate the safety and efficacy of REBLOZYL in any new indications or our therapeutic candidates to the satisfaction of regulatory authorities 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 REBLOZYL in such indications or our therapeutic candidates.

Undesirable side effects caused by REBLOZYL or our therapeutic candidates could cause us, BMS or regulatory authorities to interrupt, delay or halt clinical trials and could result in the denial of regulatory approval by the FDA or other regulatory authorities and potential products liability claims. We and BMS are currently conducting a number of clinical trials for REBLOZYL and our clinical stage therapeutic candidates. Serious adverse events deemed to be caused by REBLOZYL or our therapeutic candidates could have a material adverse effect on the development of our therapeutic candidates and our business as a whole. In the case of placebo-controlled clinical trials, if the rate of an adverse event or serious adverse event observed in the treatment group exceeds the rate of such adverse event or serious adverse event observed in the placebo-controlled group, then the FDA or other regulatory authorities may require the delay or termination of such clinical trial, or require the conduct of one or more additional clinical trials to further demonstrate the safety of the therapeutic candidate.

For a more complete description of the safety profile for REBLOZYL and our therapeutic candidates, see the description of REBLOZYL and each of our therapeutic candidates in the "Business" section of this Annual Report on Form 10-K.

Our understanding of the relationship between REBLOZYL and our therapeutic candidates and these events may change as we gather more information, and additional unexpected adverse events may occur. There can be no assurance that additional adverse events associated with REBLOZYL or our therapeutic candidates will not be observed. As is typical in drug development, we have a program of ongoing toxicology studies in animals for our clinical stage therapeutic candidates and cannot provide assurance that the findings from such studies or any ongoing or future clinical trials will not adversely affect our clinical development activities.

Before obtaining regulatory approval for the sale of our therapeutic candidates, we must complete preclinical development and then conduct extensive clinical trials to demonstrate the safety and efficacy of our therapeutic candidates in humans. Clinical testing is expensive, difficult to design and implement, can take many years to complete and is uncertain as to outcome. In addition, we have never conducted a Phase 3 clinical trial for a therapeutic candidate without a partner and we may not be successful in doing so. A failure of one or more 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 interim or initial results of a clinical trial do not necessarily predict final results. In addition, preclinical and clinical data are often susceptible to varying interpretations and analyses, and successful achievement of study endpoints does not guarantee progression to further clinical development, receipt of regulatory approval or commercialization. Many companies that have believed their therapeutic candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain regulatory approval of their products. Even though REBLOZYL received regulatory approval for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions, there can be no assurance that REBLOZYL will perform satisfactorily in clinical trials in other indications, or that REBLOZYL will receive regulatory approval in such other indications.

We or our current or future partners may experience numerous unforeseen events during, or as a result of, clinical trials that could delay or prevent our ability to receive regulatory approval or commercialize our therapeutic candidates or REBLOZYL in new indications, 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;
- we may have delays in reaching or fail to reach agreement on acceptable clinical trial contracts or clinical trial protocols with prospective trial sites;

- clinical trials of REBLOZYL or our therapeutic 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 REBLOZYL or our therapeutic candidates may be larger than we anticipate; enrollment in these clinical trials may be slower than we anticipate; or participants may drop out of these clinical trials at a higher rate than we anticipate;
- 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 REBLOZYL or our therapeutic candidates for various reasons, including a finding that the participants are being exposed to unacceptable health risks;
- regulators, institutional review boards, or the data safety monitoring board for such trials may require that we or our investigators suspend or terminate clinical research for various reasons, including noncompliance with regulatory requirements or a finding that the participants are being exposed to unacceptable health risks;
- the cost of clinical trials of REBLOZYL or our therapeutic candidates may be greater than we anticipate;
- the supply or quality of REBLOZYL or our therapeutic candidates or other materials necessary to conduct clinical trials of our therapeutic candidates may be insufficient or inadequate; and
- REBLOZYL or our therapeutic candidates may have undesirable side effects or other unexpected characteristics, causing us or our investigators, regulators or institutional review boards to suspend or terminate the trials.

If we or our current or future partners are required to conduct additional clinical trials or other testing of REBLOZYL or our therapeutic candidates beyond those that we currently contemplate, if we or our current or future partners are unable to successfully complete clinical trials of REBLOZYL or our therapeutic candidates or other testing, if the results of these trials or tests are not positive or are only modestly positive or if we or others identify undesirable side effects caused by REBLOZYL or our therapeutic candidates either before or after receipt of marketing approval, then a number of potentially significant negative consequences could result, including that we or our current or future partners may:

- be delayed in obtaining or be unable to obtain marketing approval for our therapeutic candidates or REBLOZYL in new indications;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- be required to provide a medication guide outlining the risks of such side effects for distribution to patients;
- obtain approval with labeling that includes significant use or distribution restrictions or safety warnings, including boxed warnings;
- suffer reputational harm;
- be sued and held liable for harm caused to patients;
- be subject to additional post-marketing testing requirements; or
- have the product removed from the market after obtaining marketing approval.

Product development costs will also increase if we or our current or future partners experience delays in testing or marketing approvals. 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 therapeutic candidates, could allow our competitors to bring products to market before we do, and could impair our ability to successfully commercialize our therapeutic candidates, any of which may harm our business and results of operations.

Our results to date do not guarantee that any of our therapeutic candidates will be safe or effective, or receive regulatory approval.

The risk of failure of our current therapeutic candidates is high. Later clinical trials may not yield data consistent with earlier clinical trials. Similarly, clinical responses seen in patients enrolled at early stages of a clinical trial may not be replicated in patients enrolled in that trial at a later time. In addition, adverse events not observed in early clinical trials may be seen for the first time in later studies, or adverse events observed in a small number of patients in early trials may be seen in a greater number of patients in later studies and have greater statistical significance than previously anticipated. In the event that our clinical trials do not yield data consistent with earlier experience, it may be necessary for us to change our development strategy or abandon development of that therapeutic candidate, either of which could result in delays, additional costs and a decrease in our stock price.

The Phase 2 and Phase 3 clinical trial results for REBLOZYL are not necessarily indicative or predictive of the future results of BMS's ongoing and future Phase 2 or Phase 3 clinical trials. Even though the FDA approved REBLOZYL for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions, it is impossible to predict when or if REBLOZYL will receive regulatory approval in new indications or when or if any of our therapeutic candidates will prove safe or effective in humans or receive regulatory approval. These therapeutic candidates may not demonstrate in patients the chemical and pharmacological properties ascribed to them in laboratory studies or early-to-mid-stage clinical trials, and they may interact with human biological systems or other drugs in unforeseen, ineffective or harmful ways. If REBLOZYL does not receive regulatory approval in new indications or if we are unable to discover or successfully develop drugs that are safe and effective in humans, we may not have a viable business.

We manufacture ACE-083 and our other unpartnered and preclinical therapeutic candidates at our manufacturing facility. If our manufacturing facility is damaged or destroyed or production at this facility is otherwise interrupted, our business and prospects would be negatively affected.

If the manufacturing facility at our corporate headquarters or the equipment in it is damaged or destroyed, or if production at this facility is otherwise interrupted, we may not be able to quickly or economically replace our manufacturing capacity or replace it at all. In the event of a temporary or protracted loss of this facility or equipment, we might not be able to transfer manufacturing to a third party. Even if we could transfer manufacturing to a third party, the shift would likely be expensive and time-consuming, particularly since the new facility would need to comply with the necessary regulatory requirements and we would need approval from the FDA and foreign regulators before administering any products manufactured at that facility to patients. Such an event could impair or render unusable patient data from then-ongoing clinical trials and/or delay our clinical trials, registration and launches. Any such issues may have a substantial negative effect on our business.

Our expanded research activities may not identify new therapeutic candidates, and we may not be successful in developing any new therapeutic candidates that are identified.

Discovery and development of new therapeutic candidates is an unpredictable activity. We may not succeed in identifying new therapeutic candidates, and if we are unable to do so, our pipeline of clinical stage therapeutic candidates will be reduced in size, potentially harming our business. Our discovery efforts are primarily focused on IntelliTrap™ therapeutic candidates and antibodies. We have limited experience manufacturing and developing antibodies and IntelliTrap™ proteins, and we may not be successful at doing so in the future. Manufacturing biologic therapeutic candidates is complex and often requires extensive process development to achieve suitable quality and quantity of drug substance for clinical development and commercialization, and we may not succeed in achieving the quality and quantity of drug substance that is required at any particular stage. We may be unable to manufacture these therapeutic candidates, these therapeutic candidates may show unacceptable toxicity or pharmacokinetic properties, or these therapeutic candidates may not be safe or effective in clinical trials.

Risks Related to Our Business and Industry

If we undertake business combinations, collaborations or similar strategic transactions, they may disrupt our business, divert management's attention, dilute stockholder value or be difficult to integrate.

On a regular basis, we consider various business combination transactions, collaborations, license agreements and strategic transactions with third parties, including transactions which may result in us acquiring, or being acquired by, a third party. The consummation or performance of any future business combination, collaboration or strategic transaction may involve risks, such as:

- diversion of managerial attention and resources from day-to-day operations;

- challenges associated with integrating acquired technologies and operations of acquired companies;
- exposure to unforeseen liabilities or increased regulatory and compliance obligations;
- difficulties in the assimilation of different cultures and practices, as well as in the assimilation and retention of broad and geographically dispersed personnel and operations;
- misjudgment with respect to value, return on investment or strategic fit;
- higher than expected transaction costs; and
- additional dilution to our existing stockholders if we issue equity securities as consideration for any acquisitions.

As a result of these risks, we may not be able to achieve the expected benefits of any such transaction. Future business combinations could involve the acquisition of significant intangible assets. We may need to record write-downs from future impairments of identified intangible assets and goodwill. These accounting charges would increase a reported loss or reduce any future reported earnings. In addition, we could use substantial portions of our available cash to pay the purchase price for company or product candidate acquisitions. We could also incur debt or issue additional equity securities as consideration for these acquisitions, which could cause our stockholders to suffer significant dilution.

If we fail to attract and keep senior management and key personnel, we may be unable to successfully develop our therapeutic candidates, conduct our clinical trials and commercialize our therapeutic candidates.

We are highly dependent on members of our senior management. The loss or transition of services from any member of our senior management could impede the achievement of our research, development or commercialization objectives.

Recruiting and retaining qualified scientific, clinical, regulatory, manufacturing, 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 may encounter difficulties in managing our organizational changes and successfully adjusting our operations.

As we seek to advance our therapeutic candidates through clinical trials and commercialization, we will need to expand our development, regulatory, manufacturing, marketing and sales capabilities or contract with third parties to provide these capabilities for us. As our operations expand, we expect that we will need to manage additional relationships with various strategic partners, suppliers and other third parties. Future growth will impose significant added responsibilities on members of management. Our future financial performance and our ability to commercialize our therapeutic candidates and to compete effectively will depend, in part, on our ability to manage any future growth effectively. To that end, we must be able to manage our development efforts and clinical trials effectively and hire, train and integrate additional management, administrative and, if necessary, sales and marketing personnel. We may not be able to accomplish these tasks, and our failure to accomplish any of them could prevent us from successfully growing our company.

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

We face an inherent risk of product liability as a result of the clinical testing of our therapeutic candidates and the sale of any products for which we obtain regulatory approval. For example, we may be sued if REBLOZYL or any other product we develop allegedly causes injury or is found to be otherwise unsuitable during product testing, manufacturing, marketing or sale. Any such product liability claims may include allegations of defects in manufacturing, defects in design, a failure to warn of dangers inherent in the product, negligence, strict liability, and a breach of warranties. Claims could also be asserted under state consumer protection acts. If we cannot successfully defend ourselves against product liability claims, we may incur substantial liabilities or be required to limit commercialization of our therapeutic candidates. Even a successful defense would require significant financial and management resources. Regardless of the merits or eventual outcome, liability claims may result in:

- injury to our reputation;
- withdrawal of clinical trial participants;

- costs to defend the related litigations;
- a diversion of management's time and our resources;
- substantial monetary awards to trial participants or patients;
- product recalls, withdrawals, or labeling, marketing or promotional restrictions;
- loss of revenue;
- the inability to commercialize our therapeutic candidates; and
- a decline in our stock price.

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

We could be subject to securities class action litigation.

In the past, securities class action litigation has often been brought against companies following a decline in the market price of their securities. This risk is especially relevant for us because biopharmaceutical companies have experienced significant stock price volatility in recent years. If we face such litigation, it could result in substantial costs and a diversion of management's attention and resources, which could harm our business.

Comprehensive tax reform legislation could adversely affect our business and financial condition.

On December 22, 2017, tax legislation commonly known as the "Tax Cuts and Jobs Act" (TCJA) was enacted that significantly reforms the Internal Revenue Code of 1986, as amended. The TCJA, among other things, includes changes to U.S. federal tax rates, imposes significant additional limitations on the deductibility of interest and net operating loss carryforwards, or NOLs, allows for the expensing of capital expenditures, and puts into effect the migration from a "worldwide" system of taxation to a territorial system. Our net deferred tax assets and liabilities have been revalued at the newly enacted U.S. corporate tax rate, and the impact of the reduction to our deferred tax assets and associated valuation allowance was recognized in 2017. We continue to examine the impact this tax reform legislation may have on our business. The impact of this tax reform remains uncertain and could be adverse.

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

As of December 31, 2019, we had federal NOLs of approximately \$666.3 million and state NOLs of approximately \$689.8 million available to reduce future taxable income, if any. These federal and state NOL carryforwards generally expire at various times through 2039, however, under the TCJA, federal NOLs generated after December 31, 2017 will not be subject to expiration. Under Section 382 of the Internal Revenue Code of 1986, as amended, if a corporation undergoes an "ownership change," generally defined as a greater than 50% change (by value) in its equity ownership over a three-year period, the corporation's ability to use its pre-change net operating loss carryforwards, or NOLs, and other pre-change tax attributes (such as research tax credits) to offset its post-change income may be limited. We have completed several financings since our inception which may have resulted in a change in control as defined by IRC Section 382. We may also experience ownership changes in the future as a result of subsequent shifts in our stock ownership. As a result, if we earn net taxable income, our ability to use our pre-change net operating loss carryforwards to offset U.S. federal taxable income may be subject to limitations, which could potentially result in increased future tax liability to us. In addition, at the state level, there may be periods during which the use of NOLs is suspended or otherwise limited, which could accelerate or permanently increase state taxes owed. Further, the reduction of the corporate tax rate under the TCJA may reduce the potential economic benefit of our NOLS and any other deferred tax assets.

We must comply with environmental laws and regulations, and failure to comply with these laws and regulations could expose us to significant liabilities.

We are subject to a variety of federal, state and local laws and regulations governing the use, generation, manufacture, distribution, storage, handling, treatment and disposal of materials that we use in our manufacturing process. Although we believe our safety procedures for handling and disposing of these materials and waste products comply with these laws and regulations, we cannot eliminate the risk of accidental injury or contamination from the use, manufacture, distribution, storage, handling, treatment or disposal of hazardous materials. In the event of contamination or injury, or failure to comply with environmental, occupational health and safety and export control laws and regulations, we could be held liable for any resulting damages and any such liability could exceed our assets and resources. We are uninsured for third-party contamination injury.

Our relationships with healthcare providers, physicians and third-party payers are subject to applicable anti-kickback, fraud and abuse and other healthcare laws and regulations, which, in the event of a violation, could expose us to criminal sanctions, civil penalties, contractual damages, reputational harm and diminished profits and future earnings.

Healthcare providers, physicians and third-party payers play a primary role in the recommendation and prescription of our product, REBLOZYL, and will play a primary role for any therapeutic candidates for which we obtain regulatory approval. Our arrangements with healthcare providers, physicians and third-party payers 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 medicines for which we obtain marketing approval. Restrictions under applicable federal and state healthcare laws and regulations include the following:

- the federal Anti-Kickback Statute, or AKS, prohibits, among other things, persons from knowingly and willfully soliciting, offering, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward, or in return for, either the referral of an individual for, or the purchase, order or recommendation or arranging of, any good or service, for which payment may be made under a federal healthcare program such as Medicare and Medicaid. Remuneration is not defined in the AKS and has been broadly interpreted to include anything of value, including for example, gifts, discounts, coupons, the furnishing of supplies or equipment, credit arrangements, payments of cash, waivers of payments, ownership interests and providing anything at less than its fair market value;
- the federal False Claims Act and civil monetary penalty laws impose criminal and civil penalties, including through civil whistleblower or qui tam actions, against individuals or entities for, among other things, knowingly presenting, or causing to be presented, false or fraudulent claims for payment by a federal healthcare program or making a false statement or record material to payment of a false claim or avoiding, decreasing or concealing an obligation to pay money to the federal government, with potential liability including mandatory treble damages and significant per-claim penalties, currently set at \$11,463 to \$23,331 per false claim, which amounts are subject to periodic revision by the government;
- federal criminal laws that prohibit executing a scheme to defraud any healthcare benefit program or making false statements relating to healthcare matters;
- the federal Food, Drug and Cosmetic Act and its regulations, which prohibit, among other things, the introduction or delivery for introduction into interstate commerce of any drug that is adulterated or misbranded;
- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, imposes criminal and civil liability for executing a scheme to defraud any healthcare benefit program or making false statements relating to healthcare matters;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act and its implementing regulations, also imposes obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of individually identifiable health information;
- the Foreign Corrupt Practices Act, a U.S. law, which regulates certain financial relationships with foreign government officials (which could include, for example, certain medical professionals) and its foreign equivalents;
- the federal Physician Payments Sunshine Act requires applicable manufacturers of covered drugs to report payments and other transfers of value to physicians and teaching hospitals;
- the national anti-bribery laws of European Union Member States, such as the U.K. Bribery Act 2010, or the Bribery Act, which prohibit the provision of benefits or advantages to physicians to induce or encourage the prescription, recommendation, endorsement, purchase, supply, order or use of medicinal products; and

- analogous state and foreign laws and regulations, such as state anti-kickback and false claims laws and transparency statutes, may apply to sales or marketing arrangements and claims involving healthcare items or services reimbursed by non-governmental third-party payers, including private insurers.

Some state laws require pharmaceutical companies to comply with the pharmaceutical industry's voluntary compliance guidelines and the relevant compliance guidance promulgated by the federal government and may require drug manufacturers to report information related to payments and other transfers of value to physicians and other healthcare providers or marketing expenditures. State and foreign laws also govern the privacy and security of health information in some circumstances, many of which differ from each other in significant ways and often are not preempted by HIPAA, thus complicating compliance efforts.

Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will 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, imprisonment, exclusion of products 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 healthcare providers or entities with whom we expect to 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.

Compliance with global privacy and data security requirements could result in additional costs and liabilities to us or inhibit our ability to collect and process data globally, and the failure to comply with such requirements could subject us to significant fines and penalties.

The legislative and regulatory landscape for privacy and data protection continues to evolve, and there has been an increasing amount of focus on privacy and data protection issues with the potential to affect our business, including state security breach notification laws, state health information privacy laws and federal and state consumer protection laws, that govern the collection, use and disclosure of personal information. Although we are not directly subject to HIPAA, we could be subject to criminal penalties if we knowingly obtain individually identifiable health information from a HIPAA-covered entity in a manner that is not authorized or permitted by HIPAA. Other countries also have, or are developing, laws governing the collection, use and transmission of personal information. For example, the collection, use, disclosure, transfer, or other processing of personal data regarding individuals in the EU, including personal health data, is subject to the EU General Data Protection Regulation (GDPR), which became effective on May 25, 2018. The GDPR is wide-ranging in scope and imposes numerous requirements on companies that process personal data, including requirements relating to processing health and other sensitive data, obtaining consent of the individuals to whom the personal data relates, providing information to individuals regarding data processing activities, implementing safeguards to protect the security and confidentiality of personal data, providing notification of data breaches, and taking certain measures when engaging third-party processors. The GDPR also imposes strict rules on the transfer of personal data to countries outside the EU, including the U.S., and permits data protection authorities to impose large penalties for violations of the GDPR, including potential fines of up to €20 million or 4% of annual global revenues, whichever is greater. The GDPR also confers a private right of action on data subjects and consumer associations to lodge complaints with supervisory authorities, seek judicial remedies, and obtain compensation for damages resulting from violations of the GDPR. Compliance with the GDPR will be a rigorous and time-intensive process that may increase our cost of doing business or require us to change our business practices, and despite those efforts, there is a risk that we may be subject to fines and penalties, litigation, and reputational harm in connection with our European activities.

Our internal computer systems, or those of our partners, third-party CROs or other third parties with which we contract may fail or suffer data breaches and cyber-attacks, which could compromise our intellectual property or other sensitive information and could result in a material disruption of our therapeutic candidate development programs and have a material adverse effect on our reputation, business, financial condition or results of operations.

In the ordinary course of our business, we collect, maintain and transmit sensitive data on our networks and systems and on the networks and systems of our partners, third-party CROs and other third parties with which we contract, including our intellectual property and proprietary or confidential business information (such as research data and employee personal information) and confidential information with respect to our vendors and our partners. The secure maintenance of this information is critical to our business and reputation. We believe that companies have been increasingly subject to a wide variety of security incidents, cyber-attacks and other attempts to gain unauthorized access. These threats can come from a variety of sources, ranging in sophistication from an individual hacker to a state-sponsored attack. Cyber threats may be generic, or they may be custom-crafted against our information systems. Over the past few years, cyber-attacks have become more prevalent and much harder to detect and defend against.

Our network and storage applications and those of our partners, third-party CROs and other third parties with which we contract may be subject to unauthorized access by hackers or breached due to operator error, malfeasance or other system disruptions. It is often difficult to anticipate or immediately detect such incidents and the damage caused by such incidents. These data breaches and any unauthorized access or disclosure of our information or intellectual property could compromise our intellectual property and expose sensitive business information. A data security breach could also lead to public exposure of personal information of our employees. Cyber-attacks could cause us to incur significant remediation costs, result in product development delays, disrupt key business operations and divert attention of management and key information technology resources. Our network security and data recovery measures and those of our clinical research organizations, collaborators and vendors may not be adequate to protect against such security breaches and disruptions. These incidents could also subject us to liability, expose us to significant expense and cause significant harm to our reputation and business. While we have not experienced any such material security breaches or disruptions to date, if such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our development programs and our business operations. For example, the loss of clinical trial data from completed or future clinical trials could result in delays in our or our partners' regulatory approval efforts and significantly increase our costs to recover or reproduce the data.

The increasing use of social media platforms presents new risks and challenges.

Social media is increasingly being used to communicate about our approved product, our clinical development programs and the diseases our therapeutic candidates are being developed to treat. Social media practices in the biopharmaceutical industry continue to evolve and regulations relating to such use are not always clear. This evolution creates uncertainty and risk of noncompliance with regulations applicable to our business. For example, patients may use social media channels to report an alleged adverse event. When such disclosures occur, there is a risk that we fail to monitor and comply with applicable adverse event reporting obligations, or we may not be able to defend our business or the public's legitimate interests in the face of the political and market pressures generated by social media due to restrictions on what we may say about our therapeutic candidates. There is also a risk of inappropriate disclosure of sensitive information or negative or inaccurate posts or comments about us on any social networking website, or a risk that a post on a social networking website by any of our employees may be construed as inappropriate promotion. If any of these events were to occur or we otherwise fail to comply with applicable regulations, we could incur liability, face regulatory actions, or incur other harm to our business.

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

Our results of operations could be adversely affected by general conditions in the global economy and in the global financial markets. A severe or prolonged economic downturn could result in a variety of risks to our business, including, weakened demand for our approved product or any of our therapeutic candidates and our ability to raise additional capital when needed on acceptable terms, if at all. Weak global economic conditions, especially in Europe, could decrease the number of clinical trial sites available to us and hinder our ability to conduct clinical trials, which would have a material adverse effect on our business and the development of our therapeutic candidates. A weak or declining economy could also strain our suppliers, possibly resulting in supply disruption, or cause our customers to delay making payments for our services. Any of the foregoing could harm our business and we cannot anticipate all of the ways in which the current economic climate and financial market conditions could adversely impact our business.

Risks Related to Our Common Stock

The market price of our common stock may be highly volatile, and you may not be able to resell your shares at or above the price at which you purchased them.

Since our initial public offering, the price of our common stock as reported on The Nasdaq Global Market has ranged from a low of \$16.78 on November 6 and 8, 2013 to a high of \$95.95 on February 11, 2020. The market price of shares of our common stock could be subject to wide fluctuations in response to many risk factors listed in this section, and others beyond our control, including:

- results of, and the timing of the release of results of, our clinical trials, including those that are being conducted by BMS;
- failure to obtain sufficient pricing and reimbursement for REBLOZYL or our therapeutic candidates, if approved, from private and governmental payers;
- failure to obtain market acceptance and adoption of REBLOZYL or any other potential product following regulatory approval;

- results of clinical trials of our competitors' products;
- regulatory actions with respect to our products or our competitors' products;
- actual or anticipated fluctuations in our financial condition and operating results;
- publication of research reports by securities analysts about us or our competitors or our industry;
- our failure or the failure of our competitors to meet analysts' projections or guidance that we or our competitors may give to the market;
- additions and departures of key personnel;
- strategic decisions by us or our competitors, such as acquisitions, divestitures, spin-offs, joint ventures, strategic investments or changes in business strategy;
- the passage of legislation or other regulatory developments affecting us or our industry;
- fluctuations in the valuation of companies perceived by investors to be comparable to us;
- sales of our common stock by us, our insiders or our other stockholders;
- speculation in or expectations of the press or investment community, including with regard to our potential clinical trial results, royalty revenue or market opportunities;
- announcement or expectation of additional financing efforts;
- changes in accounting principles;
- terrorist acts, acts of war or periods of widespread civil unrest;
- natural disasters and other calamities;
- actual or perceived changes in current or future market conditions for biopharmaceutical stocks; and
- changes in general market and economic conditions.

In addition, the stock market has recently experienced significant volatility, particularly with respect to pharmaceutical, biotechnology and other life sciences company stocks. The volatility of pharmaceutical, biotechnology and other life sciences company stocks often does not relate to the operating performance of the companies represented by the stock. As we operate in a single industry, we are especially vulnerable to these factors to the extent that they affect our industry or our products, or to a lesser extent our markets. In the past, securities class action litigation has often been initiated against companies following periods of volatility in their stock price. This type of litigation could result in substantial costs and divert our management's attention and resources, and could also require us to make substantial payments to satisfy judgments or to settle litigation.

We do not expect to pay any cash dividends for the foreseeable future.

You should not rely on an investment in our common stock to provide dividend income. We do not anticipate that we will pay any cash dividends to holders of our common stock in the foreseeable future. Instead, we plan to retain any earnings to maintain and expand our operations. In addition, any future debt financing arrangement may contain terms prohibiting or limiting the amount of dividends that may be declared or paid on our common stock. Accordingly, investors must rely on sales of their common stock after price appreciation, which may never occur, as the only way to realize any return on their investment. As a result, investors seeking cash dividends should not purchase our common stock.

Provisions in our restated certificate of incorporation, our amended and restated by-laws and Delaware law may have anti-takeover effects that could discourage an acquisition of us by others, even if an acquisition would be beneficial to our stockholders, and may prevent attempts by our stockholders to replace or remove our current management.

Our restated certificate of incorporation, amended and restated by-laws and Delaware law contain provisions that may have the effect of delaying or preventing a change in control of us or changes in our management. Our restated certificate of incorporation and by-laws include provisions that:

- authorize "blank check" preferred stock, which could be issued by our board of directors without stockholder approval and may contain voting, liquidation, dividend and other rights superior to our common stock;
- create a classified board of directors whose members serve staggered three-year terms;
- specify that special meetings of our stockholders can be called only by our board of directors;
- prohibit stockholder action by written consent;
- establish an advance notice procedure for stockholder approvals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to our board of directors;
- provide that our directors may be removed only for cause;
- provide that vacancies on our board of directors may be filled only by a majority of directors then in office, even though less than a quorum;
- specify that no stockholder is permitted to cumulate votes at any election of directors;
- expressly authorize our board of directors to modify, alter or repeal our amended and restated by-laws; and
- require supermajority votes of the holders of our common stock to amend specified provisions of our restated certificate of incorporation and amended and restated by-laws

These provisions, alone or together, could delay or prevent hostile takeovers and changes in control or changes in our management.

In addition, we are subject to the provisions of Section 203 of the Delaware General Corporation Law, which prohibits a publicly-held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. As a result, you may lose your ability to sell your stock for a price in excess of the prevailing market price due to these protective measures and efforts by stockholders to change the direction or management of the company may be unsuccessful.

Any provision of our restated certificate of incorporation or amended and restated by-laws or Delaware law that has the effect of delaying or deterring a change in control could limit the opportunity for our stockholders to receive a premium for their shares of our common stock, and could also affect the price that some investors are willing to pay for our common stock.

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

Our restated certificate of incorporation provides that, subject to limited exceptions, the Court of Chancery of the State of Delaware and federal court within the State of Delaware will be exclusive forums for (1) any derivative action or proceeding brought on our behalf, (2) any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders, (3) any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law, our restated certificate of incorporation or our amended and restated by-laws, or (4) any other action asserting a claim against us that is governed by the internal affairs doctrine. Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and to have consented to the provisions of our restated certificate of incorporation described above. This choice of forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage such lawsuits against us and our directors, officers and employees. Alternatively, if a court

were to find these provisions of our restated certificate of incorporation inapplicable to, or unenforceable in respect of, one or more of the specified types of actions or proceedings, we may incur additional costs associated with resolving such matters in other jurisdictions, which could adversely affect our business and financial condition.

Sales of our common stock by our employees, including our executive officers, could cause our stock price to fall or prevent it from increasing for numerous reasons, and sales by such persons could be viewed negatively by other investors.

In accordance with the guidelines specified under Rule 10b5-1 of the Securities Exchange Act of 1934, as amended, and our policies regarding stock transactions, a number of our employees, including executive officers, have adopted and may continue to adopt stock trading plans pursuant to which they have arranged to sell shares of our common stock from time to time in the future. Generally, sales under such plans by our executive officers and directors require public filings. Sales of our common stock by such persons could cause the price of our common stock to fall or prevent it from increasing. If sales by employees, executive officers or directors cause a substantial number of shares of our common stock to become available for purchase in the public market, the price of our common stock could fall or may not increase. Also, sales by such persons could be viewed negatively by holders and potential purchasers of our common stock.

If securities analysts do not publish research or reports about our business or if they publish negative, or inaccurate, evaluations of our stock, the price of our stock and trading volume could decline.

The trading market for our common stock may be impacted, in part, by the research and reports that securities or industry analysts publish about us or our business. There can be no assurance that analysts will cover us, continue to cover us or provide favorable coverage. If one or more analysts downgrade our stock or change their opinion of our stock, our share price may decline. In addition, if one or more analysts cease coverage of our company or fail to regularly publish reports on us, we could lose visibility in the financial markets, which could cause our share price or trading volume to decline.

Item 1B. *Unresolved Staff Comments*

Not applicable.

Item 2. *Properties*

Our corporate, research and development, manufacturing, and clinical trial operations are located in Cambridge, Massachusetts. We lease approximately 125,000 square feet of office and laboratory space in five adjacent buildings with aggregate monthly rent expense of approximately \$0.7 million. Four of our leases expire in September 2023 and one lease expires in March 2021.

We believe our facilities are adequate for our current needs and that suitable additional substitute space would be available if needed.

Item 3. *Legal Proceedings*

While we are not currently a party to any material legal proceedings, we could become subject to legal proceedings in the ordinary course of business. We do not expect any such potential items to have a significant impact on our financial position.

Item 4. *Mine Safety Disclosures*

Not applicable.

PART II

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

Market Information and Stockholders

Our common stock has been listed on The Nasdaq Global Market under the symbol "XLRN" since September 19, 2013. Prior to that, there was no public market for our common stock. As of January 31, 2020, there were approximately 57 holders of record of our common stock.

Dividends

We have never declared or paid cash dividends on our common stock. We currently intend to retain all available funds and any future earnings, if any, to fund the development and expansion of our business and we do not anticipate paying any cash dividends in the foreseeable future. In addition, any future debt financing arrangement may contain terms prohibiting or limiting the amount of dividends that may be declared or paid on our common stock. Any future determination to pay dividends will be made at the discretion of our board of directors.

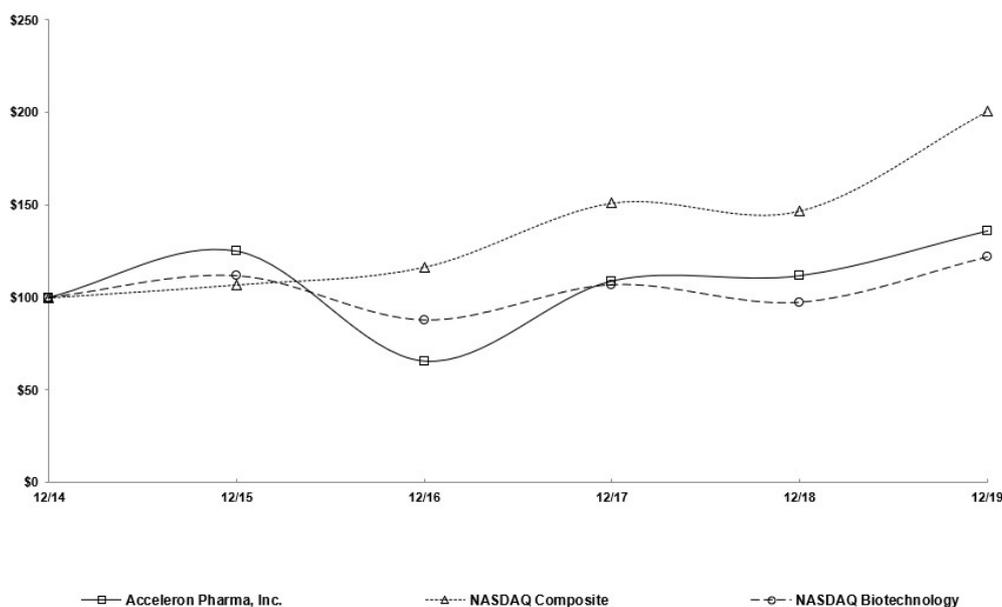
Securities Authorized for Issuance Under Equity Compensation Plans

Information about our equity compensation plans is incorporated herein by reference to Item 12 of Part III of this Annual Report on Form 10-K.

Performance Graph

The following graph shows a comparison from December 31, 2014 through December 31, 2019 of cumulative total return on assumed investment of \$100.00 in cash in our common stock, the Nasdaq Composite Index and the Nasdaq Biotechnology Index. Such returns are based on historical results and are not intended to suggest future performance. Data for the Nasdaq Composite Index and the Nasdaq Biotechnology Index assume reinvestment of dividends.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN(1)(2)
Among Acceleron Pharma Inc., the Nasdaq Composite Index, and the Nasdaq Biotechnology Index



(1) This performance graph shall not be deemed "soliciting material" or to be "filed" with the SEC for purposes of Section 18 of the Securities and Exchange Act of 1934, as amended, or otherwise subject to the liabilities under that Section, and shall not be deemed incorporated by reference into any filing of Acceleron Pharma Inc. under the Securities Act of 1933, as amended.

(2) \$100 invested on December 31, 2014 in stock or index, including reinvestment of dividends.

Purchases of Equity Securities by the Issuer or Affiliated Purchasers

None.

Item 6. Selected Financial Data

The information set forth below should be read in conjunction with the "Management's Discussion and Analysis of Financial Condition and Results of Operations" section and with our consolidated financial statements and notes thereto included elsewhere in this Annual Report on Form 10-K. The selected financial data in this section is not intended to replace the consolidated financial statements and are qualified in their entirety by the consolidated financial statements and related notes included elsewhere in this Annual Report on Form 10-K.

The selected consolidated statements of operations data for the years ended December 31, 2019, 2018 and 2017 and the consolidated balance sheet data as of December 31, 2019 and 2018 have been derived from our audited consolidated financial statements included elsewhere in this Annual Report on Form 10-K. We derived the selected consolidated financial data for the years ended December 31, 2016 and 2015 and as of December 31, 2017, 2016 and 2015 from audited financial statements which are not included in this Annual Report on Form 10-K.

Historical results are not necessarily indicative of the results to be expected in future periods.

(in thousands, except per share data)	Year Ended December 31,				
	2019	2018	2017	2016	2015
Consolidated Statements of Operations Data:					
Revenue:					
Collaboration revenue:					
License and milestone	\$ 60,000	\$ —	\$ 541	\$ 15,550	\$ 1,184
Cost-sharing, net	13,993	13,991	12,940	12,221	16,913
Total revenue	73,993	13,991	13,481	27,771	18,097
Costs and expenses:					
Research and development	153,953	103,902	89,726	68,580	58,404
Selling, general and administrative	56,485	34,503	33,738	25,297	20,572
Total costs and expenses	210,438	138,405	123,464	93,877	78,976
Loss from operations	(136,445)	(124,414)	(109,983)	(66,106)	(60,879)
Other income (expense) net	819	(52)	(992)	7,262	(3,527)
Interest income	10,706	5,568	2,553	1,854	512
Total other income (expense), net	11,525	5,516	1,561	9,116	(3,015)
Loss before income taxes	(124,920)	(118,898)	(108,422)	(56,990)	(63,894)
Income tax benefit (provision)	62	27	(32)	(24)	—
Net loss	\$ (124,858)	\$ (118,871)	\$ (108,454)	\$ (57,014)	\$ (63,894)
Net loss per share applicable to common stockholders-basic and diluted(1)	\$ (2.38)	\$ (2.59)	\$ (2.68)	\$ (1.52)	\$ (1.92)
Weighted-average number of common shares used in computing net loss per share applicable to common stockholders-basic and diluted	52,453	45,898	40,420	37,430	33,303

(in thousands)	As of December 31,				
	2019	2018	2017	2016	2015
Consolidated Balance Sheet Data:					
Cash and cash equivalents	\$ 237,677	\$ 144,052	\$ 100,150	\$ 20,950	\$ 27,783
Short and long-term investments	216,169	147,260	272,800	213,432	108,198
Operating lease - right of use asset, net	23,908	—	—	—	—
Total assets	504,906	314,821	389,177	247,647	146,337
Operating lease liability - right of use	6,183	—	—	—	—
Total current liabilities	33,373	18,912	16,745	16,149	14,491
Operating lease liability - right of use, net of current portion	20,201	—	—	—	—
Warrants to purchase common stock	1,856	1,491	2,236	1,244	17,187
Total stockholder's equity	449,476	292,037	365,217	225,597	109,263

(1) See Note 2 within the notes to our consolidated financial statements appearing elsewhere in this Annual Report on Form 10-K for a description of the method used to calculate basic and diluted net loss per common share.

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 consolidated financial statements and the notes to those consolidated financial statements included in Item 15 of 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 under "Risk Factors" and elsewhere in this Annual Report on Form 10-K, our actual results may differ materially from those anticipated in these forward-looking statements. Please also refer to the section under heading "Forward-Looking Statements."

Overview

We are a biopharmaceutical company dedicated to the discovery, development and commercialization of therapeutics to treat serious and rare diseases. Our research focuses on key natural regulators of cellular growth and repair, particularly the Transforming Growth Factor-Beta, or TGF-beta, protein superfamily. By combining our discovery and development expertise, including our proprietary knowledge of the TGF-beta superfamily, and our internal protein engineering and manufacturing capabilities, we have generated several innovative therapeutic candidates, all of which encompass novel potential first-in-class mechanisms of action. If successful, these candidates could have the potential to significantly improve clinical outcomes for patients across these areas of high, unmet need.

We have focused and prioritized our research and development activities within three key therapeutic areas: hematology, pulmonary and neuromuscular.

Hematology

In November 2019, the U.S. Food and Drug Administration, or FDA, approved our first commercial product, REBLOZYL® (luspatercept-aamt) for the treatment of anemia in adult patients with beta-thalassemia who require regular red blood cell, or RBC, transfusions. REBLOZYL is partnered with Bristol-Myers Squibb Company, or BMS (which acquired Celgene Corporation in November 2019), and is a first-in-class erythroid maturation agent designed to promote RBC production through a novel mechanism. The approval of REBLOZYL is based on the positive results from the Phase 3 BELIEVE trial evaluating the safety and efficacy of REBLOZYL for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions.

In addition to its approved indication, luspatercept-aamt is being developed to treat anemia in patients with myelodysplastic syndromes, or MDS, non-transfusion dependent beta-thalassemia, and myelofibrosis. We and BMS previously announced positive results for the Phase 3 MEDALIST trial evaluating the safety and efficacy of luspatercept-aamt for the treatment of anemia in adult patients with very low- to intermediate-risk MDS who have ring sideroblasts and require RBC transfusions. Based on these results, BMS submitted a supplemental Biologics License Application, or sBLA, in the United States for luspatercept-aamt for the treatment of anemia in adult patients with very low- to intermediate-risk MDS who have ring sideroblasts and require RBC transfusions. The FDA accepted the sBLA and set a target action date of April 4, 2020. BMS also submitted a Marketing Authorization Application, or MAA, to the European Medicines Agency, or EMA, in the BELIEVE and MEDALIST indications. The MAA has been successfully validated and we expect the EMA to issue a decision in the second half of 2020.

BMS is currently conducting a Phase 2 clinical trial with luspatercept-aamt in non-transfusion-dependent beta-thalassemia patients, referred to as the BEYOND trial, with preliminary topline results currently expected by the end of 2020, and a Phase 3 clinical trial, the COMMANDS trial, in first-line, lower-risk MDS patients. In myelofibrosis, BMS is conducting a Phase 2 clinical trial in patients with myelofibrosis-associated anemia, and initial results from this trial were presented in December 2019 at the 61st American Society of Hematology Annual Meeting and Exposition showing that luspatercept-aamt improved anemia in patients receiving and not receiving RBC transfusions, with more profound effects in patients treated with ruxolitinib, a small molecule JAK inhibitor. Based on these data, we and BMS announced plans to initiate by the end of 2020 the Phase 3 INDEPENDENCE study in patients with myelofibrosis-associated anemia who are being treated with JAK inhibitor therapy and require RBC transfusions.

If approved in the United States and Europe, we believe that there is an annual peak sales opportunity for REBLOZYL in excess of \$2 billion in lower-risk MDS and beta-thalassemia, and upon successful development and approval in the United States and Europe, an additional \$1 billion in myelofibrosis and other future development opportunities. We and BMS are evaluating luspatercept-aamt for the treatment of anemia in potential new indications that could provide additional sales opportunities.

BMS is responsible for paying 100% of the development costs for all clinical trials for luspatercept-aamt. We may receive a maximum of \$125.0 million for remaining potential regulatory and commercial milestone payments. We have a co-promotion

right in North America and our commercialization costs provided in the commercialization plan and budget approved by the Joint Commercialization Committee, or JCC, are entirely funded by BMS. Activities that we elect to conduct outside of the approved development or commercialization budgets to support REBLOZYL are at our own expense. We are eligible to receive tiered royalty payments from BMS on net sales of REBLOZYL in the low-to-mid 20% range.

Pulmonary

We are actively developing our lead pulmonary program, sotatercept, for the treatment of patients with pulmonary arterial hypertension, or PAH. Sotatercept is generally partnered with BMS, but we retain the exclusive rights to fund, develop, and lead the global commercialization of sotatercept in pulmonary hypertension, which we refer to as the PH field, and that includes PAH. PAH is a rare and chronic, rapidly progressing disorder characterized by the constriction of small pulmonary arteries, resulting in abnormally high blood pressure in the pulmonary arteries.

In January 2020, we announced that the PULSAR Phase 2 clinical trial of sotatercept for the treatment of patients with PAH met its primary and key secondary endpoints, as well as other secondary endpoints. The 18-month extension period of the PULSAR trial is ongoing. We are also currently enrolling an exploratory study called SPECTRA to provide us with greater understanding of sotatercept's potential impact on PAH, with preliminary results expected in 2020.

If sotatercept is commercialized to treat PAH and we recognize such revenue, then we will owe BMS a royalty in the low 20% range on global net sales. In certain circumstances, BMS may recognize revenue related to the commercialization of sotatercept in PAH, and in this scenario we will be eligible to receive a royalty from BMS such that the economic position of the parties is equivalent to the scenario in which we recognize such revenue.

Neuromuscular

We are independently developing our wholly-owned neuromuscular candidate, ACE-083. ACE-083 is designed for the treatment of focal muscle disorders. We are currently conducting a Phase 2 clinical trial with ACE-083 in patients with Charcot-Marie-Tooth disease, or CMT, and an extension study for eligible CMT patients who have completed treatment in the Phase 2 clinical trial with ACE-083. We previously announced results from part 1 of this Phase 2 clinical trial showing increases in mean total and contractile muscle volume, and reductions in fat fraction. The results also showed that ACE-083 was generally well tolerated. Enrollment is complete in part 2 of this trial and we expect to announce topline results from part 2 in the first quarter of 2020. In September 2019, we announced that ACE-083 did not achieve functional secondary endpoints in part 2 of a Phase 2 clinical trial in patients with facioscapulohumeral muscular dystrophy, or FSHD, and we are discontinuing development of ACE-083 in FSHD.

Funding and Expense

As of December 31, 2019, our operations have been funded primarily by \$105.1 million in equity investments from venture investors, \$773.8 million from public investors, \$154.1 million in equity investments from our collaboration partners and \$356.7 million in upfront payments, milestones, and net research and development payments from our collaboration partners. We estimate that we have spent approximately \$154.0 million, \$103.9 million, and \$89.7 million, on research and development for the years ended December 31, 2019, 2018, and 2017, respectively.

We expect to continue to incur significant expenses and increasing operating losses over at least the next several years. We expect our expenses will increase substantially in connection with our ongoing activities, as we:

- conduct clinical trials for sotatercept in the PH field, ACE-083 or any future therapeutic candidates;
- continue our preclinical studies and potential clinical development efforts of our existing preclinical therapeutic candidates;
- continue research activities for the discovery of new therapeutic candidates;
- manufacture therapeutic candidates for our preclinical studies and clinical trials, and potentially for commercialization;
- establish and maintain a sales, marketing and distribution infrastructure to commercialize any products for which we have or may obtain regulatory approval;
- acquire or in-license other therapeutic candidates and patents;
- seek regulatory approval for our therapeutic candidates; and
- attract and retain skilled personnel.

If we obtain regulatory approval for ACE-083, sotatercept in the PH field, or any future therapeutic candidate, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing and distribution to the extent that such costs are not paid by future partners. We will seek to fund our operations through the sale of equity, debt financings or other sources, including potential additional collaborations. However, we may be unable to raise additional funds or enter into such other arrangements when needed on favorable terms, or at all. If we fail to raise capital or enter into such other arrangements as, and when, needed, we may have to significantly delay, scale back or discontinue the development or commercialization of one or more of our therapeutic candidates.

To date, we have only generated limited revenue from royalties on the sale of our first and only commercial product, REBLOZYL, since receiving regulatory approval from the FDA in November 2019 for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions. Our ability to generate product revenue and become profitable depends upon our and our partners' ability to successfully commercialize products. We expect to incur losses for the foreseeable future, and we expect these losses to increase as we continue our development of, and seek regulatory approvals for, our therapeutic candidates and potentially begin to commercialize any approved products. For a description of the numerous risks and uncertainties associated with product development, see "Risk Factors".

Financial Operations Overview

Revenue

Collaboration Revenue

We have generated limited revenue from royalties on the sale of products. Our revenue to date has been predominantly derived from collaboration revenue, which includes license and milestone revenues and cost-sharing revenue, generated through collaboration and license agreements with partners for the development and commercialization of our therapeutic candidates. Cost-sharing revenue represents amounts reimbursed by our collaboration partners for expenses incurred by us for research and development activities and co-promotion activities, under our collaboration agreements. Cost-sharing revenue is recognized in the period that the related activities are performed.

Costs and Expenses

Research and Development Expenses

Research and development expenses consist primarily of costs directly incurred by us for the development of our therapeutic candidates, which include:

- direct employee-related expenses, including salaries, benefits, travel and stock-based compensation expense of our research and development personnel;
- expenses incurred under agreements with clinical research organizations, or CROs, and investigative sites that will conduct our clinical trials;
- the cost of acquiring and manufacturing preclinical and clinical study materials and developing manufacturing processes;
- allocated facilities, depreciation, and other expenses, which include rent and maintenance of facilities, insurance and other supplies;
- expenses associated with obtaining and maintaining patents; and
- costs associated with preclinical activities and regulatory compliance.

Research and development costs are expensed as incurred. Costs for certain development activities are recognized based on an evaluation of the progress to completion of specific tasks using information and data provided to us by our vendors and our clinical sites.

We cannot determine with certainty the duration and completion costs of the current or future clinical trials of our therapeutic candidates or if, when, or to what extent we will generate revenues from the commercialization and sale of any of our therapeutic candidates for which we or any partner obtain regulatory approval. We or our partners may never succeed in achieving regulatory approval for any of our therapeutic candidates beyond the initial approval of REBLOZYL. The duration, costs and timing of clinical trials and development of therapeutic candidates will depend on a variety of factors, including:

- the scope, rate of progress, and expense of our ongoing, as well as any additional, clinical trials and other research and development activities;

- future clinical trial results;
- potential changes in government regulation; and
- the timing and receipt of any regulatory approvals.

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

From inception through December 31, 2019, we have incurred \$812.7 million in research and development expenses. We plan to increase our research and development expenses for the foreseeable future as we continue the development of our TGF-beta platform therapeutic candidates, the discovery and development of preclinical therapeutic candidates, and the development of our clinical programs. Research and development expenses associated with REBLOZYL, and outside of the PH field, sotatercept, are generally reimbursed 100% by BMS. These reimbursements are recorded as revenue. We are expensing the costs of a Phase 1 clinical trial for ACE-2494, and Phase 2 clinical trials for REBLOZYL, sotatercept, and ACE-083, of which the REBLOZYL clinical trials are reimbursed by BMS. Our Phase 1 clinical trial for ACE-2494 and our Phase 2 clinical trial for ACE-083 in patients with FSHD are being discontinued. With respect to the REBLOZYL clinical trials directly conducted by BMS, we do not incur and are not reimbursed for expenses related to these development activities.

We manage certain activities such as clinical trial operations, manufacture of therapeutic candidates, and preclinical animal toxicology studies through third-party CROs. The only costs we track by each therapeutic candidate are external costs such as services provided to us by CROs, manufacturing of preclinical and clinical drug product, and other outsourced research and development expenses. We do not assign or allocate to individual development programs internal costs such as salaries and benefits, facilities costs, lab supplies and the costs of preclinical research and studies, except for REBLOZYL costs for the purposes of billing BMS. Our external research and development expenses during the years ended December 31, 2019, 2018 and 2017, were as follows:

(in thousands)	Year ended December 31,		
	2019	2018	2017
REBLOZYL(1)	\$ 4,387	\$ 6,518	\$ 6,616
Sotatercept(2)	19,027	8,633	495
Dalantercept(3)	—	—	4,718
ACE-083(4)	27,958	11,778	9,797
ACE-2494(5)	1,509	2,157	4,382
ACE-1334	5,282	2,064	—
Total direct research and development expenses	58,163	31,150	26,008
Other expenses(6)	95,790	72,752	63,718
Total research and development expenses	\$ 153,953	\$ 103,902	\$ 89,726

(1) These expenses associated with REBLOZYL are reimbursed 100% by BMS.

(2) These expenses are associated with our development of sotatercept in PAH.

(3) Development of dalantercept has been discontinued.

(4) Development of ACE-083 in FSHD is being discontinued. We expect to incur all remaining material expense in connection with development in FSHD by the second quarter of 2020.

(5) Development of ACE-2494 has been discontinued. All remaining material expense was incurred as of the end of 2019.

(6) Other expenses include employee and unallocated contractor-related expenses, facility expenses, lab supplies and miscellaneous expenses.

Selling, General and Administrative Expenses

Selling, general and administrative expenses consist primarily of salaries and related costs for personnel, including stock-based compensation and travel expenses for our employees in executive, commercial, operational, finance and human resource functions and other selling, general and administrative expenses including directors' fees and professional fees for accounting and legal services.

We continue to incur expenses related to audit, legal, regulatory and tax-related services associated with maintaining compliance with exchange listing and Securities and Exchange Commission, or SEC, requirements, director and officer insurance premiums, and investor relations costs associated with being a public company. We anticipate that our selling, general and administrative expenses will increase in the future as we increase our headcount to support our continued research and development and potential commercialization of our therapeutic candidates. Additionally, if and when we believe regulatory approval of a therapeutic candidate appears likely, to the extent that we are undertaking commercialization of such therapeutic candidate ourselves, we anticipate an increase in payroll and related expenses as a result of our preparation for commercial operation.

Other Income (Expense), Net

Other income (expense), net consists primarily of interest income earned on cash, cash equivalents and investments.

Critical Accounting Policies and Significant Judgments and Estimates

Our management's discussion and analysis of our financial condition and results of operations are based on our consolidated financial statements, which have been prepared in accordance with U.S. generally accepted accounting principles. The preparation of these consolidated financial statements requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, and expenses and the disclosure of contingent assets and liabilities in our consolidated financial statements. On an ongoing basis, we evaluate our estimates and judgments, including those related to revenue recognition and accrued clinical expenses. We base our estimates on historical experience, known trends and events, and various other factors that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are described in more detail in the notes to our consolidated financial statements appearing elsewhere in this Annual Report on Form 10-K, we believe the following accounting policies to be most critical to the judgments and estimates used in the preparation of our consolidated financial statements.

Revenue Recognition

Effective January 1, 2018, we adopted Accounting Standards Codification Topic 606, *Revenue from Contracts with Customers*, (ASC 606), using the modified retrospective transition method. Under this method, results for reporting periods beginning January 1, 2018 are presented under ASC 606, while prior period amounts are not adjusted and continue to be reported in accordance with ASC 605.

We have primarily generated revenue through collaboration, license and research arrangements, which are within the scope of ASC 606, with collaboration partners for the development and commercialization of therapeutic candidates. The arrangements generally contain performance obligations, which may include (1) licenses, or options to obtain licenses, to our technology, (2) research and development activities performed for the collaboration partners, (3) participation on joint development committees (JDCs), and (4) the manufacturing of clinical or preclinical material. Payments pursuant to these arrangements typically include non-refundable, upfront payments, milestone payments upon achieving significant development events, research and development reimbursements, sales milestones, exercises of options, and royalties on future product sales.

To determine revenue recognition for arrangements within the scope of ASC 606, we perform the following five steps: (i) identify the contract(s) with the customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) the entity satisfies a performance obligation. We only apply the five-step model to contracts when it is probable that the entity will collect the consideration it is entitled to in exchange for the goods or services it transfers to the customer. At contract inception, once the contract is determined to be within the scope of ASC 606, we assess the goods or services promised within each contract, determines those that are performance obligations, and assesses whether each promised good or service is distinct. We then recognize as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) the performance obligation is satisfied. Depending on the nature of the performance obligation these

assessments require management to make significant judgments and estimates. For additional information about our revenue recognition policy, see Note 10 to the financial statements in this Annual Report on Form 10-K.

Milestone Payments

At the inception of each arrangement that includes milestone payments, we evaluate whether the milestones are considered probable of being achieved and estimate the amount to be included in the transaction price using the most likely amount method. We evaluate factors such as the scientific, clinical, regulatory, commercial, and other risks that must be overcome to achieve the respective milestone in making this assessment. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within our or our licensee's control, such as regulatory approvals, are not considered probable of being achieved until those approvals are received. At the end of each subsequent reporting period, we reevaluate the probability of achievement of all milestones subject to constraint and, if necessary, adjust the estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect revenues and earnings in the period of adjustment. If a milestone or other variable consideration relates specifically to our efforts to satisfy a single performance obligation or to a specific outcome from satisfying the performance obligation, we generally allocate the milestone amount entirely to that performance obligation.

The next likely regulatory milestone payments for REBLOZYL would be \$25.0 million, which would result from EMA approval of a BLA or equivalent for luspatercept-aamt in either MDS or beta-thalassemia. We and BMS expect the EMA to issue a regulatory decision in the second half of 2020 for luspatercept-aamt. In accordance with our accounting policy regarding revenue recognition as described in Note 2, the revenue associated with this milestone will be recognized once it is probable that the application is approved by the regulatory authority. Milestone payments that are not within our control or the control of the licensee are not considered probable of being achieved until those approvals are received. The approval of this application is not within our control or BMS's control, and therefore, as of December 31, 2019, we cannot determine if it is probable that the regulatory agency will approve the application.

Accrued and Prepaid Clinical Trial Expenses

As part of the process of preparing our consolidated financial statements, we are required to estimate our accrued and prepaid expenses. This process involves reviewing contracts, and purchase orders, communicating with our personnel to identify services that have been performed on our behalf and estimating the level of service performed and the associated cost incurred for the service when we have not yet been invoiced or otherwise notified of the actual costs:

- CROs and investigative sites in connection with clinical studies;
- vendors in connection with preclinical development activities; and
- vendors related to product manufacturing, development and distribution of clinical supplies.

We base our expenses related to CROs and third-party service providers on our estimates of the services provided and efforts expended pursuant to quotes and contracts with CROs and third parties that conduct research and development on our behalf, as well as discussion with internal personnel and external service providers as to the progress of the services and the agreed-upon fee to be paid for such services. The financial terms of these agreements are subject to negotiation, vary from contract to contract and may result in uneven payment flows. There may be instances in which payments made to our vendors will exceed the level of services provided and result in a prepayment of the expense. Additionally, invoicing from third-party service providers may not coincide with actual work performed and can result in a prepaid position at period end. We make significant judgments and estimates in determining the services incurred as of each balance sheet date, which may result in either an accrual or prepaid balance. As actual costs become known, we adjust our estimates. Although we do not expect our estimates to be materially different from amounts actually incurred, our understanding of the status and timing of services performed, the number of subjects enrolled, and the rate of enrollment may vary from its estimates and could result in us reporting amounts that are too high or too low in a particular period. Our accrued and prepaid expenses are dependent, in part, upon the receipt of timely and accurate reporting from CROs and third-party service providers. To date, we have not experienced any material differences between estimated costs and actual costs incurred.

Stock-Based Compensation

We account for our stock-based awards in accordance with ASC Topic 718, *Compensation—Stock Compensation*, or ASC 718, which requires all stock-based payments to employees, including grants of employee stock options, modifications to existing stock options, and restricted stock unit awards, to be recognized in the statements of operations and comprehensive income (loss) based on their fair values. We recognize the compensation cost of awards subject to service-based vesting conditions over the requisite service period, which is generally equal to the vesting term. For awards subject to both

performance and service-based vesting conditions, we recognize compensation cost using an accelerated recognition method when it is probable that the performance condition will be achieved. If achievement of the performance condition is not probable, but the award will vest based on the service condition, we recognize the expense over the requisite service period. Forfeitures are recognized as they occur.

We estimate the fair value of our stock-based awards to employees and non-employees using the Black-Scholes option pricing model, which requires the input of highly subjective assumptions, including (1) the expected volatility of our stock, (2) the expected term of the award, (3) the risk-free interest rate and (4) expected dividends. We have estimated our volatility by using a blend of our stock price history, for the length of time we have market data for our stock and the historical volatility of similar public companies for the expected term of each grant. Due to the lack of a public market for our common stock prior to the completion of our initial public offering in September 2013, and resulting lack of company-specific historical and implied volatility data, we have based our estimate of expected volatility on the historical volatility of a group of similar publicly traded companies. For these analyses, we have selected companies with characteristics that we believe are comparable to ours, including enterprise value, risk profiles, position within the industry, and with historical share price information sufficient to meet the expected life of the stock-based awards. We compute the historical volatility data using the daily closing prices for the selected companies' shares during the equivalent period as the calculated expected term of our stock-based awards. As of September 2019, we had sufficient company-specific historical volatility data to begin estimating our stock's expected volatility by using our own stock's data rather than a blended rate for most awards. We have estimated the expected life of our employee stock options using the "simplified" method, whereby, the expected life equals the average of the vesting term and the original contractual term of the option. The risk-free interest rates for periods within the expected life of the option are based on the U.S. Treasury yield curve in effect during the period the options were granted.

Stock-based compensation totaled approximately \$23.0 million, \$24.6 million and \$28.2 million for the years ended December 31, 2019, 2018 and 2017, respectively. We expect the impact of our stock-based compensation expense for stock-based awards granted to employees and non-employees to grow in future periods due to the potential increases in the value of our common stock and headcount.

Results of Operations

Comparison of the Years Ended December 31, 2019 and 2018

(in thousands)	Year Ended December 31,		Increase (Decrease)
	2019	2018	
Revenue:			
Collaboration revenue:			
License and milestone	\$ 60,000	\$ —	\$ 60,000
Cost-sharing, net	13,993	13,991	2
Total revenue (all amounts are with a related party)	73,993	13,991	60,002
Costs and expenses:			
Research and development	153,953	103,902	50,051
Selling, general and administrative	56,485	34,503	21,982
Total costs and expenses	210,438	138,405	72,033
Loss from operations	(136,445)	(124,414)	(12,031)
Other income (expense) net	819	(52)	871
Interest income	10,706	5,568	5,138
Other income, net	11,525	5,516	6,009
Loss before income taxes	(124,920)	(118,898)	(6,022)
Income tax benefit	62	27	35
Net loss	\$ (124,858)	\$ (118,871)	\$ (5,987)

Revenue. We recognized revenue of \$74.0 million in the year ended December 31, 2019, compared to \$14.0 million in the year ended December 31, 2018. All of the revenue in both periods was derived from the BMS agreements. This increase in revenue of \$60.0 million was primarily due to the recognition of milestones from BMS (then Celgene) for the acceptance of the BLA and validation of the MAA for REBLOZYL, as well as the approval of the BLA for REBLOZYL.

Research and Development Expenses. Research and development expenses were \$154.0 million in the year ended December 31, 2019, compared to \$103.9 million in the year ended December 31, 2018. This \$50.1 million increase is primarily related to growth in order to support our wholly-owned therapeutic candidates and preclinical programs and includes:

- an increase in personnel and facilities-related expense of \$6.0 million related to increased headcount to support our growth;
- an increase in external clinical trial expense of \$8.7 million related to our ongoing clinical trials;
- an increase in toxicology expense of \$6.7 million related to the advancement of our clinical and preclinical programs;
- an increase in contract manufacturing and drug supply expense of \$11.1 million related to our ongoing clinical and preclinical programs;
- an increase in in-licensing expense related to payments that were made in connection with achievements of milestones in 2019 totaling \$3.6 million;
- an increase of \$10.0 million in relation to the execution of the license and collaboration agreement with Fulcrum Therapeutics, as discussed further in Note 10 to the financial statements in this Annual Report on Form 10-K; and
- an increase in miscellaneous research expense and professional fees of \$4.0 million.

Selling, General and Administrative Expenses. Selling, general and administrative expenses were \$56.5 million in the year ended December 31, 2019, compared to \$34.5 million in the year ended December 31, 2018. This \$22.0 million increase was primarily due to the following factors:

- an increase in selling expense of \$5.1 million in preparation for the launch of REBLOZYL, our first commercial product approved by the FDA on November 8, 2019;
- an increase in personnel and facilities-related expense of \$12.7 million related to increased headcount to support our growth; and
- an increase of \$4.2 million in professional fees for legal, consulting, and accounting services.

Other Income, Net. Other income, net was \$11.5 million in the year ended December 31, 2019, compared to \$5.5 million in the year ended December 31, 2018. This \$6.0 million increase was primarily due to a \$5.1 million increase in the interest earned on our investment portfolio as a result of our higher balance of interest-bearing cash equivalents and short- and long-term investments and a \$1.3 million increase in the income associated with our sublease, offset by a \$0.4 million decrease in the gain associated with marking the common warrant liability to market.

Income Tax Benefit. Income tax benefit is attributable to the realization of current year benefits that offset unrealized gains, recognized in other comprehensive income, from our investment portfolio, offset slightly by state tax expense.

Comparison of the Years Ended December 31, 2018 and 2017

(in thousands)	Year Ended December 31,		Increase (Decrease)
	2018	2017	
Revenue:			
Collaboration revenue:			
License and milestone	\$ —	\$ 541	\$ (541)
Cost-sharing, net	13,991	12,940	1,051
Total revenue (all amounts are with a related party)	13,991	13,481	510
Costs and expenses:			
Research and development	103,902	89,726	14,176
Selling, general and administrative	34,503	33,738	765
Total costs and expenses	138,405	123,464	14,941
Loss from operations	(124,414)	(109,983)	(14,431)
Other income, net	5,516	1,561	3,955
Loss before income taxes	(118,898)	(108,422)	(10,476)
Income tax benefit (provision)	27	(32)	59
Net loss	\$ (118,871)	\$ (108,454)	\$ (10,417)

Revenue. We recognized revenue of \$14.0 million in the year ended December 31, 2018, compared to \$13.5 million in year ended December 31, 2017. All of the revenue in both periods was derived from the BMS agreements. Significant factors resulting in this \$0.5 million increase include:

- an increase in cost-sharing revenue of \$1.1 million primarily due to an increase in external expenses in preparation for the commercial launch of REBLOZYL; offset by
- a decrease in license and milestone revenue of \$0.6 million resulting from the adoption of Accounting Standards Codification Topic 606, Revenue from Contracts with Customers, (ASC 606), the impact of which is discussed further in Note 2 to the financial statements in this Annual Report on Form 10-K.

Research and Development Expenses. Research and development expenses were \$103.9 million in the year ended December 31, 2018, compared to \$89.7 million in the year ended December 31, 2017. This \$14.2 million increase was primarily related to growth in order to support our wholly-owned therapeutic candidates and preclinical programs and includes:

- an increase in personnel expenses totaling \$7.3 million;
- an increase in external clinical trial expenses of \$8.6 million related to our sotatercept and ACE-083 Phase 2 clinical trials;
- an increase in facility expenses of \$1.9 million; offset by
- a decrease in toxicology expenses of \$4.5 million as compared to the same period in 2017.

Selling, General and Administrative Expenses. Selling, general and administrative expenses were \$34.5 million in the year ended December 31, 2018, compared to \$33.7 million in the year ended December 31, 2017. The \$0.8 million increase was primarily due to an increase in personnel expenses of \$0.7 million related to increased headcount to support our growth.

Other Income, Net. Other income, net was \$5.5 million in the year ended December 31, 2018, compared to \$1.6 million in the year ended December 31, 2017. This \$3.9 million increase was primarily due to a \$3.0 million increase in the interest income earned on our investment portfolio as a result of our higher balance of interest-bearing cash equivalents and short- and long-term investments.

Income Tax Provision. Income tax provision is attributable to the realization of our current year losses that offset unrealized gains, recognized in other comprehensive income, from our investment portfolio.

Liquidity and Capital Resources

We have incurred losses and cumulative negative cash flows from operations since our inception in June 2003, and as of December 31, 2019, we had an accumulated deficit of \$711.4 million. We anticipate that we will continue to incur losses for at

least the next several years. We expect that our research and development and selling, general and administrative expenses will continue to increase and, as a result, we will need additional capital to fund our operations, which we may raise through a combination of the sale of equity, debt financings or other sources, including potential additional collaborations.

As of December 31, 2019, our operations have been primarily funded by \$105.1 million in equity investments from venture investors prior to our IPO, \$773.8 million from public investors, \$154.1 million in equity investments from our partners and \$356.7 million in upfront payments, milestones, and net research and development payments from our collaboration partners.

As of December 31, 2019, we had \$453.8 million in cash, cash equivalents and investments. Cash in excess of immediate requirements is invested in accordance with our investment policy, primarily with a view to liquidity and capital preservation.

Cash Flows

The following table sets forth the primary sources and uses of cash for each of the years set forth below:

(in thousands)	Year Ended December 31,		
	2019	2018	2017
Net cash (used in) provided by:			
Operating activities	\$ (93,804)	\$ (94,706)	\$ (76,544)
Investing activities	(71,291)	122,927	(64,366)
Financing activities	258,720	16,146	220,296
Net increase in cash, cash equivalents and restricted cash	\$ 93,625	\$ 44,367	\$ 79,386

Operating Activities.

Net cash used in operating activities was \$93.8 million for the year ended December 31, 2019, compared to \$94.7 million and \$76.5 million for the years ended December 31, 2018 and 2017, respectively. Net cash used in operating activities has decreased over this three-year period as a result of \$60.0 million of milestone payments received in 2019, offset by increased operating expenses over the same period. The increase in operating expenses consists of increased expenses related to headcount and facilities, increased external expenses for clinical and preclinical activities, contract manufacturing, consulting, and other external expenses to support our wholly-owned therapeutic programs, as well as expenses for commercial activities in advance of and in conjunction with the commercial launch of REBLOZYL. The change in net cash used in operating activities primarily consists of our net losses adjusted for non-cash items and changes in components of operating assets and liabilities as follows:

- for the year ended December 31, 2019, a net loss of \$124.9 million adjusted for non-cash items including: stock-based compensation expense of \$23.0 million and depreciation and amortization expense of \$3.9 million, and a net increase of \$4.0 million due to changes in operating assets and liabilities. The significant items in the change in operating assets and liabilities include an increase in accrued expenses of \$6.3 million and an increase in collaboration receivable of \$1.5 million.
- for the year ended December 31, 2018, a net loss of \$118.9 million adjusted for non-cash items including: stock-based compensation expense of \$24.6 million, depreciation and amortization expense of \$3.7 million, and a net decrease of \$4.6 million due to changes in operating assets and liabilities. The significant items in the change in operating assets and liabilities include an increase in prepaid expenses of \$3.0 million primarily for start-up activities for the PULSAR clinical trial, and an increase in collaboration receivables of \$3.5 million.
- for the year ended December 31, 2017, a net loss of \$108.5 million adjusted for non-cash items including: stock-based compensation expense of \$28.2 million, depreciation and amortization expense of \$2.8 million and an increase in fair value of warrants of \$1.0 million.

Investing Activities.

Net cash used by investing activities was \$71.3 million for the year ended December 31, 2019, compared to net cash provided by investing activities of \$122.9 million and net cash used in investing activities of \$64.4 million for the years ended December 31, 2018 and 2017, respectively. Net cash provided by or used in, as applicable, investing activities primarily consisted of the following amounts relating to the activity within our investment portfolio:

- for the year ended December 31, 2019, net purchases of investments of \$68.0 million;

- for the year ended December 31, 2018, net maturities of investments of \$125.5 million; and
- for the year ended December 31, 2017, net purchases of investments of \$60.0 million.

Net purchases for the years ended December 31, 2019 and December 31, 2017 were due to the implementation of our investment policy when we began to invest the money raised in our September 2017 and January 2019 public offerings in marketable securities. Net maturities for the year ended December 31, 2018 were the result of managing our investment portfolio to meet our projected cash requirements.

Financing Activities.

Net cash provided by financing activities was \$258.7 million for the year ended December 31, 2019, compared to \$16.1 million and \$220.3 million for the years ended December 31, 2018 and 2017, respectively. Net cash provided by financing activities primarily consisted of net proceeds from our public offerings in 2019 and 2017, and, in all periods, cash proceeds from the exercise of stock options and issuance of common stock related to the employee stock purchase plan, as follows:

- for the year ended December 31, 2019, net proceeds of \$248.1 million from our January 2019 public offering and the underwriters full exercise of the over-allotment option in the offering, as well as cash proceeds from the exercise of stock options and the issuance of common stock related to the employee stock purchase plan of \$10.6 million;
- for the year ended December 31, 2018, cash proceeds from the exercise of stock options and the issuance of common stock related to the employee stock purchase plan of \$16.3 million; and
- for the year ended December 31, 2017, net proceeds of \$215.8 million from our September 2017 public offering and the underwriters full exercise of the over-allotment option in the offering, as well as \$4.5 million in cash proceeds from the exercise of stock options and the issuance of common stock related to the employee stock purchase plan.

Operating Capital Requirements

To date, we have only generated limited revenue from royalties on the sale of our first and only commercial product, REBLOZYL, since receiving regulatory approval from the FDA in November 2019 for the treatment of anemia in adult patients with beta-thalassemia who require regular RBC transfusions. We anticipate that we will continue to generate losses for the foreseeable future, and we expect the losses to increase as we continue the development of, and seek and obtain regulatory approvals for ACE-083, sotatercept in the PH field, and any future therapeutic candidates, and begin to commercialize any approved products. We are subject to all of the risks incident in the development of therapeutic candidates, and we may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business.

Based on our current operating plan and projections, we believe that our current cash, cash equivalents and investments, will be sufficient to fund our projected operating requirements until such time as we expect to receive significant royalty revenue from REBLOZYL sales. Independent of the timing or significance of REBLOZYL royalty revenue, however, we may raise additional funds for future development, operations and activities, particularly if there are changes in our operating plan or projections, we add additional programs to our pipeline, or our programs advance in development faster than anticipated.

Until we can generate a sufficient amount of revenue from our products, if ever, we expect to fund our operations through a combination of equity offerings, debt financings or other sources including potential additional collaborations. Additional capital may not be available on favorable terms, if at all. If we are unable to raise additional capital in sufficient amounts or on terms acceptable to us, we may have to significantly delay, scale back or discontinue the development or commercialization of one or more of our therapeutic candidates. If we raise additional funds through the issuance of additional debt or equity securities, it could result in dilution to our existing stockholders and increased fixed payment obligations, and these securities may have rights senior to those of our common stock. If we incur indebtedness, we could become subject to covenants that would restrict our operations and potentially impair our competitiveness, such as limitations on our ability to incur additional debt, limitations on our ability to acquire, sell or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. We may not be able to enter into new collaboration arrangements for any of our proprietary therapeutic candidates. Any of these events could significantly harm our business, financial condition and prospects.

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

sooner than we currently expect. Our future funding requirements, both near and long-term, will depend on many factors, including, but not limited to:

- the achievement of milestones under our agreements with BMS;
- the amount of royalties we receive on sales of REBLOZYL;
- the terms and timing of any other collaborative, licensing and other arrangements that we may establish;
- the initiation, progress, timing and completion of preclinical studies and clinical trials for our therapeutic candidates and potential therapeutic candidates;
- the number and characteristics of therapeutic candidates that we pursue;
- the progress, costs and results of our clinical trials;
- the outcome, timing and cost of regulatory approvals;
- delays that may be caused by changing regulatory requirements;
- the cost and timing of hiring new employees to support our continued growth;
- the costs involved in filing and prosecuting patent applications and enforcing and defending patent claims;
- the costs and timing of procuring clinical and commercial supplies of our therapeutic candidates;
- the extent to which we acquire or invest in businesses, products or technologies; and
- the costs involved in defending and prosecuting litigation regarding in-licensed or wholly-owned intellectual property.

Contractual Obligations and Commitments

The following is a summary of our long-term contractual cash obligations as of December 31, 2019.

<u>(in thousands)</u>	Total	2020	2021 through 2022	2023 through 2024	After 2024
Operating lease obligations(1)	\$ 31,805	\$ 8,610	\$ 16,745	\$ 6,450	\$ —
Total	\$ 31,805	\$ 8,610	\$ 16,745	\$ 6,450	\$ —

- (1) We lease office and lab space at 128 Sidney Street, 149 Sidney Street, 99 Erie Street, and 167 Sidney Street in Cambridge, Massachusetts under noncancelable operating leases that expire in September 2023. We also lease office space at 125 Sidney Street under a noncancelable operating lease that expires in March 2021. Our leasehold improvements are being amortized over 3-7 years which represent the shorter of their useful life or remaining lease term. In accordance with the leases, we entered into cash-collateralized, irrevocable standby letters of credit totaling \$1.6 million, naming the respective landlords as beneficiaries.

We also have obligations to make future payments to third party licensors that become due and payable on the achievement of certain development, regulatory and commercial milestones. We have not included these commitments on our consolidated balance sheet or in the table above because the achievement and timing of these milestones is not fixed or determinable. These commitments include the following:

- Under our two license agreements with the Salk Institute for Biological Studies, or Salk, relating to the first cloning of the type II activin receptors, if we sublicense the Salk patent rights, we will owe Salk a percentage of sublicensing revenue, excluding payments based on sales. Under one agreement, we agreed to pay Salk specified development milestone payments totaling up to \$2.0 million for sotatercept. Under the other agreement, we agreed to pay Salk specified development milestone payments of up to \$0.7 million for REBLOZYL. In addition, under both agreements, we are required to pay Salk royalties in the low single-digits on worldwide net product sales by us or our sublicensees under the licensed patent rights of products claimed in the licensed patents, or products derived from use of the

licensed patent rights, with royalty obligations for sotatercept continuing at a reduced rate for a period of time after patent expiration.

- In May 2014, we executed a collaboration agreement with a research technology company. We paid an upfront and research fee of \$0.3 million upon execution of the agreement. We also received an option to obtain a commercial license to the molecules developed during the collaboration, which, if exercised, would obligate us to pay royalty and milestone payments.
- In December 2019, we executed a license and collaboration agreement with Fulcrum Therapeutics to identify small molecules designed to modulate specific pathways associated with a targeted indication within the pulmonary disease space. We paid an upfront research fee of \$10.0 million upon execution of the agreement. We also agreed to pay specified research, development and commercial milestone payments of up to \$295.0 million for a first product commercialized and up to a maximum of \$143.5 million in additional milestone payments for all subsequent products commercialized. Fulcrum will additionally receive tiered royalty payments in the mid-single-digit to low double-digit range on net sales, as well as reimbursement for relevant R&D costs.

We enter into contracts in the normal course of business with CROs for clinical trials and clinical supply manufacturing and with vendors for preclinical safety and research studies, research supplies and other services and products for operating purposes. These contracts generally provide for termination on notice, and therefore are cancelable contracts and not included in the table of contractual obligations and commitments.

Net Operating Loss (NOL) Carryforwards

We have net deferred tax assets of approximately \$226.0 million as of December 31, 2019, which have been fully offset by a valuation allowance due to uncertainties surrounding our ability to realize these tax benefits. The deferred tax assets are primarily composed of federal and state tax net operating loss, or NOL, carryforwards, research and development tax credit carryforwards, and deferred revenue, accruals and other temporary differences. As of December 31, 2019, we had federal NOL carryforwards of approximately \$666.3 million and state NOL carryforwards of \$689.8 million available to reduce future taxable income, if any. Of these federal and state NOL carryforwards, \$438.0 million and \$689.4 million, respectively, will expire at various times through 2039. The federal NOL of \$228.3 million and state NOL of \$0.4 million generated beginning in 2018 can be carried forward indefinitely. In general, if we experience a greater than 50% aggregate change in ownership of certain significant stockholders over a three-year period, or a Section 382 ownership change, utilization of our pre-change NOL carryforwards are subject to an annual limitation under Section 382 of the Internal Revenue Code of 1986, as amended, and similar state laws. Such limitations may result in expiration of a portion of the NOL carryforwards before utilization and may be substantial. If we experience a Section 382 ownership change in connection with our public offerings or as a result of future changes in our stock ownership, some of which changes are outside our control, the tax benefits related to the NOL carryforwards may be limited or lost. For additional information about our taxes, see Note 13 to the financial statements in this Annual Report on Form 10-K.

Off-Balance Sheet Arrangements

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

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

We are exposed to market risk related to changes in interest rates. As of December 31, 2019 and December 31, 2018, we had cash, cash equivalents and investments of \$453.8 million and \$291.3 million, respectively. Our cash equivalents are invested primarily in bank deposits and money market mutual funds. Our primary exposure to market risk is interest rate sensitivity, which is affected by changes in the general level of U.S. interest rates. Our investments are subject to interest rate risk and could fall in value if market interest rates increase. Due to the duration of our investment portfolio and the low risk profile of our investments, we do not believe an immediate 100 basis point change in interest rates would have a material effect on the fair market value of our portfolio. We have the ability 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 change in market interest rates on our investments.

Item 8. *Financial Statements and Supplementary Data*

All financial statements and supplementary data required to be filed hereunder are filed as listed under Item 15(a) of this Annual Report on Form 10-K and are incorporated herein by this reference.

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

None.

Item 9A. *Controls and Procedures*

Conclusion Regarding the Effectiveness of Disclosure Controls and Procedures

As of December 31, 2019, management, with the participation of our Chief Executive Officer and Chief Financial Officer, performed an evaluation of the effectiveness of the design and operation of our disclosure controls and procedures as defined in Rules 13a-15(e) and 15d-15(e) of the Exchange Act. Our disclosure controls and procedures are designed to ensure that information required to be disclosed in the reports we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the Securities and Exchange Commission's rules and forms, and that such information is accumulated and communicated to our management, including the Chief Executive Officer and the Chief Financial Officer, to allow timely decisions regarding required disclosures. Any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objective. Based on this evaluation, our Chief Executive Officer and Chief Financial Officer concluded that, as of December 31, 2019, the design and operation of our disclosure controls and procedures were effective.

Management's Report on Internal Control Over Financial Reporting

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, is responsible for establishing and maintaining adequate internal control over financial reporting, as defined in Rule 13a-15(f) and 15d-15(f) of the Exchange Act. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. 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 policy or procedures may deteriorate. Under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, management has conducted an evaluation of the effectiveness of our internal control over financial reporting as of December 31, 2019 based upon the Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Based on this evaluation, management, including our Chief Executive Officer and Chief Financial Officer, has concluded that our internal control over financial reporting was effective as of December 31, 2019.

The effectiveness of our internal control over financial reporting as of December 31, 2019 has been audited by Ernst & Young LLP, our independent registered public accounting firm, as stated in their report which is included herein.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting (as defined in Rule 13a-15(f) under the Exchange Act) during the quarter ended December 31, 2019, that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Acceleron Pharma Inc.

Opinion on Internal Control Over Financial Reporting

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

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of Acceleron Pharma Inc. as of December 31, 2019 and 2018, the related consolidated statements of operations and comprehensive loss, stockholders' equity and cash flows for each of the three years in the period ended December 31, 2019, and the related notes and our report dated February 27, 2020 expressed an unqualified opinion thereon.

Basis for Opinion

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

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

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

Definition and Limitations of Internal Control Over Financial Reporting

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

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

/s/ Ernst & Young LLP

Boston, Massachusetts
February 27, 2020

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 in our definitive proxy statement to be filed with the Securities and Exchange Commission, or SEC, with respect to our 2020 Annual Meeting of Stockholders and is incorporated herein by reference.

Item 11. *Executive Compensation*

The information required by this Item 11 will be included in our definitive proxy statement to be filed with the SEC with respect to our 2020 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 in our definitive proxy statement to be filed with the SEC with respect to our 2020 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 in our definitive proxy statement to be filed with the SEC with respect to our 2020 Annual Meeting of Stockholders and is incorporated herein by reference.

Item 14. *Principal Accounting Fees and Services*

The information required by this Item 14 will be included in our definitive proxy statement to be filed with the SEC with respect to our 2020 Annual Meeting of Stockholders and is incorporated herein by reference.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(a) The following documents are filed as part of this report:

(1) Financial Statements.

	Page number in this Report
Report of Independent Registered Public Accounting Firm	F-2
Consolidated Balance Sheets at December 31, 2019 and 2018	F-4
Consolidated Statements of Operations and Comprehensive Loss for the years ended December 31, 2019, 2018 and 2017	F-5
Consolidated Statements of Stockholders' Equity for the years ended December 31, 2019, 2018 and 2017	F-6
Consolidated Statements of Cash Flows for the years ended December 31, 2019, 2018 and 2017	F-7
Notes to Consolidated Financial Statements	F-8

(2) Financial Statement Schedules.

We are not filing any financial statement schedules as part of this Annual Report on Form 10-K because they are not applicable or the required information is included in the consolidated financial statements or notes thereto.

(3) Exhibits.

The list of Exhibits filed as a part of this Annual Report on Form 10-K is set forth on the Exhibit Index immediately preceding the signature page of this Annual Report on Form 10-K and is incorporated herein by this reference.

(b) The Exhibits filed or incorporated by reference as a part of this Annual Report on Form 10-K are set forth on the Exhibit Index immediately preceding the signature page of this Annual Report on Form 10-K.

(c) None.

Item 16. Form 10-K Summary

None.

Accelaron Pharma Inc.

Index to Consolidated Financial Statements

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Report of Independent Registered Public Accounting Firm	F-2
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Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of Acceleron Pharma Inc.

Opinion on the Financial Statements

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

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2019, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) and our report dated February 27, 2020 expressed an unqualified opinion thereon.

Adoption of ASU No. 2014-09

As discussed in Note 10 to the consolidated financial statements, the Company changed its method of accounting for revenue in 2018 due to the adoption of Accounting Standards Update (ASU) No. 2014-09, *Revenue from Contracts with Customers (Topic 606)*, and related amendments.

Adoption of ASU No. 2016-02

As discussed in Note 14 to the consolidated financial statements, the Company changed its method of accounting for leases in 2019 due to the adoption of Accounting Standards Update (ASU) No. 2016-02, *Leases (Topic 842)*, and related amendments.

Basis for Opinion

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

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

Critical Audit Matter

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

Accrued and Prepaid Clinical Trial Expenses

Description of the Matter

The Company's total accrued expenses were \$24.9 million at December 31, 2019, which included the estimated obligation for clinical trial expenses incurred as of December 31, 2019 but not paid as of that date. In addition, the Company's total prepaid expenses were \$10.0 million at December 31, 2019, which included amounts that were paid in advance of services incurred pursuant to clinical trials. As discussed in Note 2 of the consolidated financial statements, the Company's clinical trial expenses are based on the Company's estimates of the services received and efforts expended pursuant to quotes and contracts with third parties that conduct research and development on the Company's behalf, which results in an accrual or prepaid at period end.

Auditing the Company's accrued and prepaid clinical trial expenses was especially challenging due to the application of significant management judgment over the estimate of services provided but not yet invoiced. Specifically, the amount of accrued and prepaid clinical trial expenses recognized is sensitive to the availability of information to make the estimate, including the estimate of the period over which services will be performed, the level of effort expended as of the balance sheet date and the associated cost of such services. Additionally, due to the long duration of clinical trials and the timing of invoicing received from third parties, the actual amounts incurred are not typically known by the report date.

How We Addressed the Matter in Our Audit

We evaluated and tested the design and operating effectiveness of internal controls related to the accounting for accrued and prepaid clinical trial expenses. For example, we tested management's review controls related to the review of the underlying data used in the clinical accrual and prepaid calculations, the significant assumptions used to develop its estimates, and the clerical accuracy of the related schedules.

To evaluate the Company's estimate of services incurred as of period end pursuant to its clinical trials, our audit procedures included, among others, testing the accuracy and completeness of the underlying data used in the estimates and evaluating the significant assumptions stated above that are used by management to estimate the recorded amounts. To assess the reasonableness of the significant assumptions, we obtained information regarding the nature and extent of progress of clinical trials from the Company's research and development personnel that oversee the clinical trials and obtained information directly from third parties which indicated the third parties' estimate of costs incurred to date. To evaluate the completeness and valuation of the accrual or prepaid clinical trial expenses, we compared invoices received by the Company subsequent to December 31, 2019 to the amounts recognized by the Company as of that date. We inspected the Company's contracts with third parties and any pending change orders to assess the impact to the amounts recorded. We also independently estimated the services incurred by the third party and compared it to the amount recognized by the Company.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2005.
Boston, Massachusetts
February 27, 2020

Accelaron Pharma Inc.
Consolidated Balance Sheets
(amounts in thousands except share and per share data)

	December 31,	
	2019	2018
Assets		
Current assets:		
Cash and cash equivalents	\$ 237,677	\$ 144,052
Short-term investments	193,692	147,260
Collaboration receivables (all amounts are with a related party)	8,547	7,039
Prepaid expenses and other current assets	10,000	7,662
Total current assets	449,916	306,013
Property and equipment, net	6,812	7,106
Operating lease - right of use asset, net	23,908	—
Long-term investments	22,477	—
Other assets	1,793	1,702
Total assets	\$ 504,906	\$ 314,821
Liabilities and stockholders' equity		
Current liabilities:		
Accounts payable	\$ 2,295	\$ 419
Accrued expenses	24,895	18,209
Deferred rent	—	284
Operating lease liability - right of use	6,183	—
Total current liabilities	33,373	18,912
Deferred rent, net of current portion	—	2,381
Warrants to purchase common stock	1,856	1,491
Operating lease liability - right of use, net of current portion	20,201	—
Total liabilities	55,430	22,784
Commitments and contingencies (Note 8)	—	—
Stockholders' equity:		
Undesignated preferred stock, \$0.001 par value: 25,000,000 shares authorized and no shares issued or outstanding	—	—
Common stock, \$0.001 par value: 175,000,000 shares authorized; 53,123,567 and 46,260,747 shares issued and outstanding at December 31, 2019 and 2018, respectively	53	47
Additional paid-in capital	1,160,807	879,099
Accumulated deficit	(711,407)	(586,549)
Accumulated other comprehensive income (loss)	23	(560)
Total stockholders' equity	449,476	292,037
Total liabilities and stockholders' equity	\$ 504,906	\$ 314,821

See accompanying notes to consolidated financial statements.

Accelaron Pharma Inc.
Consolidated Statements of Operations and Comprehensive Loss
(amounts in thousands except per share data)

	Year Ended December 31,		
	2019	2018	2017
Revenue:			
Collaboration revenue:			
License and milestone	\$ 60,000	\$ —	\$ 541
Cost-sharing, net	13,993	13,991	12,940
Total revenue (all amounts are with a related party)	73,993	13,991	13,481
Costs and expenses:			
Research and development	153,953	103,902	89,726
Selling, general and administrative	56,485	34,503	33,738
Total costs and expenses	210,438	138,405	123,464
Loss from operations	(136,445)	(124,414)	(109,983)
Other income (expense), net	819	(52)	(992)
Interest income	10,706	5,568	2,553
Other income, net	11,525	5,516	1,561
Loss before income taxes	(124,920)	(118,898)	(108,422)
Income tax benefit (provision)	62	27	(32)
Net loss	\$ (124,858)	\$ (118,871)	\$ (108,454)
Other comprehensive income (loss):			
Net unrealized holding gains (losses) on short- and long-term investments during the period, net of tax	583	335	(470)
Comprehensive loss	\$ (124,275)	\$ (118,536)	\$ (108,924)
Net loss per share- basic and diluted	\$ (2.38)	\$ (2.59)	\$ (2.68)
Weighted-average number of common shares used in computing net loss per share- basic and diluted	52,453	45,898	40,420

See accompanying notes to consolidated financial statements.

Accelaron Pharma Inc.
Consolidated Statements of Stockholders' Equity
(amounts in thousands except share and per share data)

	Common Stock			Accumulated Deficit	Comprehensive (Loss) Income	Total Stockholders' Equity
	Number of Shares	\$0.001 Par Value	Additional Paid-In Capital			
Balance at December 31, 2016	38,251,826	\$ 39	\$ 590,474	\$ (364,491)	\$ (425)	\$ 225,597
Stock-based compensation	—	—	28,248	—	—	28,248
Issuance of common stock, net of expense \$397	6,216,216	6	215,796	—	—	215,802
Exercise of stock options	474,056	1	3,892	—	—	3,893
Vesting of restricted stock units, net of shares withheld for taxes	282,158	—	(226)	—	—	(226)
Issuance of common stock related to ESPP	33,698	—	827	—	—	827
Net exercise of warrants to purchase common stock	3,221	—	—	—	—	—
Unrealized loss on available-for-sale securities	—	—	—	—	(470)	(470)
Effect of adoption of ASU 2016-09	—	—	79	(79)	—	—
Net loss	—	—	—	(108,454)	—	(108,454)
Balance at December 31, 2017	45,261,175	46	839,090	(473,024)	(895)	365,217
Stock-based compensation	—	—	24,569	—	—	24,569
Exercise of stock options	779,711	1	15,930	—	—	15,931
Vesting of restricted stock units, net of shares withheld for taxes	170,516	—	(731)	—	—	(731)
Issuance of common stock related to ESPP	30,896	—	1,085	—	—	1,085
Net exercise of warrants to purchase common stock	18,449	—	797	—	—	797
Unrealized gain on available-for-sale securities, net of tax	—	—	—	—	335	335
Effect of adoption of ASU 606	—	—	—	3,705	—	3,705
Effect of adoption of ASU 2018-07	—	—	(1,641)	1,641	—	—
Net loss	—	—	—	(118,871)	—	(118,871)
Balance at December 31, 2018	46,260,747	47	879,099	(586,549)	(560)	292,037
Stock-based compensation	—	—	22,995	—	—	22,995
Issuance of common stock, net of expense \$500	6,151,163	6	248,124	—	—	248,130
Exercise of stock options	344,257	—	10,096	—	—	10,096
Vesting of restricted stock units, net of shares withheld for taxes	334,141	—	(802)	—	—	(802)
Issuance of common stock related to ESPP	33,259	—	1,295	—	—	1,295
Unrealized gain on available-for-sale securities, net of tax	—	—	—	—	583	583
Net loss	—	—	—	(124,858)	—	(124,858)
Balance at December 31, 2019	53,123,567	\$ 53	\$ 1,160,807	\$ (711,407)	\$ 23	\$ 449,476

See accompanying notes to consolidated financial statements.

Accelaron Pharma Inc.
Consolidated Statements of Cash Flows
(amounts in thousands)

	Year Ended December 31,		
	2019	2018	2017
Operating Activities			
Net loss	\$ (124,858)	\$ (118,871)	\$ (108,454)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	3,941	3,747	2,825
Stock-based compensation	22,995	24,569	28,248
Other non-cash items	128	409	1,168
Changes in assets and liabilities:			
Prepaid expenses and other current assets	(2,429)	(2,986)	(675)
Collaboration receivables	(1,508)	(3,470)	(336)
Non-cash lease expense	5,143	—	—
Accounts payable	1,876	(673)	(504)
Accrued expenses	6,258	1,904	1,493
Operating lease obligations (Note 14)	(5,333)	—	—
Other changes in operating assets and liabilities	(17)	665	(309)
Net cash used in operating activities	(93,804)	(94,706)	(76,544)
Investing Activities			
Purchase of investments	(395,138)	(73,570)	(179,935)
Proceeds from sale of securities	327,134	199,087	119,965
Purchases of property and equipment	(3,287)	(2,590)	(4,396)
Net cash (used in) provided by investing activities	(71,291)	122,927	(64,366)
Financing Activities			
Proceeds from issuance of common stock from follow-on public offering, net of issuance costs	248,130	—	215,802
Payments for capital lease expenditures	—	(139)	—
Net proceeds from exercises and vesting of stock awards, ESPP contributions, and exercise of warrants to purchase common stock	10,590	16,285	4,494
Net cash provided by financing activities	258,720	16,146	220,296
Net increase in cash, cash equivalents and restricted cash	93,625	44,367	79,386
Cash, cash equivalents and restricted cash at beginning of period	145,649	101,282	21,896
Cash, cash equivalents and restricted cash at end of period	\$ 239,274	\$ 145,649	\$ 101,282
Supplemental Disclosure of Non-Cash Investing and Financing Activities:			
Cashless exercise of warrants	\$ —	\$ 797	\$ —
Capitalized follow-on public offering costs included in accrued expenses	\$ —	\$ 221	\$ —
Purchase of property and equipment included in accounts payable and accrued expenses	\$ 444	\$ 1,159	\$ 194

See accompanying notes to consolidated financial statements.

Acceleron Pharma Inc.
Notes to Consolidated Financial Statements
Years Ended December 31, 2019, 2018 and 2017

1. Nature of Business

Acceleron Pharma Inc. (Acceleron or the Company) is a Cambridge, Massachusetts-based biopharmaceutical company dedicated to the discovery, development and commercialization of therapeutics to treat serious and rare diseases. The Company's leadership in the understanding of TGF-beta biology and protein engineering generates innovative compounds that engage the body's ability to regulate cellular growth and repair.

The Company is subject to risks common to companies in the biotechnology industry, including, but not limited to, the risk that the Company never achieves profitability, the need for substantial additional financing, risk of relying on third parties, risks of clinical trial failures, dependence on key personnel, protection of proprietary technology and compliance with government regulations.

2. Summary of Significant Accounting Policies

The accompanying consolidated financial statements reflect the application of certain significant accounting policies as described below and elsewhere in these notes to the consolidated financial statements. The Company believes that a significant accounting policy is one that is both important to the portrayal of the Company's financial condition and results, and requires management's most difficult, subjective, or complex judgments, often as the result of the need to make estimates about the effect of matters that are inherently uncertain.

Principles of Consolidation

The accompanying consolidated financial statements include those of the Company and its wholly-owned subsidiary, Acceleron Securities Corp. All significant intercompany balances and transactions have been eliminated in consolidation.

Basis of Presentation

The accompanying consolidated financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America (GAAP). Any reference in these notes to applicable guidance is meant to refer to the authoritative United States generally accepted accounting principles as found in the Accounting Standards Codification (ASC) and Accounting Standards Update (ASU) of the Financial Accounting Standards Board (FASB).

Use of Estimates

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, the disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts expensed during the reporting period.

Management considers many factors in selecting appropriate financial accounting policies and controls, and in developing the estimates and assumptions that are used in the preparation of these consolidated financial statements. Management must apply significant judgment in this process. In addition, other factors may affect estimates, including: expected business and operational changes, sensitivity and volatility associated with the assumptions used in developing estimates, and whether historical trends are expected to be representative of future trends. The estimation process often may yield a range of potentially reasonable estimates of the ultimate future outcomes and management must select an amount that falls within that range of reasonable estimates. This process may result in actual results differing materially from those estimated amounts used in the preparation of the consolidated financial statements if these results differ from historical experience, or other assumptions do not turn out to be substantially accurate, even if such assumptions are reasonable when made.

In preparing these consolidated financial statements, management used estimates in the following areas, among others: accrued and prepaid clinical expenses, stock-based compensation expense, revenue recognition and the recoverability of the Company's net deferred tax assets and related valuation allowance.

Collaboration Receivable

Credit is extended to customers based upon an evaluation of the customer's financial condition. Collaboration receivables are recorded at net realizable value. The Company does not charge interest on past due balances. Collaboration receivables are determined to be past due when the payment due date is exceeded. The Company utilizes a specific identification accounts

Notes to Consolidated Financial Statements (Continued)**Years Ended December 31, 2019, 2018 and 2017**

receivable reserve methodology based on a review of outstanding balances and previous activities to determine the allowance for doubtful accounts. The Company charges off uncollectible receivables at the time the Company determines the receivable is no longer collectible. The Company did not have an allowance for doubtful accounts at December 31, 2019 or 2018.

Segment Information

Operating segments are identified as components of an enterprise about which separate discrete financial information is available for evaluation by the chief operating decision maker, or decision making group, in making decisions on how to allocate resources and assess performance. The Company's chief operating decision maker is the chief executive officer. The Company and the chief executive officer view the Company's operations and manage its business as one operating segment, which is the discovery, development and commercialization of highly innovative therapeutics to treat serious and rare diseases. All material long-lived assets of the Company reside in the United States. The Company does use contract research organizations (CROs) and research institutions located outside the United States. Some of these expenses are subject to collaboration reimbursement which is presented as a component of cost-sharing, net in the consolidated statements of operations and comprehensive loss.

Cash, Cash Equivalents and Short-term and Long-term Investments

The Company considers all highly liquid investments purchased with original maturities of 90 days or less at the date of acquisition to be cash equivalents. Cash and cash equivalents include cash held in banks and amounts held in interest-bearing money market accounts, as well as marketable securities with a remaining maturity of 90 days or less. Cash equivalents are carried at cost, which approximates their fair market value.

The Company determines the appropriate classification of marketable securities at the time of purchase and reevaluates such designation at each balance sheet date. The Company has classified all of its marketable securities at December 31, 2019 and 2018 as "available-for-sale" pursuant to ASC 320, *Investments – Debt and Equity Securities*. The Company records available-for-sale securities at fair value, with the unrealized gains and losses included in accumulated other comprehensive income (loss) in stockholders' equity. There were no realized gains or losses on marketable securities for the years ended December 31, 2019, 2018 and 2017.

Investments not classified as cash equivalents are presented as either short-term or long-term investments based on both their maturities as well as the time period the Company intends to hold such securities.

The Company adjusts the cost of available-for-sale debt securities for amortization of premiums and accretion of discounts to maturity. The Company includes such amortization and accretion in interest income. The cost of securities sold is based on the specific identification method. The Company includes interest and dividends on securities classified as available-for-sale in interest income in the accompanying consolidated statements of operations and comprehensive loss.

The Company reviews marketable securities for other-than-temporary impairment whenever the fair value of a marketable security is less than the amortized cost and evidence indicates that a marketable security's carrying amount is not recoverable within a reasonable period of time. Other-than-temporary impairments of investments are recognized in the consolidated statements of operations if the Company has experienced a credit loss, has the intent to sell the marketable security, or if it is more likely than not that the Company will be required to sell the marketable security before recovery of the amortized cost basis. Evidence considered in this assessment includes reasons for the impairment, compliance with the Company's investment policy, the severity and the duration of the impairment and changes in value subsequent to the end of the period.

The aggregate fair value of securities held by the Company in an unrealized loss position for less than twelve months as of December 31, 2019 and December 31, 2018 was \$35.8 million and \$51.2 million, respectively. The aggregate fair value of securities held by the Company in an unrealized loss position for more than twelve months as of December 31, 2019 and December 31, 2018 was zero and \$94.3 million, respectively. The aggregate unrealized loss for those securities in an unrealized loss position for more than twelve months was zero and \$0.4 million, respectively. The Company evaluated its securities for other-than-temporary impairment and considered the decline in market value for the securities to be primarily attributable to current economic and market conditions. It is not more likely than not that the Company will be required to sell the securities, and the Company does not intend to do so prior to the recovery of the amortized cost basis. Based on this analysis, these marketable securities were not considered to be other-than-temporarily impaired as of December 31, 2019 and December 31, 2018.

Concentrations of Credit Risk and Off-Balance Sheet Risk

Accelaron Pharma Inc.**Notes to Consolidated Financial Statements (Continued)****Years Ended December 31, 2019, 2018 and 2017**

The Company has no off-balance sheet risk, such as foreign exchange contracts, option contracts, or other foreign hedging arrangements. Financial instruments that potentially subject the Company to concentrations of credit risk are primarily cash, cash equivalents, restricted cash, short-term and long-term investments and collaboration receivables. The Company maintains its cash and cash equivalent balances and short-term and long-term investments with financial institutions that management believes are creditworthy. Short-term and long-term investments consist of investment grade corporate obligations, treasury notes, asset backed securities, and certificates of deposit. The Company's investment policy includes guidelines on the quality of the institutions and financial instruments and defines allowable investments that the Company believes minimizes the exposure to concentrations of credit risk.

The Company routinely assesses the creditworthiness of its customers and collaboration partners. The Company has not experienced any material losses related to receivables from individual customers and collaboration partners, or groups of customers. The Company does not require collateral. Due to these factors, no additional credit risk beyond amounts provided for collection losses is believed by management to be probable in the Company's collaboration receivables.

Disclosure of Fair Value of Financial Instruments

The Company's financial instruments include cash, cash equivalents, short-term and long-term investments, collaboration receivables, common stock warrants, accounts payable, and accrued expenses. See discussion below on the determination of the fair value of the Company's common stock warrants and short-term and long-term investments. The carrying value of the remainder of the Company's financial instruments approximated their fair values at December 31, 2019 and 2018 due to the short-term nature of these instruments. The Company has evaluated the estimated fair value of financial instruments using available market information and management's estimates. The use of different market assumptions and/or estimation methodologies could have a significant effect on the estimated fair value amounts.

Fair Value Measurements

ASC Topic 820, *Fair Value Measurement* (ASC 820), establishes a fair value hierarchy for instruments measured at fair value that distinguishes between assumptions based on market data (observable inputs) and the Company's own assumptions (unobservable inputs). Observable inputs are inputs that market participants would use in pricing the asset or liability based on market data obtained from sources independent of the Company. Unobservable inputs are inputs that reflect the Company's assumptions about the inputs that market participants would use in pricing the asset or liability, and are developed based on the best information available in the circumstances.

ASC 820 identifies fair value as the exchange price, or exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As a basis for considering market participant assumptions in fair value measurements, ASC 820 establishes a three-tier fair value hierarchy that distinguishes between the following:

- Level 1—Quoted market prices in active markets for identical assets or liabilities.
- Level 2—Inputs other than Level 1 inputs that are either directly or indirectly observable, such as quoted market prices, interest rates, and yield curves.
- Level 3—Unobservable inputs developed using estimates of assumptions developed by the Company, which reflect those that a market participant would use.

To the extent that the valuation is based on models or inputs that are less observable or unobservable in the market, the determination of fair value requires more judgment. Accordingly, the degree of judgment exercised by the Company in determining fair value is greatest for instruments categorized in Level 3. A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement.

Items measured at fair value on a recurring basis include short-term and long-term investments (Note 5), and warrants to purchase common stock (Note 7). During the periods presented, the Company has not changed the manner in which it values assets and liabilities that are measured at fair value using Level 3 inputs.

The following tables set forth the Company's financial instruments carried at fair value using the lowest level of input applicable to each financial instrument as of December 31, 2019 and 2018 (in thousands):

Accelaron Pharma Inc.
Notes to Consolidated Financial Statements (Continued)
Years Ended December 31, 2019, 2018 and 2017

	December 31, 2019			Total
	Quoted Prices in Active Markets for Identical Items (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	
Assets:				
Money market funds	\$ 193,867	\$ —	\$ —	\$ 193,867
Corporate obligations	—	138,369	—	138,369
U.S. Treasury securities	—	83,819	—	83,819
Certificates of deposit	—	493	—	493
Mortgage and other asset backed securities	—	12,470	—	12,470
Total assets	\$ 193,867	\$ 235,151	\$ —	\$ 429,018
Liabilities:				
Warrants to purchase common stock	\$ —	\$ —	\$ 1,856	\$ 1,856
Total liabilities	\$ —	\$ —	\$ 1,856	\$ 1,856

	December 31, 2018			Total
	Quoted Prices in Active Markets for Identical Items (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	
Assets:				
Money market funds	\$ 74,023	\$ —	\$ —	\$ 74,023
Corporate obligations	—	128,920	—	128,920
U.S. Treasury securities	—	56,978	—	56,978
Certificates of deposit	—	1,715	—	1,715
Mortgage and other asset backed securities	—	26,874	—	26,874
Total assets	\$ 74,023	\$ 214,487	\$ —	\$ 288,510
Liabilities:				
Warrants to purchase common stock	\$ —	\$ —	\$ 1,491	\$ 1,491
Total liabilities	\$ —	\$ —	\$ 1,491	\$ 1,491

The money market funds noted above are included in cash and cash equivalents in the accompanying consolidated balance sheets. The Company recognizes transfers between levels of the fair value hierarchy as of the end of the reporting period. There were no transfers within the hierarchy during the years ended December 31, 2019 and 2018.

The following table sets forth a summary of changes in the fair value of the Company's common stock warrant liabilities, which represent a recurring measurement that is classified within Level 3 of the fair value hierarchy, wherein fair value is estimated using significant unobservable inputs (in thousands):

	Year Ended December 31,	
	2019	2018
Beginning balance	\$ 1,491	\$ 2,236
Change in fair value	365	52
Exercises	—	(797)
Ending balance	\$ 1,856	\$ 1,491

Accelaron Pharma Inc.**Notes to Consolidated Financial Statements (Continued)****Years Ended December 31, 2019, 2018 and 2017**

The fair value of the warrants to purchase common stock on the date of issuance and on each re-measurement date for those warrants classified as liabilities was estimated using either the Monte Carlo simulation framework, which incorporates future financing events over the remaining life of the warrants to purchase common stock, or for certain re-measurement dates, due to the warrants being deeply in the money, the Black-Scholes option pricing model. The Black-Scholes method of valuation involves using inputs such as the fair value of the Company's stock, stock price volatility, the contractual term of the warrants, risk-free interest rates, and dividend yields. At each reporting period the Company evaluates the best valuation methodology. At December 31, 2019, and December 31, 2018 and December 31, 2017, the Black-Scholes option pricing model was used. Due to the nature of these inputs, the valuation of the warrants is considered a Level 3 measurement. See Note 7 for further discussions of the accounting for the warrants.

The Company measures eligible assets and liabilities at fair value, with changes in value recognized in earnings. Fair value treatment may be elected either upon initial recognition of an eligible asset or liability or, for an existing asset or liability, if an event triggers a new basis of accounting. The Company did not elect to remeasure any of its existing financial assets or liabilities, and did not elect the fair value option for any financial assets and liabilities transacted in the years ended December 31, 2019 or 2018.

Property and Equipment

Property and equipment is stated at cost. Maintenance and repairs that do not improve or extend the lives of the respective assets are expensed to operations as incurred. Upon disposal, retirement or sale the related cost and accumulated depreciation is removed from the accounts and any resulting gain or loss is included in the results of operations. Depreciation and amortization is calculated using the straight-line method over the estimated useful lives of the assets, which are as follows:

Asset	Estimated Useful Life
Computer equipment and software	3 years
Office and laboratory equipment	3 years
Leasehold improvements	Shorter of the useful life or remaining lease term

The Company reviews long-lived assets when events or changes in circumstances indicate the carrying value of the assets may not be recoverable. Recoverability is measured by comparison of the book values of the assets to future net undiscounted cash flows that the assets are expected to generate. If such assets are considered to be impaired, the impairment to be recognized is measured by the amount by which the book value of the assets exceed their fair value, which is measured based on the projected discounted future net cash flows arising from the assets. No impairment losses have been recorded during the years ended December 31, 2019, 2018 and 2017.

Accrued and Prepaid Clinical Trial Expenses

The Company accrues for estimated costs of research and development activities conducted by third-party service providers, which includes the conduct of clinical trials. The Company records the estimated costs of clinical trial activities based upon the estimated amount of services provided and includes the costs incurred but not yet invoiced within accrued liabilities on the balance sheet and within research and development expense in the consolidated statements of operations and comprehensive loss. Invoicing from third-party service providers may not coincide with actual work performed and can result in the Company being in a prepaid position at period end. These costs can be a significant component of the Company's research and development expenses.

The Company estimates the amount of services provided and efforts expended pursuant to quotes and contracts with third parties, as well as discussion with internal personnel and external service providers as to the progress of the services and the agreed-upon fee to be paid for such services. The Company makes significant judgments and estimates in determining the services incurred as of the balance sheet date, which may result in either an accrual or prepaid balance. As actual costs become known, it adjusts its estimates. Although the Company does not expect its estimates to be materially different from amounts actually incurred, its understanding of the status and timing of services performed, the number of subjects enrolled, and the rate of enrollment may vary from its estimates and could result in the Company reporting amounts that are too high or too low in a particular period. The Company's accrued and prepaid expenses are dependent, in part, upon the receipt of timely and accurate reporting from contract research organizations and third-party service providers. To date, the Company has not experienced any material differences between its estimated costs and actual costs incurred.

Revenue Recognition

Accelaron Pharma Inc.**Notes to Consolidated Financial Statements (Continued)****Years Ended December 31, 2019, 2018 and 2017**

Effective January 1, 2018, the Company adopted Accounting Standards Codification Topic 606, *Revenue from Contracts with Customers*, (ASC 606), using the modified retrospective transition method. Under this method, results for reporting periods beginning January 1, 2018 are presented under ASC 606, while prior period amounts are not adjusted and continue to be reported in accordance with ASC 605.

The Company has primarily generated revenue through collaboration, license and research arrangements, which are within the scope of ASC 606, with collaboration partners for the development and commercialization of therapeutic candidates. The arrangements generally contain performance obligations, which may include (1) licenses, or options to obtain licenses, to the Company's technology, (2) research and development activities performed for the collaboration partners (3) participation on joint development committees (JDCs), and (4) the manufacturing of clinical or preclinical material. Payments pursuant to these arrangements typically include non-refundable, upfront payments, milestone payments upon achieving significant development events, research and development reimbursements, sales milestones, exercises of options, and royalties on future product sales.

Amounts received prior to satisfying the revenue recognition criteria are recorded as deferred revenue in the Company's consolidated balance sheets. Amounts expected to be recognized as revenue within the 12 months following the balance sheet date are classified as deferred revenue, current portion. Amounts not expected to be recognized as revenue within the 12 months following the balance sheet date are classified as deferred revenue, net of current portion. Amounts recognized as revenue, but not yet received or invoiced are generally recognized as contract assets, including collaboration receivables.

To determine revenue recognition for arrangements within the scope of ASC 606, the Company performs the following five steps: (i) identify the contract(s) with the customer; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when (or as) the entity satisfies a performance obligation. The Company only applies the five-step model to contracts when it is probable that the entity will collect the consideration it is entitled to in exchange for the goods or services it transfers to the customer. At contract inception, once the contract is determined to be within the scope of ASC 606, the Company assesses the goods or services promised within each contract, determines those that are performance obligations, and assesses whether each promised good or service is distinct. The Company then recognizes as revenue the amount of the transaction price that is allocated to the respective performance obligation when (or as) the performance obligation is satisfied. Depending on the nature of the performance obligation these assessments require management to make judgments and estimates.

Exclusive Licenses

If the license to the Company's intellectual property is determined to be distinct from the other promises or performance obligations identified in the arrangement, the Company recognizes revenue from non-refundable, upfront fees allocated to the license when the license is transferred and the customer is able to use and benefit from the license. In order to assess whether the license is distinct, the Company considers the capabilities of the collaboration partner and the availability of the necessary expertise in the general marketplace to determine whether the collaboration partner can benefit from the license for its intended purpose without the receipt of the remaining elements. For licenses determined not to be distinct the Company utilizes judgment to assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over or at a point in time and, if over time, the appropriate method of measuring progress for purposes of recognizing revenue. The Company evaluates the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition. The measure of progress, and thereby periods over which revenue should be recognized, are subject to estimates by management and may change over the course of the research and development and licensing agreement.

Research and Development Services

The promises under the Company's collaboration and license agreements generally include research and development services to be performed by the Company on behalf of the collaboration partner. As the provision of research and development services is a part of the Company's central operations, when the Company is principally responsible for the performance of these services under the agreements, the Company recognizes revenue on a gross basis for research and development services in accordance with the ASC 606 framework described above.

Customer Options

Notes to Consolidated Financial Statements (Continued)**Years Ended December 31, 2019, 2018 and 2017**

The Company's agreements may contain options which provide the collaboration partner the right to obtain additional licenses. If an arrangement is determined to contain customer options, the goods and services underlying the customer options are not considered to be performance obligations at the inception of the arrangement, and the associated option fees are not included in the transaction price. The Company evaluates the customer options to determine if they represent material rights, which may include options to acquire additional goods or services for free or at a discount. If the customer options are determined to represent a material right, the material right is recognized as a separate performance obligation at the outset of the arrangement. The Company allocates the transaction price to material rights based on the relative standalone selling price, which is determined based on the identified discount and the probability that the customer will exercise the option. Amounts allocated to a material right are not recognized as revenue until, at the earliest, the option is exercised.

Milestone Payments

At the inception of each arrangement that includes milestone payments, the Company evaluates whether the milestones are considered probable of being achieved and estimates the amount to be included in the transaction price using the most likely amount method. The Company evaluates factors such as the scientific, clinical, regulatory, commercial, and other risks that must be overcome to achieve the respective milestone in making this assessment. If it is probable that a significant revenue reversal would not occur, the associated milestone value is included in the transaction price. Milestone payments that are not within the control of the Company or the licensee, such as regulatory approvals, are not considered probable of being achieved until those approvals are received. At the end of each subsequent reporting period, the Company reevaluates the probability of achievement of all milestones subject to constraint and, if necessary, adjusts its estimate of the overall transaction price. Any such adjustments are recorded on a cumulative catch-up basis, which would affect revenues and earnings in the period of adjustment. If a milestone or other variable consideration relates specifically to the Company's efforts to satisfy a single performance obligation or to a specific outcome from satisfying the performance obligation, the Company generally allocates the milestone amount entirely to that performance obligation.

Royalties

For arrangements that include sales-based royalties, including milestone payments based on a level of sales, and the license is deemed to be the predominant item to which the royalties relate, the Company recognizes revenue at the later of (i) when the related sales occur, or (ii) when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied). To date, the Company has recognized minimal royalty revenue resulting from any of its licensing arrangements.

Research and Development Expenses

Research and development costs are charged to expense as costs are incurred in performing research and development activities. Research and development costs include all direct costs, including salaries, stock compensation and benefits for research and development personnel, outside consultants, costs of clinical trials, costs related to acquiring and manufacturing clinical study materials, sponsored research, clinical trials insurance, other outside costs, depreciation and facility costs related to the development of drug candidates. The Company records upfront, non-refundable payments made to outside vendors, or other payments made in advance of services performed or goods being delivered, as prepaid expenses, which are expensed as services are performed or the goods are delivered.

Certain research and development projects are, or have been, partially funded by collaboration agreements, and the expenses related to these activities are included in research and development costs. The Company records the related reimbursement of research and development costs under these agreements as revenue, as more fully described above and in Note 10.

Stock-Based Compensation

At December 31, 2019, the Company had two stock-based compensation plans, which are more fully described in Note 11. The Company accounts for stock-based compensation in accordance with the provisions of ASC Topic 718, *Compensation—Stock Compensation* (ASC 718), which requires the recognition of expense related to the fair value of stock-based compensation awards in the consolidated statements of operations and comprehensive loss.

For stock-based awards issued to employees and members of the Company's board of directors (the Board) for their services on the Board and for participation in the employee stock purchase plan, the Company estimates the grant date fair

Acceleron Pharma Inc.

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

value of each option award using the Black-Scholes option pricing model. The use of the Black-Scholes option pricing model requires management to make assumptions with respect to the expected term of the option, the expected volatility of the common stock consistent with the expected life of the option, risk-free interest rates and expected dividend yields of the common stock. For awards subject to service-based vesting conditions, the Company recognizes stock-based compensation expense, equal to the grant date fair value of stock options on a straight-line basis over the requisite service period, which is generally the vesting term. For awards subject to both performance and service-based vesting conditions, the Company recognizes stock-based compensation expense using an accelerated recognition method when it is probable that the performance condition will be achieved. If achievement of the performance condition is not probable, but the award will vest based on the service condition, expense is recognized over the requisite service period.

In July 2018, the Company early adopted ASU 2018-07, which expands the scope of Topic 718 to include share-based payments to non-employees. In connection with the adoption of this standard, the Company changed its accounting policy to establish the fair value of awards to non-employees at adoption date for existing awards and at grant date for new awards, rather than to mark such awards to market through the vesting period of the award. Additionally under the new guidance, the Company uses qualitative factors, such as exercise behavior and expected term to establish the term of the awards, rather than using contractual term, when valuing the awards. Forfeitures are recognized as they occur.

See Note 11 for a discussion of the assumptions used by the Company in determining the grant date fair value of options granted under the Black-Scholes option pricing model, as well as a summary of the stock option activity under the Company's stock-based compensation plans for the year ended December 31, 2019.

Income Taxes

Income taxes are recorded in accordance with ASC Topic 740, *Income Taxes* (ASC 740), which provides for deferred taxes using an asset and liability approach. The Company recognizes deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements or tax returns. Deferred tax assets and liabilities are determined based on the difference between the financial statement and tax bases of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. Valuation allowances are provided, if based upon 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 accounts for uncertain tax positions in accordance with the provisions of ASC 740. When uncertain tax positions exist, the Company recognizes the tax benefit of tax positions to the extent that the benefit will more likely than not be realized. The determination as to whether the tax benefit will more likely than not be realized is based upon the technical merits of the tax position as well as consideration of the available facts and circumstances. As of December 31, 2019 or 2018, the Company does not have any significant uncertain tax positions.

Net Loss Per Share

The Company calculates basic and diluted net loss per common share by dividing the net loss by the weighted-average number of common shares outstanding during the period. For the years ended December 31, 2019, 2018 and 2017, the Company has excluded the effects of all potentially dilutive shares, which include outstanding common stock options, warrants to purchase common stock, common stock issuable under the employee stock purchase plan, and restricted stock units, from the weighted-average number of common shares outstanding as their inclusion in the computation for these years would be anti-dilutive due to net losses incurred.

The following is a summary of the common stock equivalents which were excluded from the calculation of diluted net loss per share for the periods indicated (in thousands):

	Year Ended December 31,		
	2019	2018	2017
Outstanding stock options	3,820	3,513	3,452
Common stock warrants	39	39	61
Shares issuable under employee stock purchase plan	23	18	18
Restricted stock units	397	608	604
Total excluded common stock equivalents	4,279	4,178	4,135

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

Comprehensive Income (Loss)

Comprehensive Income (loss) is defined as the change in equity of a business enterprise during a period from transactions, other events, and circumstances from non-owner sources. Comprehensive income (loss) consists of net loss and other comprehensive income (loss), which includes certain changes in equity that are excluded from net loss. Comprehensive income (loss) has been disclosed in the accompanying consolidated statements of operations and comprehensive loss. Accumulated other comprehensive loss is presented separately on the consolidated balance sheets and consists entirely of unrealized holdings gains or losses on investments as of December 31, 2019 and 2018.

Subsequent Events

The Company considers events or transactions that occur after the balance sheet date but prior to the issuance of the financial statements to provide additional evidence relative to certain estimates or to identify matters that require additional disclosure. Subsequent events have been evaluated as required. The Company has evaluated all subsequent events and determined that there are no material recognized or unrecognized subsequent events requiring disclosure.

Recently Adopted Accounting Pronouncements

In February 2016, FASB, issued ASU 2016-02, *Leases (Topic 842), Amendments to the FASB Accounting Standards Codification*. ASU 2016-02 requires lessees to recognize assets and liabilities on the balance sheet for the rights and obligations created by leases. On January 1, 2019, the Company adopted ASU 2016-02 and all related amendments. For discussion regarding the impact of this accounting pronouncement, refer to Note 14 within the notes to our consolidated financial statements appearing elsewhere in this Annual Report on Form 10-K.

In March 2017, the FASB issued Accounting Standards Update 2017-08, *Receivables - Nonrefundable Fees and Other Costs (Subtopic 310-20): Premium Amortization on Purchased Callable Debt Securities* (ASU 2017-08). This standard amends the amortization period for certain purchased callable debt securities held at a premium by shortening the amortization period to the earliest call date. On January 1, 2019, the Company adopted ASU 2017-08, with no material impact on its consolidated financial statements and related disclosures.

Recent Accounting Pronouncements - Not Yet Adopted

From time to time, new accounting pronouncements are issued by the FASB or other standard setting bodies and adopted by the Company as of the specified effective date. Unless otherwise discussed, the Company believes that the impact of recently issued standards that are not yet effective will not have a material impact on its financial position or results of operations upon adoption.

In June 2016, the FASB issued ASU 2016-13, *Financial Instruments-Credit Losses*. The new standard requires entities to measure all expected credit losses for financial assets held at the reporting date based on historical experience, current conditions and reasonable and supportable forecasts. For available-for-sale debt securities with unrealized losses, the standard requires allowances to be recorded instead of reducing the amortized cost of the investment. The standard limits the amount of credit losses to be recognized for available-for-sale debt securities to the amount by which the carrying value exceeds fair value and requires the reversal of previously recognized credit losses if fair value increases. ASU 2016-13 will become effective for the Company beginning on January 1, 2020. The Company is currently evaluating the impact ASU 2016-13 will have on its consolidated financial statements and related disclosures.

In June 2018, the FASB issued ASU 2018-15, *Intangible-Goodwill and Other Internal-Use Software (Subtopic 350-40): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement that is a Service Contract*. This amendment aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software. The standard will become effective for the Company beginning on January 1, 2020. The Company does not anticipate that ASU 2018-15 will have a material impact on its consolidated financial statements and related disclosures.

In December 2019, the FASB issued ASU 2019-12, *Simplifying the Accounting for Income Taxes*. The ASU simplifies the accounting for income taxes by eliminating certain exceptions to the guidance in ASC 740, *Income Taxes*, related to the approach for allocating income tax expense or benefit for the year to continuing operations, discontinued operations, other comprehensive income, and other charges or credits recorded directly to shareholders' equity; the methodology for calculating income taxes in an interim period; and the recognition of deferred tax liabilities for outside basis differences. The ASU will

Acceleron Pharma Inc.

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

become effective for the Company beginning on January 1, 2021, with early adoption permitted. The Company is currently assessing the timing of adoption as well as the impact of adoption on its consolidated financial statements and related disclosures.

3. Property and Equipment, Net

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

	December 31,	
	2019	2018
Computer equipment and software	\$ 1,767	\$ 1,712
Office equipment	672	672
Laboratory equipment	22,079	19,948
Leasehold improvements	12,347	11,668
Construction in progress	1,181	1,139
Total property and equipment	38,046	35,139
Accumulated depreciation and amortization	(31,234)	(28,033)
Property and equipment, net	\$ 6,812	\$ 7,106

Depreciation and amortization expense was \$3.9 million, \$3.7 million and \$2.8 million for the years ending December 31, 2019, 2018 and 2017, respectively.

4. Restricted Cash

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the consolidated balance sheet that sum to the total of the same such amounts shown in the statement of cash flows (in thousands):

	December 31,		
	2019	2018	2017
Cash and cash equivalents	\$ 237,677	\$ 144,052	\$ 100,150
Restricted cash	1,597	1,597	1,132
Total cash, cash equivalents and restricted cash shown in the statement of cash flows	\$ 239,274	\$ 145,649	\$ 101,282

As of December 31, 2019, 2018, and 2017, the Company maintained letters of credit totaling \$1.6 million, \$1.6 million and \$1.1 million, respectively, held in the form of certificates of deposit as collateral for the Company's facility lease obligations and its credit cards.

Accelaron Pharma Inc.
Notes to Consolidated Financial Statements (Continued)
Years Ended December 31, 2019, 2018 and 2017
5. Cash, Cash Equivalents and Short-term and Long-term Investments

The following is a summary of cash, cash equivalents and available-for-sale securities as of December 31, 2019 and December 31, 2018 (in thousands):

	December 31, 2019			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
Cash and cash equivalents due in 90 days or less	\$ 237,677	\$ —	\$ —	\$ 237,677
Available-for-sale securities:				
Corporate obligations	124,676	219	(15)	124,880
U.S. Treasury securities	78,230	98	(1)	78,327
Certificates of deposit	490	3	—	493
Mortgage and other asset backed securities	12,476	5	(12)	12,469
Total available-for-sale securities	\$ 215,872	\$ 325	\$ (28)	\$ 216,169
Total cash, cash equivalents and available-for-sale securities	\$ 453,549	\$ 325	\$ (28)	\$ 453,846
	December 31, 2018			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
Cash and cash equivalents due in 90 days or less	\$ 144,064	\$ —	\$ (12)	\$ 144,052
Available-for-sale securities:				
Corporate obligations due in one year or less	73,671	—	(267)	73,404
U.S. Treasury securities due in one year or less	45,346	—	(79)	45,267
Certificates of deposit due in one year or less	1,715	—	—	1,715
Mortgage and other asset backed securities due in one year or less	26,982	—	(108)	26,874
Total available-for-sale securities	\$ 147,714	\$ —	\$ (454)	\$ 147,260
Total cash, cash equivalents and available-for-sale securities	\$ 291,778	\$ —	\$ (466)	\$ 291,312

6. Accrued Expenses

Accrued expenses consist of the following (in thousands):

	December 31,	
	2019	2018
Research and development	\$ 11,844	\$ 8,144
Commercial	1,027	—
Employee compensation	9,932	7,975
Professional services	976	621
Accrued purchases	119	351
Other	997	1,118
Total accrued expenses	\$ 24,895	\$ 18,209

Accelaron Pharma Inc.

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

7. Warrants

Below is a summary of the number of shares issuable upon exercise of outstanding warrants and the terms and accounting treatment for the outstanding warrants (in thousands, except per share data):

	Warrants as of		Weighted-Average Exercise Price Per Share	Expiration	Balance Sheet Classification	
	December 31, 2019	December 31, 2018			December 31, 2019	December 31, 2018
Warrants to purchase common stock	39	39	\$ 5.88	June 10, 2020 - July 9, 2020	Liability	Liability
All warrants	39	39	\$ 5.88			

Upon issuance the Company concluded the anti-dilution feature required the warrants to be classified as liabilities under ASC Topic 815, *Derivatives and Hedging—Contracts in Entity's Own Equity* (ASC 815). The warrants are measured at fair value, with changes in fair value recognized as a gain or loss to other income (expense) in the consolidated statements of operations and comprehensive loss for each reporting period thereafter. At the end of each reporting period, the Company remeasures the fair value of the outstanding warrants until they are exercised or expire. All outstanding warrants were fully vested and exercisable as of December 31, 2019.

8. Commitments and Contingencies

Operating Leases

The Company leases its facilities under non-cancelable operating leases that expire at various dates through September 2024. All of the Company's leases contain escalating rent clauses, which require higher rent payments in future years. Prior to 2019, the Company recognized rent expense, calculated as the remaining cost of the lease allocated over the remaining lease term on a straight line basis, as well as deferred rent for certain lease incentives, amortized as a reduction of rent expense over the life of the lease. As of January 1, 2019, the Company adopted Accounting Standards Codification Topic 842, *Leases* (ASC 842), which requires lessees to recognize assets and liabilities on the balance sheet for the rights and obligations created by leases. As a result of this adoption, the Company recorded a right-of-use asset and corresponding lease liability on the consolidated balance sheet as of December 31, 2019. The Company continues to recognize rent expense, which is calculated as the remaining cost of the lease allocated over the remaining lease term on a straight-line basis. Refer to Footnote 14 for additional information regarding the Company's operating leases.

Legal Proceedings

The Company, from time to time, may be party to litigation arising in the ordinary course of its business. Except as discussed below, the Company was not subject to any material legal proceedings during the years ended December 31, 2019, 2018 and 2017, and, to the best of its knowledge, no material legal proceedings are currently pending or threatened.

Other

The Company is also party to various agreements, principally relating to licensed technology, that require future payments relating to milestones not met at December 31, 2019 and 2018, or royalties on future sales of specified products. See Note 10 for discussion of these arrangements.

The Company enters into standard indemnification agreements in the ordinary course of business. Pursuant to the agreements, the Company indemnifies, holds harmless, and agrees to reimburse the indemnified party for losses suffered or incurred by the indemnified party, generally the Company's business partners or customers, in connection with any U.S. patent or any copyright or other intellectual property infringement claim by any third party with respect to the Company's products. The term of these indemnification agreements is generally perpetual any time after execution of the agreement. The maximum potential amount of future payments the Company could be required to make under these indemnification agreements is unlimited. The Company has never incurred costs to defend lawsuits or settle claims related to these indemnification agreements.

Accelaron Pharma Inc.

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

9. Stockholders' Equity

On September 25, 2017, the Company completed the sale of 5,405,406 shares of common stock at a public offering price of \$37.00 per share. On October 4, 2017, in connection with the September 2017 public offering, the underwriters fully exercised their option to purchase an additional 810,810 shares of common stock. The total net proceeds to the Company from the September 2017 public offering and the underwriters' exercise of their option to purchase additional shares of common stock was \$215.8 million.

On January 18, 2019, the Company completed the sale of 5,348,838 shares of common stock at a public offering price of \$43.00 per share, resulting in net proceeds to the Company of approximately \$215.8 million. In connection with the January 2019 public offering, on February 12, 2019, the underwriters fully exercised their option to purchase an additional 802,325 shares of common stock. The total net proceeds to the Company from the January 2019 public offering and the underwriters' exercise of their option to purchase additional shares of common stock was \$248.2 million.

Preferred Stock

The Company's certificate of incorporation authorizes the Board to issue up to 25,000,000 shares of preferred stock from time to time in one or more series. The rights, preferences, restrictions, qualifications and limitations of such stock are determined by the Board. As of December 31, 2019 no preferred shares are issued or outstanding.

Common Stock

The holders of shares of common stock are entitled to one vote for each share of common stock held at all meetings of stockholders and written actions in lieu of meetings.

The holders of shares of common stock are entitled to receive dividends, if and when declared by the Board. No dividends have been declared or paid by the Company through December 31, 2019.

Common Stock Reserved for Future Issuance

At December 31, 2019, the Company has reserved for future issuance the following number of shares of common stock (in thousands):

	December 31, 2019
Outstanding stock options to purchase common stock	3,820
Outstanding restricted stock units	397
Shares available for future issuance under equity incentive plan	4,634
Warrants to purchase common stock	39
Shares available for future issuance under the employee stock purchase plan	123
Additional shares reserved for unissued, but designated, Preferred Stock	25,000
Total shares of authorized common stock reserved for future issuance	34,013

10. Significant Agreements

BMS (Bristol-Myers Squibb Company)

Overview

On February 20, 2008 the Company entered into an agreement with Celgene, which was acquired by BMS in November 2019 and is now referred to herein as BMS, relating to sotatercept (the Original Sotatercept Agreement), which was amended on August 2, 2011 (as amended, the Amended Sotatercept Agreement). The Company further amended and restated the Original Sotatercept Agreement in its entirety on September 18, 2017, (the Restated Sotatercept Agreement). On August 2, 2011 the Company entered into a second agreement with BMS for REBLOZYL® (luspatercept-aamt) (the REBLOZYL Agreement, formerly the Luspatercept Agreement).

Restated Sotatercept Agreement

Accelaron Pharma Inc.**Notes to Consolidated Financial Statements (Continued)****Years Ended December 31, 2019, 2018 and 2017**

The Restated Sotatercept Agreement provides BMS with an exclusive license to sotatercept outside of the field of pulmonary hypertension, referred to as the PH field, and provides the Company with the worldwide rights to develop and commercialize sotatercept in the PH field.

In connection with the Restated Sotatercept Agreement, BMS agreed not to develop or commercialize in the PH field any compound developed under the Restated Sotatercept Agreement or the REBLOZYL Agreement, and the Company agreed not to develop or commercialize any compound developed under the Restated Sotatercept Agreement or the REBLOZYL Agreement in any field outside the PH field. The Company has the right to license, transfer or sell its rights to develop and commercialize sotatercept in the PH field, subject to BMS's right of first negotiation.

The Company is responsible for 100% of the costs related to its development and commercialization of sotatercept in the PH field. If sotatercept is commercialized to treat pulmonary hypertension and the Company recognizes such revenue, then BMS will be eligible to receive a royalty in the low 20% range on global net sales. In certain circumstances BMS may recognize revenue related to the commercialization of sotatercept in the PH field, and in this scenario, the Company will be eligible to receive a royalty from BMS such that the economic position of the parties is equivalent to the scenario in which the Company recognizes such revenue. With respect to the development and commercialization of sotatercept outside of the PH field or the development and commercialization of any other compound under the Restated Sotatercept Agreement, the terms of the Amended Sotatercept Agreement, described below, remained unchanged.

Pursuant to the Restated Sotatercept Agreement, BMS will provide the Company with certain quantities of their existing clinical supply of sotatercept for development in the PH field at no cost. For clinical supply of sotatercept in excess of that which is agreed to under the Restated Sotatercept Agreement, BMS had the option to provide the Company with such clinical supply of sotatercept, but has declined this option, and the Company is responsible for manufacturing future clinical supply of sotatercept in the PH field. BMS may elect, however, to provide the Company with commercial supply of sotatercept at a negotiated price or provide a tech transfer to enable the Company to manufacture on its own behalf. The conduct of the collaboration is managed by a Joint Development Committee (JDC) and Joint Commercialization Committee (JCC). In the event of a deadlock of a committee, the Company shall determine the resolution of issues specifically related to the PH field, (other than pricing which shall be determined by consensus), and BMS shall determine the resolution of all other issues. The JCC will oversee commercialization of sotatercept, and sotatercept pricing will be determined by mutual agreement of the Company and BMS in the JCC.

The Restated Sotatercept Agreement will expire on a country-by-country basis on the occurrence of the latest to occur of the following: (1) the expiration of the royalty term with respect to all licensed products outside the PH field in such country, (2) the expiration of the royalty term with respect to all sotatercept licensed products in the PH field in such country, and (3) the exercise or forfeiture by BMS of its option with regard to each option compound. In the PH field, the royalty term for each licensed product in each country is the period commencing with first commercial sale of the applicable licensed product in the applicable country and ending on the latest of expiration of specified patent coverage or a specified period of years. Outside the PH field, the royalty term for each licensed product in each country outside North America is the period commencing with first commercial sale of the applicable licensed product in the applicable country and ending on the latest of expiration of specified patent coverage or a specified period of years, and the royalty term for each licensed product in North America is the period commencing with the first commercial sale in North America and ending, on a licensed product and country-by-country basis on the date which commercialization of such licensed product has ceased. The term for each option compound runs for a specified period of years unless BMS exercises its option, in which case the compound becomes a licensed product, or forfeits its option by failing to make certain payments following the achievement of certain milestones in early clinical development of the option compound.

The Restated Sotatercept Agreement is terminable by either party upon a breach that is uncured and continuing or by BMS for convenience on a country-by-country or product-by-product basis, or in its entirety. BMS may also terminate the Restated Sotatercept Agreement, in its entirety or on a product-by-product basis, for failure of a product to meet a development or clinical trial endpoint. Termination for cause by the Company or termination by BMS for convenience or failure to meet an endpoint will have the effect of terminating the applicable license to BMS and the rights granted to the Company with respect to the development of sotatercept in the PH field shall become irrevocable. Termination for cause by either party shall result in reducing the remaining royalties due to the breaching party by a certain percentage. Upon termination by BMS for convenience or for failure to meet an endpoint, the Company and BMS will enter into a termination agreement pursuant to which, among other things, BMS will continue to be eligible to receive a royalty in the low 20% range on global net sales of sotatercept in the PH field.

Accelaron Pharma Inc.**Notes to Consolidated Financial Statements (Continued)****Years Ended December 31, 2019, 2018 and 2017**

The Company was not required to make any upfront payments to BMS upon execution of the Restated Sotatercept Agreement, and is not required to make any milestone payments to BMS in connection with its development and commercialization of sotatercept in the PH field.

Original and Amended Sotatercept Agreement

Under the Original Sotatercept Agreement, as preserved by the Amended Sotatercept Agreement, the Company granted BMS an exclusive license to sotatercept in all indications and an option to license discovery stage compounds against three specified targets. BMS paid \$45.0 million of nonrefundable, upfront license and option payments to the Company and bought \$5.0 million of equity upon closing in February 2008. Per the Original Sotatercept Agreement, concurrent with the Company's 2013 IPO, BMS purchased an additional \$10.0 million of the Company's common stock.

The Company retained responsibility for research and development of sotatercept through the end of Phase 2a clinical trials, as well as manufacturing the clinical supplies for these trials. These activities were substantially completed in 2011. BMS will be responsible for any sotatercept Phase 3 clinical trials, as well as any additional Phase 2 clinical trials and is responsible for manufacturing or overseeing the manufacture of Phase 3 and commercial supplies outside of the PH field. Commensurate with the execution of the REBLOZYL Agreement described below, in August 2011 the Company and BMS agreed to modify the terms of the collaboration. Outside of the PH field, the significant financial terms of the Amended Sotatercept Agreement, which were preserved in the Restated Sotatercept Agreement, are:

- Since January 1, 2013, BMS has been responsible for paying 100% of worldwide development costs for the sotatercept program;
- BMS will be responsible for all commercialization costs worldwide as agreed in the budget between the Company and BMS;
- The Company is eligible to receive tiered royalty payments in the low-to-mid 20% percent range on net sales of sotatercept subject to certain reductions, including for entry of a generic product onto the market; and
- The Company has the right to co-promote sotatercept and future products in all fields, in each case if approved, in North America, and BMS will pay all costs related thereto.

The Amended Sotatercept Agreement, as preserved in the Restated Sotatercept Agreement, contains a two-category contingent development milestone structure outside of the PH field (oncology and non-oncology) for sotatercept, including future clinical milestones of up to \$27.0 million, regulatory milestones of up to \$190.0 million and commercial milestones of up to \$150.0 million. Additionally, the Company is eligible to receive option fees of up to \$30.0 million for each of the three discovery-stage targets, and for all three discovery-stage targets in the aggregate, clinical milestones of up to \$25.5 million, regulatory milestones of up to \$142.5 million and commercial milestones of up to \$150.0 million. None of the three discovery stage programs has advanced to the stage to achieve payment of a milestone, nor does the Company expect any such milestone payments in the near future.

REBLOZYL Agreement

Under the terms of the REBLOZYL Agreement, the Company and BMS collaborate worldwide for the joint development and commercialization of REBLOZYL. The Company also granted BMS an option for future products for which Accelaron files an Investigational New Drug application for the treatment of anemia. BMS paid \$25.0 million on the closing of the REBLOZYL Agreement in August 2011.

The Company retained responsibility for research and development through the end of Phase 1 and the Company's initial luspatercept-aamt beta-thalassemia and MDS Phase 2 clinical trials, as well as manufacturing the clinical supplies for these studies. BMS will conduct subsequent Phase 2 and Phase 3 clinical studies and will be responsible for overseeing the manufacture of Phase 3 and commercial supplies by third party contract manufacturing organizations. The significant financial terms of the REBLOZYL Agreement are:

- Since January 1, 2013, BMS has been responsible for paying 100% of worldwide development costs for the REBLOZYL program;
- BMS is responsible for all commercialization costs worldwide as agreed in the budget between the Company and BMS;
- The Company is eligible to receive tiered royalty payments in the low-to-mid 20% percent range on net sales of REBLOZYL subject to certain reductions, including for entry of a generic product onto the market; and

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

- The Company has the right to co-promote REBLOZYL and future products in all fields, in each case if approved, in North America, and BMS will pay all costs related thereto, as agreed in the budget between the Company and BMS.

Per the terms of the agreement, the Company was eligible to receive total clinical milestones of up to \$32.5 million, regulatory milestones of up to \$105.0 million and commercial milestones of up to \$80.0 million for REBLOZYL. The Company will receive additional, lower development, regulatory, and commercial milestones for any additional products for the treatment of anemia on which BMS exercises an option. As of December 31, 2019, the Company is eligible to receive remaining future regulatory and commercial milestones of up to \$125.0 million for the REBLOZYL program. Additionally, activities that the Company elects to conduct outside of the approved budgets to support REBLOZYL are at the Company's expense.

The REBLOZYL Agreement will expire on a country-by-country basis on the occurrence of both of the following: (1) the expiration of the royalty term with respect to all license products in such country, and (2) the end of the option term. The royalty term for each licensed product in each country outside North America is the period commencing with first commercial sale of the applicable licensed product in the applicable country and ending on the latest of expiration of specified patent coverage or a specified period of years. The royalty term for each licensed product in North America is the period commencing with the first commercial sale in North America and ending, on a licensed product and country-by-country basis on the date which commercialization of such licensed product has ceased. The option term runs until the later of (1) the date on which no development or commercialization activities are ongoing or are expected to commence for any licensed products under the REBLOZYL Agreement; (2) the date on which no development or commercialization activities are ongoing or are expected to commence for any licensed products under the Restated Sotatercept Agreement and all option rights under the Restated Sotatercept Agreement have been forfeited with respect to each option compound where BMS has made a payment with respect to such compound; and (3) the royalty term for all licensed products under the REBLOZYL Agreement and the Restated Sotatercept Agreement has ended; provided that if at the time the option term would otherwise end any option compounds under the REBLOZYL Agreement are in clinical development the option term shall continue until BMS's rights to such compound are either exercised or forfeited.

BMS has the right to terminate the REBLOZYL Agreement with respect to one or more licensed targets or in its entirety, upon 180 days' notice (or 45 days' notice if the licensed product has failed to meet certain end point criteria with respect to clinical trials or other development activities). The agreement may also be terminated in its entirety by either BMS or the Company in the event of a material breach by the other party or in the event of a bankruptcy filing of the other party. There are no cancellation, termination or refund provisions in this arrangement that contain material financial consequences to the Company.

Accounting Analysis

The Company initially accounted for these arrangements pursuant to FASB ASC Topic 605, *Revenue Recognition*. As indicated in Note 2, the Company adopted ASC 606 on January 1, 2018 using the modified retrospective transition method, which resulted in a cumulative-effect reduction to accumulated deficit of \$3.7 million. The most significant change in the Company's accounting policy upon adoption of ASC 606 related to the evaluation of milestone revenue pursuant to its arrangements with BMS. In accordance with ASC 605, at the inception of each arrangement that included milestone payments, the Company evaluated, with respect to each milestone, whether the milestone was substantive and at-risk. The Company recognized the milestone payment upon achievement, assuming all other revenue recognition criteria were met, or over the remaining service period if not deemed substantive and at-risk. Pursuant to ASC 606, at inception and each subsequent reporting period, the Company evaluates whether the milestones are probable of being achieved and estimates the amount to be included in the transaction price using the most likely amount method. The change in guidance noted above could result in earlier recognition of milestones pursuant to the Company's arrangements.

The Company identified the following material promises under the Restated Sotatercept Agreement and REBLOZYL Agreement: (1) licenses to develop and commercialize sotatercept and REBLOZYL; (2) performance of research and development services; (3) participation in the JDCs; and (4) the performance of the manufacturing services. The Company determined that the licenses to sotatercept and REBLOZYL technology, the research and development activities, participation in the JDCs and the manufacturing services are each distinct performance obligations. The option rights to future products related to the treatment of anemia under the REBLOZYL Agreement are not considered to represent a material right as this right is a protective provision akin to exclusivity and does not represent a customer option to receive the rights or services at a discount. In addition, the Company is under no obligation to discover, develop, or deliver any new compounds that modulate anemia. Therefore, the option right under the REBLOZYL Agreement is not a performance obligation. Commercialization

Accelaron Pharma Inc.**Notes to Consolidated Financial Statements (Continued)****Years Ended December 31, 2019, 2018 and 2017**

support for each of sotatercept and REBLOZYL is considered to be a participatory right and not a performance obligation. The Company concluded that services provided for the extension studies do not represent a contract modification or a performance obligation but rather a separate services arrangement, which is accounted for as a separate contract. Each study includes one promise, the completion of the study, which is distinct from the performance obligations in the Restated Sotatercept Agreement and REBLOZYL Agreement that is satisfied over time, and the consideration for each study approximates the stand-alone selling price. Revenue is recognized as the services for each study are provided for the extension studies.

The transaction price includes the following payments received under the Restated Sotatercept and REBLOZYL Agreement through the adoption date for a total of \$192.3 million, as follows:

- \$25.0 million upfront fee in connection with the closing of the REBLOZYL Agreement;
- \$45.0 million of nonrefundable, upfront license and option payments in connection with the closing of the Original and Amended Sotatercept Agreements;
- \$14.9 million received for sotatercept development and manufacturing activities;
- \$47.9 million received for REBLOZYL development and manufacturing activities; and
- \$59.5 million milestone payments pursuant to the agreements.

The Company allocated the total transaction price to the identified performance obligations (both satisfied and unsatisfied) using the estimated standalone selling price of each performance obligation as of the adoption date of ASC 606. The Company's estimate of the standalone selling price requires judgment, in particular in estimating the value of the license rights for REBLOZYL and sotatercept, which includes assumptions over the projected revenues and expenses, probability of technical and regulatory success and appropriate discount rates.

As of the ASC 606 adoption date, the only remaining undelivered element was participation in the Joint Development Committee (JDC). The transaction price allocated to participation on the JDC based on the established standalone selling price of all performance obligations was de minimis as the sotatercept and REBLOZYL licenses carried the most significant portion of the value included in the agreements, and the Company's remaining effort on the JDC is minimal. Therefore, the Company recorded a cumulative-effect reduction to accumulated deficit of \$3.7 million as the adoption date and a corresponding decrease to deferred revenue, of which \$0.5 million was recorded to current deferred revenue and \$3.2 million was recorded to long-term deferred revenue.

Upon adoption of ASC 606, all future potential milestone payments were excluded from the transaction price as they were still subject to completion of on-going clinical studies or other risks that are outside of the Company's control and therefore the risk of significant reversal has not been resolved. As of December 31, 2019, the next milestone payment for REBLOZYL would be \$25.0 million and would result from European Medicines Agency (EMA) approval of a Biologics Licensing Application (BLA) or equivalent for luspatercept-aamt in either myelodysplastic syndromes or beta-thalassemia. The Company and BMS expect the EMA to issue a decision on the approval of the MAA in the second half of 2020. In accordance with the Company's accounting policy regarding revenue recognition as described in Note 2, the revenue associated with this milestone will be recognized once it is probable that the application is approved by the regulatory authority. Milestone payments that are not within the control of the Company or the licensee are not considered probable of being achieved until those approvals are received. The approval of the application is not within the control of the Company or the licensee, and therefore, as of December 31, 2019, the Company cannot determine if it is probable that a regulatory agency will approve the applications.

On June 4, 2019, the Company and BMS announced that the U.S. Food and Drug Administration (FDA) accepted BMS's Biologics Licensing Application (BLA), and the European Medicines Agency (EMA) validated BMS's marketing authorization application (MAA), for luspatercept-aamt for both myelodysplastic syndrome and beta-thalassemia. As a result, the \$25.0 million milestone for acceptance of the BLA by the FDA or EMA for use of a Licensed Product is no longer constrained. Additionally, on November 8, 2019, the Company and BMS announced that the FDA approved REBLOZYL for the treatment of anemia in adult patients with beta-thalassemia who require regular red blood cell transfusions. As a result, the \$35.0 million milestone for approval of the BLA for REBLOZYL was no longer constrained. As the Company does not have any remaining

Notes to Consolidated Financial Statements (Continued)

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performance obligations under the agreement with BMS, the full \$60.0 million was recognized during the year ended December 31, 2019.

Through December 31, 2019, under all BMS arrangements the Company has received net cost-share payments and milestones of \$181.9 million and \$44.7 million for REBLOZYL and sotatercept, respectively. The Company recorded net cost-sharing revenue of \$14.0 million, \$14.0 million, and \$12.9 million during the years ended December 31, 2019, 2018, and 2017, respectively.

Other Agreements*Other*

In 2004, the Company entered into a license agreement with a non-profit institution for an exclusive, sublicensable, worldwide, royalty-bearing license to certain patents developed by the institution (Primary Licensed Products). In addition, the Company was granted a non-exclusive, non-sub-licensable license for Secondary Licensed Products. The Company agreed to pay specified development milestone payments totaling up to \$2.0 million for sotatercept and \$0.7 million for REBLOZYL. In addition, the Company is obligated to pay milestone fees based on the Company's research and development progress, and U.S. sublicensing revenue ranging from 10%-25%, as well as a royalty ranging from 1.0%-3.5% of net sales on any products developed under the licenses. During the years ended December 31, 2019, 2018 and 2017, the Company paid and expensed milestones and fees defined under the agreement totaling \$3.7 million, \$0.1 million and \$0.1 million, respectively, which is recorded as research and development expense. For further discussion on this agreement, see the description in the "Business - In-Licenses" section of this Annual Report on Form 10-K.

In May 2014, the Company executed a collaboration agreement with a research technology company. The Company paid an upfront research fee of \$0.3 million upon execution of the agreement. The Company also received an option to obtain a commercial license to the molecules developed during the collaboration. During the years ended December 31, 2019, 2018, and 2017, the Company expensed milestones and fees totaling \$2.1 million, \$0.1 million, and \$1.6 million, which is recorded as research and development expense.

In December 2019, the Company executed a license and collaboration agreement with Fulcrum Therapeutics to identify small molecules designed to modulate specific pathways associated with a targeted indication within the pulmonary disease space. The Company paid an upfront research fee of \$10.0 million upon execution of the agreement. The Company also agreed to pay specified research, development and commercial milestone payments of up to \$295.0 million for a first product commercialized and up to a maximum of \$143.5 million in additional milestone payments for all subsequent products commercialized. Fulcrum will additionally receive tiered royalty payments in the mid-single-digit to low double-digit range on net sales, as well as reimbursement for relevant research and development costs. During the year ended December 31, 2019, the Company expensed the upfront fee of \$10.0 million, which is recorded as research and development expense.

11. Stock-Based Compensation

At December 31, 2019, the Company had two stock-based compensations plans, which are more fully described below.

The Company's 2003 Stock Option and Restricted Stock Plan (the 2003 Plan) provided for the issuance of stock options and restricted stock to employees, officers, directors, consultants and key personnel of the Company as determined by the Board. In conjunction with the effectiveness of the 2013 Equity Incentive Plan (the 2013 Plan) described below, the Company determined that no further stock options or other equity-based awards may be granted under the 2003 Plan.

On September 4, 2013, the Board and stockholders approved the adoption of the 2013 Equity Incentive Plan (the 2013 Plan), which provides for the issuance of stock options, restricted stock units, and other equity-based awards. The Company has reserved for issuance an aggregate of 1,500,000 shares of common stock under the 2013 Plan which is comprised of (i) the remaining 155,884 shares reserved for issuance under the 2003 Plan and (ii) an additional 1,344,116 shares. The 2013 Plan provides that the number of shares reserved and available for issuance under the plan will automatically increase each January 1, beginning in 2014, by the lesser of (i) 3,150,000 shares, or (ii) 4% of the outstanding number of shares of the Company's common stock on the immediately preceding December 31st. This number is subject to adjustment in the event of a stock split, stock dividend or other change in the Company's capitalization. The number of shares underlying equity awards available for future grant was 4,634,133 at December 31, 2019.

Acceleron Pharma Inc.

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

The Company has not granted unrestricted stock awards under the 2003 Plan or the 2013 Plan since its inception. Stock options carry an exercise price equal to the estimated fair value of the Company's common stock on the date of grant. Options generally expire 10 years following the date of grant. Stock options typically vest over 4 years, and restricted stock units typically vest over 3 years, but vesting provisions can vary based on the discretion of the Board.

Shares of the Company's common stock underlying any awards that are forfeited, canceled, withheld upon exercise of an option, or settlement of an award to cover the exercise price or tax withholding, reacquired by the Company prior to vesting, satisfied without the issuance of shares of the Company's common stock, or otherwise terminated other than by exercise will be added back to the shares of common stock available for issuance under the 2013 Plan. Shares available for issuance under the 2013 Plan may be authorized but unissued shares of the Company's common stock or shares of the Company's common stock that have been reacquired by the Company.

Additionally, on September 4, 2013, the Board and stockholders approved the adoption of the 2013 Employee Stock Purchase Plan (the 2013 ESPP). Under the 2013 ESPP, 275,000 shares of the Company's common stock will be available for issuance to eligible employees. The per-share purchase price at the end of each offering period is equal to 85% of the closing price of one share of the Company's common stock at the beginning or end of the offering period, whichever is lower, subject to Internal Revenue Service limits. The 2013 ESPP will terminate on September 4, 2023, the tenth anniversary of the initial adoption of the plan. The Board determined the initial offering period commenced on September 16, 2014 and the initial purchase occurred on the 6 month anniversary with subsequent 6 month purchase periods commencing on the day following the purchase from the prior period. The Company recorded \$0.4 million, \$0.4 million, and \$0.3 million of stock-based compensation expense during the years ended December 31, 2019, 2018, and 2017, respectively related to the 2013 ESPP. The number of shares available for future issuance was 122,589 at December 31, 2019.

In December 2016, the Company entered into a consulting agreement with its former Chief Executive Officer. In accordance with the 2003 Plan and 2013 Plan, any vested shares remain exercisable and any outstanding and unvested options and restricted stock units will continue to vest in accordance with their terms so long as he continues to provide services as a non-employee consultant. During the years ended December 31, 2019, 2018 and 2017, the Company recognized \$1.0 million, \$2.4 million, and \$4.9 million, respectively, of stock-based compensation expense related to the agreement.

The Company recognized stock-based compensation expense under the various Plans in the consolidated statements of operations and comprehensive loss as follows (in thousands):

	Year Ended December 31,		
	2019	2018	2017
Research and development	\$ 9,943	\$ 12,669	\$ 14,227
Selling, general and administrative	13,052	11,900	14,021
	<u>\$ 22,995</u>	<u>\$ 24,569</u>	<u>\$ 28,248</u>

The fair value of each option issued to employees was estimated on the date of grant using the Black-Scholes option pricing model with the following weighted-average assumptions:

	Year Ended December 31,		
	2019	2018	2017
Expected volatility	58.6%	62.8%	65.7%
Expected term (in years)	6.0	6.0	6.0
Risk-free interest rate	2.39%	2.70%	2.13%
Expected dividend yield	—%	—%	—%

The expected volatility of the options granted has been determined using a weighted-average of the historical volatility measures of a peer group of companies as well as the historical volatility of the Company's own common stock. As of September 2019, the Company had sufficient company-specific historical volatility data to begin estimating expected volatility by using its own stock's data rather than a blended rate for most awards. The expected life of options has been determined utilizing the "simplified method". The simplified method is based on the average of the vesting tranches and the contractual life of each grant. The risk-free interest rate is based on a treasury instrument whose term is consistent with the expected life of the

Accelaron Pharma Inc.
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stock options. The Company has not paid, and does not anticipate paying, cash dividends on its common stock; therefore, the expected dividend yield is assumed to be zero. The Company accounts for forfeitures as they occur.

Stock Option Activity

The following table summarizes the stock option activity under the Company's stock option plans during the year ended December 31, 2019 (in thousands, except per share amounts and years):

	Number of Grants (in thousands)	Weighted- Average Exercise Price Per Share	Weighted- Average Contractual Life (in years)	Aggregate Intrinsic Value(1)
Outstanding at December 31, 2018	3,513	\$ 34.40		
Granted	924	\$ 42.32		
Exercised	(344)	\$ 29.33		
Canceled or forfeited	(273)	\$ 41.64		
Outstanding at December 31, 2019	3,820	\$ 36.26	6.81	\$ 64,146
Exercisable at December 31, 2019	2,400	\$ 33.76	5.80	\$ 46,258

(1) The aggregate intrinsic value is calculated as the difference between the exercise price of the underlying options and the estimated fair value of the common stock for the options that were in the money at December 31, 2019.

During the years ended December 31, 2019, 2018 and 2017, the Company granted stock options to purchase an aggregate of 923,508; 942,271; and 701,384 shares of its common stock, respectively, with weighted-average grant date fair values of \$23.65, \$25.05, and \$18.58, respectively.

During the years ended December 31, 2019, 2018 and 2017, current and former employees of the Company exercised a total of 344,257; 779,711; and 474,056 options, respectively, resulting in total proceeds of \$10.1 million, \$15.9 million, and \$3.9 million, respectively.

The aggregate intrinsic value of options exercised during the years ended December 31, 2019, 2018, and 2017, under the Company's stock option plans, was \$4.9 million, \$19.3 million, and \$10.2 million, respectively, calculated as the difference between the exercise price of the underlying options and the estimated fair value of the common stock for the options on the respective date of exercise.

As of December 31, 2019, there was \$28.4 million of unrecognized compensation expense that is expected to be recognized over a weighted-average period of 2.4 years.

Restricted Stock Units

The following table summarizes the restricted stock unit (RSU) activity under the 2013 Plan during the year ended December 31, 2019:

	Number of Stock Units (in thousands)	Weighted- Average Grant Date Fair Value Per Share
Unvested balance at December 31, 2018	372	\$ 36.53
Granted	216	\$ 41.43
Vested	(124)	\$ 34.59
Forfeited	(67)	\$ 40.25
Unvested balance at December 31, 2019	397	\$ 39.20

Accelaron Pharma Inc.

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

At December 31, 2019, there was approximately \$10.5 million of related unrecognized compensation cost which the Company expects to recognize over a remaining weighted-average period of 1.8 years.

Performance-Based Restricted Stock Units

The Company has granted performance-based restricted stock units (PSU) whereby vesting accelerates upon the occurrence of certain milestone events. In September 2019, all of the remaining unvested PSUs vested. The following table summarizes PSU activity under the 2013 Plan during the year ended December 31, 2019:

	Number of Stock Units (in thousands)	Weighted- Average Grant Date Fair Value Per Share
Unvested balance at December 31, 2018	236	\$ 31.42
Granted	—	\$ —
Vested	(227)	\$ 31.44
Forfeited	(9)	\$ 31.09
Unvested balance at December 31, 2019	—	\$ —

As of December 31, 2019, all related compensation cost had been recognized.

12. 401(k) Savings Plan

In 2004, the Company established a defined-contribution savings plan under Section 401(k) of the Internal Revenue Code (the 401(k) Plan). The 401(k) Plan covers all employees who meet defined minimum age and service requirements, and allows participants to defer a portion of their annual compensation on a pretax basis. For the years 2019, 2018, and 2017, the Board approved matching contributions of up to \$10,000, \$8,500, and \$7,000, respectively, per eligible participant pursuant to the 401(k) Savings Plan's matching formula. All matching contributions and participant contributions vest immediately. Matching contributions totaled \$1.7 million, \$1.1 million, and \$0.7 million for the years ended December 31, 2019, 2018, and 2017, respectively, and have been recorded in the consolidated statement of operations and comprehensive loss.

13. Income Taxes

The Company provides for income taxes under ASC 740. Under ASC 740, the liability method is used in accounting for income taxes. Under this method, deferred tax assets and liabilities are determined based on differences between financial reporting and tax bases of assets and liabilities, and are measured using the enacted tax rates and laws that will be in effect when the differences are expected to reverse.

U.S. Tax Reform

On December 22, 2017, legislation commonly known as the Tax Cuts and Jobs Act (the Tax Act) was signed into law. The Tax Act, among other things, reduced the U.S. federal corporate tax rate from 35% to 21%, required taxpayers to pay a one-time transition tax on earnings of certain foreign subsidiaries that were previously tax deferred and created new taxes on certain foreign sourced earnings. The Company does not currently have any foreign subsidiaries and the international aspects of the Tax Act are not applicable as of December 31, 2019.

In connection with the Tax Act, as of December 31, 2017, the Company remeasured certain 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 balance was primarily offset by application of its valuation allowance.

Deferred tax assets and valuation allowance

The Company recorded a tax benefit of \$62,000 and \$27,000 for the years ended December 31, 2019 and 2018, respectively, related to the realization of current year losses that offset unrealized gains, recognized in other comprehensive income, from our investment portfolio. The Company recognized current income tax expense of \$32,000 for the year ended December 31, 2017 related state income taxes on its interest income.

Accelaron Pharma Inc.
Notes to Consolidated Financial Statements (Continued)
Years Ended December 31, 2019, 2018 and 2017

The Company's loss before income taxes was \$124.9 million, \$118.9 million and \$108.4 million for the years ended December 31, 2019, 2018 and 2017, respectively, and was generated entirely in the United States.

Deferred taxes are recognized for temporary differences between the basis of assets and liabilities for financial statement and income tax purposes. The significant components of the Company's deferred tax assets are comprised of the following (in thousands):

	Year Ended December 31,	
	2019	2018
Deferred tax assets:		
U.S. and state net operating loss carryforwards	\$ 184,355	\$ 149,170
Research and development credits	21,345	16,340
Stock compensation	14,024	13,819
Lease liabilities	7,090	—
Accruals and other temporary differences	5,584	3,626
Total deferred tax assets	232,398	182,955
Right of use asset	(6,429)	—
Less valuation allowance	(225,969)	(182,955)
Net deferred tax assets	\$ —	\$ —

The Company has evaluated the positive and negative evidence bearing upon the realizability of its deferred tax assets. Based on the Company's history of operating losses, the Company has concluded that it is more likely than not that the benefit of its deferred tax assets will not be realized. Accordingly, the Company has provided a full valuation allowance for deferred tax assets as of December 31, 2019 and 2018. The valuation allowance increased by \$43.0 million, \$37.3 million, and \$9.1 million during the years ended December 31, 2019, 2018, and 2017, respectively, due primarily to the generation of net operating losses during these periods, and the tax reform rate change during the year ended December 31, 2017.

A reconciliation of income tax expense computed at the statutory federal income tax rate to income taxes as reflected in the consolidated financial statements is as follows:

	Year Ended December 31,		
	2019	2018	2017
Federal income tax expense at statutory rate	21.0 %	21.0 %	34.0 %
State income tax, net of federal benefit	9.9 %	7.0 %	5.6 %
Permanent differences	0.2 %	2.0 %	1.9 %
Research and development credit	4.2 %	3.2 %	1.9 %
Tax reform rate change	— %	— %	(54.7)%
Other	(0.9)%	(0.6)%	(0.3)%
Change in valuation allowance	(34.4)%	(32.6)%	11.6 %
Effective income tax rate	— %	— %	— %

As of December 31, 2019 and 2018, the Company had U.S. federal net operating loss carryforwards of \$666.3 million and \$556.0 million, respectively, which may be available to offset future taxable income. Federal net operating loss carryforwards of \$438.0 million will expire at various dates from 2023 through 2037. \$228.3 million of the federal net operating loss carryforward can be carried forward indefinitely. As of December 31, 2019 and 2018, the Company also had U.S. state net operating loss carryforwards of \$689.8 million and \$515.0 million, respectively, which may be available to offset future income tax liabilities. State net operating loss carryforwards of \$689.4 million will expire at various dates from 2030 through 2039. State net operating loss carryforwards of \$0.4 million can be carried forward indefinitely.

As of December 31, 2019 and 2018, the Company had federal research and development and orphan drug tax credit carryforwards of \$14.5 million and \$10.7 million, respectively, available to reduce future tax liabilities which expire at various

Accelaron Pharma Inc.**Notes to Consolidated Financial Statements (Continued)****Years Ended December 31, 2019, 2018 and 2017**

dates through 2039. As of December 31, 2019 and 2018, the Company had state tax credit carryforwards of approximately \$8.7 million and \$7.1 million, respectively, available to reduce future tax liabilities which expire at various dates through 2034.

Under the provisions of the Internal Revenue Code, the net operating loss and tax credit carryforwards are subject to review and possible adjustment by the Internal Revenue Service and state tax authorities. Net operating loss and tax credit carryforwards may become subject to an annual limitation in the event of certain cumulative changes in the ownership interest of significant shareholders over a three-year period in excess of 50 percent, as defined under Sections 382 and 383 of the Internal Revenue Code, respectively, as well as similar state provisions. This could limit the amount of tax attributes that can be utilized annually to offset future taxable income or tax liabilities. The amount of the annual limitation is determined based on the value of the Company immediately prior to the ownership change. Subsequent ownership changes may further affect the limitation in future years. The Company has completed several financings since its inception which may have resulted in a change in control as defined by Sections 382 and 383 of the Internal Revenue Code, or could result in a change in control in the future. The Company has completed an assessment through December 31, 2017 to determine whether there may have been a Section 382 ownership change and determined that it is more-likely-than-not that the Company's net operating and tax credit amounts as disclosed are not subject to any material Section 382 limitations through December 31, 2017. If a change in ownership were to have occurred after that period, and resulted in the restriction of net operating loss and tax credit carryforwards, the reduction in the related deferred tax asset would be offset with a corresponding reduction in the valuation allowance.

The Company will recognize interest and penalties related to uncertain tax positions in income tax expense. As of December 31, 2019 and 2018, the Company had no accrued interest or penalties related to uncertain tax positions and no amounts have been recognized in the Company's consolidated statements of operations and comprehensive loss.

For all years through December 31, 2019, the Company generated research credits but has not conducted a study to document the qualified activities. This study may result in an adjustment to the Company's research and development credit carryforwards; however, until a study is completed and any adjustment is known, no amounts are being presented as an uncertain tax position for the years ended December 31, 2019 and 2018. A full valuation allowance has been provided against the Company's research and development credits and, if an adjustment is required, this adjustment would be offset by an adjustment to the deferred tax asset established for the research and development credit carryforwards and the valuation allowance.

The Company files income tax returns in the United States, and various state jurisdictions. The federal and state income tax returns are generally subject to tax examinations for the tax years ended December 31, 2016 through December 31, 2019. To the extent the Company has tax attribute carryforwards, the tax years in which the attribute was generated may still be adjusted upon examination by the Internal Revenue Service or state taxing authorities to the extent utilized in a future period.

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

14. Leases**Accounting under ASC 842**

In February 2016, the FASB issued Accounting Standards Codification Topic 842, *Leases* (ASC 842), which replaces the existing guidance for leases. ASC 842 requires lessees to recognize assets and liabilities on the balance sheet for the rights and obligations created by all leases with terms of more than 12 months. ASC 842 also requires certain qualitative and quantitative disclosures designed to give financial statement users information on the amount, timing, and uncertainty of cash flows arising from leases.

The Company adopted ASC 842 effective January 1, 2019. The Company elected to employ the transitional relief offered by the FASB under ASU 2018-11 and implemented the new standard without the restatement of comparative periods' financial information. ASU-2018-11 also provides for recognizing the effects of applying ASC 842 as a cumulative-effect adjustment to retained earnings as of January 1, 2019; however, no such adjustment was recorded as of January 1, 2019.

The Company elected to employ the package of practical expedients offered under ASC 842, which allowed the Company to not reassess the following:

- the presence of a lease in any expired or existing contracts;
- the lease classification for any existing or expired leases; and
- the initial direct costs for any existing leases.

The Company currently leases approximately 125,000 square feet of office and laboratory space in five adjacent buildings in Cambridge, Massachusetts (the Leases). The Leases were classified as operating leases under ASC 840. The Leases are also classified as operating leases under ASC 842 in accordance with the Company's election of the practical expedient under ASC 842. Pursuant to the package of practical expedients, the Company also did not reassess initial direct costs for the Leases. Additionally, the Company elected to account for the lease components and non-lease components as a single lease component.

The Company occupied the premises of the Leases at various points in time prior to January 1, 2019 under non-cancelable agreements which expire at various dates through September 2023. Each of the Leases have options to renew for periods ranging from three to five years, which are not included in the measurement of these leases. All of the Company's leases contain escalating rent clauses, which require higher rent payments in future years. There are no variable payments, exercise purchase options, penalties, fees, or residual value guarantees under the Leases. The Company is also obligated to pay the Landlord for certain costs, taxes, and operating expenses related to the premises. However, the Company has concluded that these payments are not in-substance fixed payments and therefore are not included in the calculation of the related lease liability and asset under ASC 842.

The Company recorded the liability associated with the Leases at the present value of the lease payments not yet paid, discounted using the discount rate for the Leases established at the adoption date. As the discount rate implicit in the Leases was typically not readily determinable, the Company utilized its incremental borrowing rate (IBR). In transition to ASC 842, the Company utilized the remaining lease term of its leases in determining the appropriate incremental borrowing rates.

The IBR for the Leases was determined by establishing a credit rating of the Company using the Ordered Logit (oLogit) model. The oLogit Model is a quantitative method to assess the credit rating of a company. Based on the established credit rating, the Company determined a borrowing rate using regression analysis on selected financial ratios of publicly traded comparable companies and the companies' credit ratings, adjusted for the risk-free rate, which resulted in an IBR of approximately 10%.

The Company recorded the liability associated with the Leases at the present value of the lease payments not yet paid, discounted using the incremental borrowing rate for each lease established at the adoption date. On January 1, 2019, the Company recorded a right-of-use asset in the amount of \$29.1 million, which represented a lease liability of \$31.0 million, adjusted for previously recognized lease-related balances, including deferred rent of \$2.7 million and prepaid rent of \$0.7 million. This lease liability will be reduced over the remaining lease term based on cash payments made offset by accretion of monthly interest calculated on the lease liability. The right-of-use asset will be amortized over the remaining lease term in an amount equal to the difference between the calculated straight-line expense of the total lease payments less the monthly interest calculated on the remaining lease liability. The adoption of ASC 842 did not have a material impact on the consolidated statement of operations and comprehensive loss for the year ended December 31, 2019, or the consolidated statement of cash flows for the year ended December 31, 2019.

Future minimum lease payments under the Company's non-cancelable operating leases as of December 31, 2019, are as follows (in thousands):

Accelaron Pharma Inc.
Notes to Consolidated Financial Statements (Continued)
Years Ended December 31, 2019, 2018 and 2017

	<u>As of December 31,</u>
	<u>2019</u>
2020	\$ 8,610
2021	8,336
2022	8,409
2023	6,450
Total lease payments	\$ 31,805
Less: imputed interest	(5,421)
Total operating lease liabilities	<u>\$ 26,384</u>

The Company recognizes rent expense, calculated as the remaining cost of the lease allocated over the remaining lease term on a straight-line basis. Rent expense is presented as a part of continuing operations in the consolidated statement of operations and comprehensive loss. For the year ended December 31, 2019, the Company recognized rent expense of \$8.2 million.

For the year ended December 31, 2019, the Company paid \$8.4 million in rent relating to the Leases. As payments resulting from an operating lease, the \$8.4 million is classified within operating activities in the consolidated statements of cash flows.

The following table contains supplemental balance sheet information pertaining to the Company's leases as of December 31, 2019:

	<u>As of December 31,</u>
	<u>2019</u>
Weighted average remaining lease term	3.7 years
Weighted average discount rate	10.59%

Accounting under ASC 840

Prior to the adoption of ASC 842, the Company recorded rent expense on a straight-line basis over the term of the lease, including any rent-free periods. In addition, the Company recorded deferred rent for certain lease incentives received, which were amortized as a reduction of rent expense over the life of the lease. Rent expense was presented as part of continuing operations in the consolidated statement of operations and comprehensive loss; deferred rent was recorded on the consolidated balance sheet.

As of December 31, 2018, the future minimum lease payments due were as follows (in thousands):

	<u>As of December 31,</u>
	<u>2018</u>
2019	\$ 8,195
2020	8,438
2021	8,180
2022	8,256
2023	6,333
Total future lease payments	<u>\$ 39,402</u>

The Company recorded total rent expense of \$5.8 million and \$4.8 million for the twelve months ending December 31, 2018 and 2017, respectively.

15. Related Party Transactions

Celgene (BMS)

In connection with the Company's January 2019, September 2017 and January 2016 public offerings, BMS purchased 706,206, 745,592 and 800,000 shares of common stock, respectively. In connection with these and prior transactions, BMS owned 12.0% and 12.2% of the Company's fully diluted equity as of December 31, 2019 and 2018, respectively.

Acceleron Pharma Inc.

Notes to Consolidated Financial Statements (Continued)

Years Ended December 31, 2019, 2018 and 2017

During the years ended December 31, 2019, 2018 and 2017, all revenue recognized by the Company was recognized under the BMS collaboration agreement. Refer to Note 10 for additional information regarding these collaboration agreements.

16. Quarterly Financial Data (unaudited)

The following table presents certain unaudited quarterly financial information for the previous eight quarters. This information has been prepared on the same basis as the audited financial statements and includes all adjustments (consisting only of normal recurring adjustments) necessary to present fairly the unaudited quarterly results of operations set forth herein.

	For the Three Months Ended(1)			
	March 31	June 30	September 30	December 31
	(in thousands except per share data)			
2019				
Total revenue	\$ 2,780	\$ 27,666	\$ 4,208	\$ 39,338
Total costs and expenses	43,585	48,802	53,131	64,919
Loss from operations	(40,805)	(21,136)	(48,923)	(25,581)
Net loss	(38,053)	(17,862)	(45,369)	(23,575)
Net loss per share- basic and diluted	\$ (0.74)	\$ (0.34)	\$ (0.86)	\$ (0.44)
2018				
Total revenue	\$ 3,232	\$ 3,685	\$ 3,258	\$ 3,816
Total costs and expenses	30,872	33,591	33,320	40,622
Loss from operations	(27,640)	(29,906)	(30,062)	(36,806)
Net income (loss)	(26,219)	(28,938)	(28,979)	(34,734)
Net loss per share- basic and diluted	\$ (0.58)	\$ (0.63)	\$ (0.63)	\$ (0.75)

(1) The amounts were computed independently for each quarter, and the sum of the quarters may not total the annual amounts.

Exhibit Index

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
3.1	Restated Certificate of Incorporation		Form 8-K (Exhibit 3.1)	9/24/2013	001-36065
3.2	Amended and Restated By-laws, as amended		Form 10-K (Exhibit 3.2)	2/27/2018	001-36065
4.1	Form of Common Stock Certificate		Form S-1/A (Exhibit 4.1)	9/6/2013	333-190417
4.2	Form of Amended and Restated Registration Rights Agreement		Form S-1 (Exhibit 4.2)	8/7/2013	333-190417
4.3	Form of Warrant to Purchase Stock, issued to Series E Investors as of June 10, 2010 and July 9, 2010		Form S-1 (Exhibit 4.3)	8/7/2013	333-190417
4.4	Description of Capital Stock	X			
10.1*	Form of Director Indemnification Agreement		Form S-1 (Exhibit 10.1)	8/7/2013	333-190417
10.2+	Amended and Restated Collaboration, License and Option Agreement between Acceleron Pharma Inc. and Celgene Corporation, dated as of September 18, 2017		Form 10-Q (Exhibit 10.2)	11/7/2017	001-36065
10.3+	Collaboration, License and Option Agreement between Acceleron Pharma Inc. and Celgene Corporation, dated as of August 2, 2011		Form 10-Q (Exhibit 10.1)	8/2/2018	001-36065
10.4	Amended and Restated License Agreement (ActRIIA) between Salk Institute for Biological Studies and Acceleron Pharma Inc., dated as of August 10, 2010		Form S-1 (Exhibit 10.10)	8/7/2013	333-190417
10.5	Amended and Restated License Agreement (ActRIIB) between Salk Institute for Biological Studies and Acceleron Pharma Inc., dated as of August 11, 2010		Form S-1 (Exhibit 10.11)	8/7/2013	333-190417
10.5.1	Amendment to Amended and Restated License Agreement (ActRIIB) between Salk Institute for Biological Studies and Acceleron Pharma Inc., dated as of July 25, 2014		Form 10-Q (Exhibit 10.1)	8/12/2014	001-36065
10.6	Indenture of Lease between Massachusetts Institute of Technology and Acceleron Pharma Inc., dated as of May 20, 2008		Form S-1 (Exhibit 10.12)	8/7/2013	333-190417
10.6.1	First Amendment to Lease, dated as of July 18, 2017, between MIT 128 Sidney Leasehold LLC and Acceleron Pharma Inc.		Form 8-K (Exhibit 10.1)	7/19/2017	001-36065
10.7*	Employment Agreement between Habib J. Dable and Acceleron Pharma Inc., dated as of September 23, 2016		Form 8-K (Exhibit 10.1)	9/27/2016	001-36065
10.8*	Amended and Restated Employment Agreement between Kevin F. McLaughlin and Acceleron Pharma Inc. dated as of January 31, 2014		Form 10-K (Exhibit 10.16)	3/2/2015	001-36065
10.8.1*	First Amendment to Amended and Restated Employment Agreement between Kevin F. McLaughlin and Acceleron Pharma Inc., dated as of September 9, 2015		Form 8-K (Exhibit 10.2)	9/11/2015	001-36065
10.9*	Amended and Restated Employment Agreement between John D. Quisel and Acceleron Pharma Inc., dated as of August 26, 2013		Form 10-K (Exhibit 10.15)	3/2/2015	001-36065
10.10*	Employment Agreement between Ravindra Kumar and Acceleron Pharma Inc., dated as of January 31, 2014		Form 10-Q (Exhibit 10.1)	5/8/2017	001-36065
10.11*	Offer Letter between Sujay Kango and Acceleron Pharma Inc., dated as of December 29, 2017		Form 10-K (Exhibit 10.11)	2/27/2019	001-36065
10.12*	Employment Agreement between Sujay Kango and Acceleron Pharma Inc., dated as of February 12, 2018		Form 10-K (Exhibit 10.12)	2/27/2019	001-36065

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Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
10.13*	Offer Letter between Robert K. Zeldin and Acceleron Pharma Inc., dated as of June 15, 2018		Form 10-K (Exhibit 10.13)	2/27/2019	001-36065
10.14*	Employment Agreement between Robert K. Zeldin and Acceleron Pharma Inc., dated as of June 29, 2018		Form 10-K (Exhibit 10.14)	2/27/2019	001-36065
10.15*	Acceleron Pharma Inc. Short-Term Incentive Compensation Plan		Form 8-K (Exhibit 10.1)	6/6/2016	001-36065
10.16*	Employee Stock Purchase Plan		Form S-1/A (Exhibit 10.20)	9/6/2013	333-190417
10.17*	Acceleron Pharma Inc. 2003 Stock Option and Restricted Stock Plan		Form S-1 (Exhibit 10.15)	8/7/2013	333-190417
10.18*	Acceleron Pharma Inc. 2013 Equity Incentive Plan		Form S-8 (Exhibit 4.4)	12/12/2013	333-192789
10.19*	Form of Non-Statutory Stock Option Agreement under the 2013 Equity Incentive Plan	X			
10.20*	Form of Incentive Stock Option Agreement under the 2013 Equity Incentive Plan		Form S-1 (Exhibit 10.22)	1/9/2014	333-193252
10.21*	Form of Restricted Stock Unit Award Agreement under the 2013 Equity Incentive Plan	X			
10.22*	Form of Performance-Based Restricted Stock Unit Award Agreement under the 2013 Equity Incentive Plan	X			
21.1	List of Subsidiaries	X			
23.1	Consent of Ernst & Young LLP, Independent Registered Public Accounting Firm	X			
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	X			
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	X			
32.1	Certification of Principal Executive Officer and Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002	X			
101.INS	Inline XBRL Instance Document	X			
101.SCH	XBRL Taxonomy Extension Schema Document	X			
101.CAL	XBRL Taxonomy Calculation Linkbase Document	X			
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document	X			
101.LAB	XBRL Taxonomy Label Linkbase Document	X			
101.PRE	XBRL Taxonomy Presentation Linkbase Document	X			
104	Cover Page Interactive Data File (formatted as Inline XBRL with applicable taxonomy extension information contained in Exhibits 101)	X			

+ Confidential treatment has been granted by, or is being requested from, the Securities and Exchange Commission as to certain portions of this Exhibit, which portions have been omitted and filed separately with the Securities and Exchange Commission as part of an application for confidential treatment pursuant to the Securities Act of 1933, as amended, and the Securities Exchange Act of 1934, as amended, as applicable.

* Management contract or compensatory plan or arrangement.

DESCRIPTION OF CAPITAL STOCK

The following description of the capital stock of Acceleron Pharma Inc. (“us,” “our,” “we” or the “Company”) is intended as a summary only. This summary is qualified in its entirety by reference to our restated certificate of incorporation and amended and restated by-laws, both of which have been filed with the Securities and Exchange Commission and are incorporated by reference to this Annual Report on Form 10-K for the year ended December 31, 2019, and to the applicable provisions of the Delaware General Corporation Law. We refer in this section to our restated certificate of incorporation as our certificate of incorporation, and we refer to our amended and restated by-laws as our by-laws.

Our authorized capital stock consists of 175,000,000 shares of our common stock, par value \$0.001 per share, and 25,000,000 shares of our preferred stock, par value \$0.001 per share, all of which preferred stock is undesignated. The common stock is registered under Section 12 of the Securities Exchange Act of 1934, as amended.

Common Stock

Dividend Rights. Subject to preferences that may apply to shares of preferred stock outstanding at the time, holders of outstanding shares of common stock will be entitled to receive dividends out of assets legally available at the times and in the amounts as the board of directors may from time to time determine.

Voting Rights. Each outstanding share of common stock will be entitled to one vote on all matters submitted to a vote of stockholders. Holders of shares of our common stock shall have no cumulative voting rights.

Preemptive Rights. Our common stock will not be entitled to preemptive or other similar subscription rights to purchase any of our securities.

Conversion or Redemption Rights. Our common stock will be neither convertible nor redeemable.

Liquidation Rights. Upon our liquidation, the holders of our common stock will be entitled to receive pro rata our assets which are legally available for distribution, after payment of all debts and other liabilities and subject to the prior rights of any holders of preferred stock then outstanding.

Listing. Our common stock is listed on the Nasdaq Global Market under the symbol "XLRN".

Transfer Agent and Registrar. The transfer agent and registrar for our common stock is Computershare Trust Company, N.A.

Preferred Stock

Our board of directors may, without further action by our stockholders, from time to time, direct the issuance of shares of preferred stock in series and may, at the time of issuance, determine the designations, powers, preferences, privileges, and relative participating, optional or special rights as well as the qualifications, limitations or restrictions thereof, including dividend rights, conversion rights, voting rights, terms of redemption and liquidation preferences, any or all of which may be greater than the rights of the common stock. Satisfaction of any dividend preferences of outstanding shares of preferred stock would reduce the amount of funds available for the payment of dividends on shares of our common stock. Holders of shares of preferred stock may be entitled to receive a preference payment in the event of our liquidation before any payment is made to the holders of shares of our common stock. Under certain circumstances, the issuance of shares of preferred stock may render more difficult or tend to discourage a merger, tender offer or proxy contest, the assumption of control by a holder of a large block of our securities or the removal of incumbent management. Upon the affirmative vote of a majority of the total number of directors then in office, our board of directors, without stockholder approval, may issue shares of preferred stock with voting and conversion rights which could adversely affect the holders of shares of our common stock and the market value of our common stock. There are no shares of preferred stock outstanding, and we have no present intention to issue any shares of preferred stock.

Registration Rights

We are party to an amended and restated registration rights agreement with certain holders of our common stock.

Under the amended and restated registration rights agreement, holders of registrable shares can demand that we file a registration statement or request that their shares be included on a registration statement that we are otherwise filing, in either case, registering the resale of their shares of common stock. These registration rights are subject to conditions and limitations, including the right, in certain circumstances, of the underwriters of an offering to limit the number of shares included in such registration and our right, in certain circumstances, not to effect a requested S-1 or S-3 registration within 60 days before the Company's estimated date of filing a registration statement or six months following the effective date of a registration statement pertaining to an underwritten public offering of securities for the account of the Company.

Demand Registration Rights. The holders of at least a majority of the registrable shares may require us to file a registration statement under the Securities Act of 1933, as amended (the "Securities Act") at our expense with respect to the resale of their registrable shares, and we are required to use our best efforts to effect the registration.

Piggyback Registration Rights. If we propose to register any of our securities under the Securities Act for our own account or the account of any other holder, the holders of registrable shares are entitled to notice of such registration and to request that we include registrable shares for resale on such registration statement, subject to the right of any underwriter to limit the number of shares included in such registration.

We will pay all registration expenses, other than underwriting discounts and commissions, related to any demand or piggyback registration. The amended and restated registration rights agreement contains customary cross-indemnification provisions, pursuant to which we are obligated to indemnify the selling stockholders, in the event of misstatements or omissions in the registration statement attributable to us and they are obligated to indemnify us for misstatements or omissions attributable to them, in each case, except in the event of fraud. The registration rights will not terminate until all registrable shares have been sold or no longer qualify as registrable shares.

Anti-Takeover Effects of Our Certificate of Incorporation and Our By-Laws

Our certificate of incorporation and by-laws contain certain provisions that are intended to enhance the likelihood of continuity and stability in the composition of our board of directors and which may have the effect of delaying, deferring or preventing a future takeover or change in control of the company unless such takeover or change in control is approved by our board of directors.

These provisions include:

Classified Board. Our certificate of incorporation provides that our board of directors be divided into three classes of directors, with the classes as nearly equal in number as possible. As a result, approximately one-third of our board of directors will be elected each year. The classification of directors has the effect of making it more difficult for stockholders to change the composition of our board. Our certificate of incorporation also provides that, subject to any rights of holders of preferred stock to elect additional directors under specified circumstances, the number of directors is fixed exclusively pursuant to a resolution adopted by our board of directors.

Action by Written Consent; Special Meetings of Stockholders. Our certificate of incorporation provides that, except as otherwise provided for by a resolution of the board of directors providing for the issuance of a series of preferred stock, stockholder action can be taken only at an annual or special meeting of stockholders and cannot be taken by written consent in lieu of a meeting. Our certificate of incorporation and the by-laws also provide that, except as otherwise required by law, and subject to any special rights of the holders of preferred stock, special meetings of the stockholders can only be called pursuant to a resolution adopted by a majority of the board of directors. Except as described above, stockholders are not permitted to call a special meeting or to require the board of directors to call a special meeting.

Removal of Directors. Our certificate of incorporation provides that, subject to any special rights of holders of preferred stock, our directors may be removed only for cause by the affirmative vote of at least 75% of the voting power of our outstanding shares of capital stock, voting together as a single class. This requirement of a supermajority vote to remove directors could enable holders of a minority of our capital stock to prevent a change in the composition of our board.

Advance Notice Procedures. Our by-laws establish an advance notice procedure for stockholder proposals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to the board of directors. Stockholders at an annual meeting will only be able to consider proposals or nominations specified in the notice of meeting or brought before the meeting by or at the direction of the board of directors or by

a stockholder who was a stockholder of record on the record date for the meeting, who is entitled to vote at the meeting and who has given our Secretary timely written notice, in proper form, of the stockholder's intention to bring that business before the meeting. Although the by-laws do not give the board of directors the power to approve or disapprove stockholder nominations of candidates or proposals regarding other business to be conducted at a special or annual meeting, the by-laws may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed or may discourage or deter a potential acquiror from conducting a solicitation of proxies to elect its own slate of directors or otherwise attempting to obtain control of the company.

Supermajority Approval Requirements. The Delaware General Corporation Law generally provides that the affirmative vote of a majority of the shares entitled to vote on any matter is required to amend a corporation's certificate of incorporation or by-laws, unless either a corporation's certificate of incorporation or by-laws require a greater percentage. Our certificate of incorporation provides that the affirmative vote of holders of at least 75% of the voting power of the outstanding shares of our capital stock is required to amend, alter, change or repeal our by-laws. This requirement of a supermajority vote to approve amendments to our by-laws could enable holders of a minority of our capital stock to exercise veto power over any such amendments.

Authorized but Unissued Shares. Our authorized but unissued shares of common stock and preferred stock will be available for future issuance without stockholder approval. These additional shares may be utilized for a variety of corporate purposes, including future public offerings to raise additional capital, corporate acquisitions and employee benefit plans. The existence of authorized but unissued shares of common stock and preferred stock could render more difficult or discourage an attempt to obtain control of a majority of our common stock by means of a proxy contest, tender offer, merger or otherwise.

Exclusive Forum. Our certificate of incorporation provides that, subject to limited exceptions, the state or federal court located within the State of Delaware is the sole and exclusive forum for (1) any derivative action or proceeding brought on our behalf, (2) any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders, (3) any action asserting a claim against us arising pursuant to any provision of the Delaware General Corporation Law, our certificate of incorporation or our by-laws, or (4) any other action asserting a claim against us that is governed by the internal affairs doctrine. Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and to have consented to the provisions of our certificate of incorporation described above. Although we believe these provisions benefit us by providing increased consistency in the application of Delaware law for the specified types of actions and proceedings, the provisions may have the effect of discouraging lawsuits against our directors and officers. The enforceability of similar choice of forum provisions in other companies' certificates of incorporation has been challenged in legal proceedings, and it is possible that, in connection with one or more actions or proceedings described above, a court could find the choice of forum provisions contained in our certificate of incorporation to be inapplicable or unenforceable.

Section 203 of the Delaware General Corporation Law. We are subject to the provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits a publicly held Delaware corporation from engaging in a "business combination" with an "interested stockholder" for a three-year period following the time that this stockholder becomes an interested stockholder, unless the business combination is approved in a prescribed manner. A "business combination" includes, among other things, a merger, asset or stock sale or other transaction resulting in a financial benefit to the interested stockholder. An "interested stockholder" is a person who, together with affiliates and associates, owns, or did own within three years prior to the determination of interested stockholder status, 15% or more of the corporation's voting stock.

Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions: before the stockholder became interested, the board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder; upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances; or at or after the time the stockholder became interested, the business combination was approved by the board of directors of the corporation and authorized at an annual or special meeting of the stockholders by the

affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

A Delaware corporation may "opt out" of these provisions with an express provision in its original certificate of incorporation or an express provision in its certificate of incorporation or by-laws resulting from a stockholders' amendment approved by at least a majority of the outstanding voting shares. We have not opted out of these provisions. As a result, mergers or other takeover or change in control attempts of us may be discouraged or prevented.

Name:	[•]
Number of Shares of Stock subject to Stock Option:	[•]
Exercise Price Per Share:	[\$•]
Date of Grant:	[•]
Vesting Start Date:	[•]

**ACCELERON PHARMA INC.
2013 EQUITY INCENTIVE PLAN**

NON-STATUTORY STOCK OPTION AGREEMENT

This agreement (this “Agreement”) evidences a stock option granted by Acceleron Pharma Inc. (the “Company”) to the undersigned (the “Optionee”) pursuant to and subject to the terms of the Acceleron Pharma Inc. 2013 Equity Incentive Plan (as amended from time to time, the “Plan”).

1. Grant of Stock Option. The Company grants to the Optionee on the date set forth above (the “Date of Grant”) an option (the “Stock Option”) to purchase, on the terms provided herein and in the Plan, up to the number of shares of Stock set forth above (the “Shares”) with an exercise price per Share as set forth above, in each case subject to adjustment pursuant to Section 7(b) of the Plan in respect of transactions occurring after the date hereof.

The Stock Option evidenced by this Agreement is a non-statutory option (that is, an option that does not qualify as an incentive stock option under Section 422 of the Code) and is granted to the Optionee in connection with the Optionee’s employment by or service to the Company and its qualifying subsidiaries. For purposes of the immediately preceding sentence, “qualifying subsidiary” means a subsidiary of the Company as to which the Company has a “controlling interest” as described in Treas. Regs. §1.409A-1(b)(5)(iii)(E)(1).

2. Meaning of Certain Terms. Except as otherwise defined herein, all capitalized terms used herein have the same meaning as in the Plan. The following terms have the following meanings:

- (a) “Beneficiary” means, in the event of the Optionee’s death, the beneficiary named in the written designation (in form acceptable to the Administrator) most recently filed with the Administrator by the Optionee prior to the Optionee’s death and not subsequently revoked, or, if there is no such designated beneficiary, the executor or administrator of the Optionee’s estate. An effective beneficiary designation will be treated as having been revoked only upon receipt by the Administrator, prior to the Optionee’s death, of an instrument of revocation in form acceptable to the Administrator.

- (b) [“Employment” means, unless otherwise determined by the Administrator, the Participant’s employment with the Company or its Affiliates. Unless otherwise determined by the Administrator, the Participant’s Employment will terminate at such time as the Participant ceases to be an employee of the Company or its Affiliates.]¹
- (c) “Option Holder” means the Optionee or, if as of the relevant time the Stock Option has passed to a Beneficiary, the Beneficiary.

3. Vesting; Method of Exercise; Treatment of the Stock Option Upon Cessation of Employment.

- (a) Vesting. As used herein with respect to the Stock Option or any portion thereof, the term “vest” means to become exercisable and the term “vested” as applied to any outstanding Stock Option means that the Stock Option is then exercisable, subject in each case to the terms of the Plan. Unless earlier terminated, forfeited, relinquished or expired, the Stock Option will vest as to [●]. Notwithstanding the foregoing, Shares subject to the Stock Option shall not vest on any vesting date unless the Optionee has remained in continuous Employment from the Date of Grant through such vesting date.
- (b) Exercise of the Stock Option. No portion of the Stock Option may be exercised until such portion vests. Each election to exercise any vested portion of the Stock Option will be subject to the terms and conditions of the Plan and shall be in writing, signed by the Option Holder (or in such other form as is acceptable to the Administrator). Each such written exercise election must be received by the Company at its principal office or by such other party as the Administrator may prescribe and be accompanied by payment in full as provided in the Plan. The exercise price may be paid (i) by cash or check acceptable to the Administrator, (ii) to the extent permitted by the Administrator, through a broker-assisted cashless exercise program acceptable to the Administrator, (iii) by such other means, if any, as may be acceptable to the Administrator, or (iv) by any combination of the foregoing permissible forms of payment. In the event that the Stock Option is exercised by a person other than the Optionee, the Company will be under no obligation to deliver Shares hereunder unless and until it is satisfied as to the authority of the Option Holder to exercise the Stock Option and compliance with applicable securities laws. The latest date on which the Stock Option or any portion thereof may be exercised will be the 10th anniversary of the Date of Grant (the “Final Exercise Date”); provided, however, if at such time the Optionee is prohibited by applicable law or written Company policy applicable to similarly situated employees from engaging in any open-market sales of Stock, the Final Exercise Date will be automatically extended to thirty (30) days following the date the Optionee is no longer prohibited from engaging in such open-market sales. If the Stock Option is not exercised by the Final Exercise

¹Note: Not applicable for non-employee directors.

Date the Stock Option or any remaining portion thereof will thereupon immediately terminate.

- (c) Treatment of the Stock Option Upon Cessation of Employment. If the Optionee's Employment ceases, the Stock Option, to the extent not already vested will be immediately forfeited, and any vested portion of the Stock Option that is then outstanding will be treated as follows:
- (i) Subject to clauses (ii) and (iii) below and Section 4 of this Agreement, the Stock Option, to the extent vested immediately prior to the cessation of the Optionee's Employment, will remain exercisable until the earlier of (A) the date that is three months following the date of such cessation of Employment, or (B) the Final Exercise Date, and except to the extent previously exercised as permitted by this Section 3(c)(i) will thereupon immediately terminate.
 - (ii) Subject to clauses (iii) below and Section 4 of this Agreement, the Stock Option, to the extent vested immediately prior to the cessation of the Optionee's Employment due to death, will remain exercisable until the earlier of (A) the first anniversary of the Optionee's death or (B) the Final Exercise Date, and except to the extent previously exercised as permitted by this Section 3(c)(ii) will thereupon immediately terminate.
 - (iii) If the Optionee's Employment is terminated by the Company or its Affiliates in connection with an act or failure to act constituting Cause (as the Administrator, in its sole discretion, may determine), or such termination occurs in circumstances that in the determination of the Administrator would have entitled the Company and its subsidiaries to terminate the Optionee's Employment for Cause, the Stock Option (whether or not vested) will immediately terminate and be forfeited upon such termination.

4. Forfeiture; Recovery of Compensation.

- (a) The Administrator may cancel, rescind, withhold or otherwise limit or restrict the Stock Option at any time if the Optionee is not in compliance with all applicable provisions of this Agreement and the Plan.
- (b) By accepting the Stock Option, the Optionee expressly acknowledges and agrees that his or her rights, and those of any permitted transferee of the Stock Option, under the Stock Option, including to any Stock acquired under the Stock Option or proceeds from the disposition thereof, are subject to Section 6(a)(5) of the Plan (including any successor provision). Nothing in the preceding sentence shall be construed as limiting the general application of Section 8 of this Agreement.

5. Transfer of Stock Option. The Stock Option may not be transferred except as expressly permitted under Section 6(a) (3) of the Plan.

6. Withholding. The exercise of this Stock Option will give rise to “wages” subject to withholding. The Optionee expressly acknowledges and agrees that the Optionee’s rights hereunder, including the right to be issued Shares upon exercise, are subject to the Optionee promptly paying to the Company in cash (or by such other means as may be acceptable to the Administrator in its discretion) all taxes required to be withheld. No Shares will be transferred pursuant to the exercise of this Stock Option unless and until the person exercising this Stock Option has remitted to the Company an amount in cash sufficient to satisfy any federal, state, or local withholding tax requirements, or has made other arrangements satisfactory to the Company with respect to such taxes. The Optionee authorizes the Company and its subsidiaries to withhold such amount from any amounts otherwise owed to the Optionee, but nothing in this sentence shall be construed as relieving the Optionee of any liability for satisfying his or her obligation under the preceding provisions of this Section

7. Effect on Employment. Neither the grant of the Stock Option, nor the issuance of Shares upon exercise of the Stock Option, will give the Optionee any right to be retained in the employ or service of the Company or any of its Affiliates, affect the right of the Company or any of its Affiliates to discharge or discipline such Optionee at any time, or affect any right of such Optionee to terminate his or her Employment at any time.

8. Provisions of the Plan. This Agreement is subject in its entirety to the provisions of the Plan, which are incorporated herein by reference. A copy of the Plan as in effect on the Date of Grant has been furnished to the Optionee. By exercising all or any part of the Stock Option, the Optionee agrees to be bound by the terms of the Plan and this Agreement. In the event of any conflict between the terms of this Agreement and the Plan, the terms of the Plan shall control (except as otherwise expressly provided in Section 2 above).

9. Acknowledgements. The Optionee acknowledges and agrees that (i) this Agreement may be executed in two or more counterparts, each of which shall be an original and all of which together shall constitute one and the same instrument, (ii) this agreement may be executed and exchanged using facsimile, portable document format (PDF) or electronic signature, which, in each case, shall constitute an original signature for all purposes hereunder and (iii) such signature by the Company will be binding against the Company and will create a legally binding agreement when this Agreement is countersigned by the Optionee.

[Signature page follows.]

IN WITNESS WHEREOF, the Company has caused this Agreement to be executed by its duly authorized officer.

ACCELERON PHARMA INC.

By: _____

Name:

Title:

Dated:

Acknowledged and Agreed:

By: _____

[Optionee's Name]

In connection with grants of stock options under the 2013 Equity Incentive Plan, it is the Company's policy to provide the recipient with a copy of the Prospectus for the Plan. Please sign below to acknowledge receipt of the Prospectus. If you have not received the Prospectus, please contact a representative of the Company.

I acknowledge receipt of a Prospectus for the 2013 Equity Incentive Plan.

By: _____

[Optionee's Name]

Name:	[●]
Number of Restricted Stock Units subject to Award:	[●]
Date of Grant:	[●]

**ACCELERON PHARMA INC.
2013 EQUITY INCENTIVE PLAN**

RESTRICTED STOCK UNIT AWARD AGREEMENT

This agreement (the “Agreement”) evidences an award (the “Award”) of restricted stock units (the “Restricted Stock Units”) granted by Acceleron Pharma Inc. (the “Company”) to the undersigned (the “Participant”) pursuant and subject to the terms and conditions of the Acceleron Pharma Inc. 2013 Equity Incentive Plan (as amended from time to time, the “Plan”), which is incorporated herein by reference. Except as otherwise defined herein, all capitalized terms used herein have the same meaning as in the Plan.

1. Restricted Stock Unit Award.

On the date of grant set forth above (the “Date of Grant”) the Company granted to the Participant the Award, consisting of the right to receive on the terms provided herein and in the Plan, one share of Stock with respect to each Restricted Stock Unit forming part of the Award, in each case, subject to adjustment pursuant to Section 7 of the Plan in respect of transactions occurring after the date hereof.

2. Vesting; Termination of Employment.

- (a) Time-Based Vesting. This Award shall vest with respect to [●]. Notwithstanding the foregoing, no Restricted Stock Units shall vest on any vesting date unless the Participant has remained in continuous Employment from the Date of Grant through such vesting date.
- (b) Termination of Employment. Automatically and immediately upon the cessation of the Participant’s Employment (i) the unvested portion of this Award shall terminate and be forfeited for no consideration, and (ii) the vested portion of this Award, if any, shall terminate and be forfeited for no consideration if the Participant’s Employment is terminated by the Company or its Affiliates in connection with an act or failure to act constituting Cause (as the Administrator, in its sole discretion, may determine), or if such termination occurs in circumstances that in the determination of the Administrator would have entitled the Company or its Affiliates to terminate the Participant’s Employment for Cause.

3. Delivery of Shares.

The Company shall, as soon as practicable upon the vesting of the Restricted Stock Units or any portion thereof (but in no event later than thirty (30) days following the date on which such Restricted Stock Units, or any portion thereof, vest) effect delivery of the Stock with respect to such vested Restricted Stock Units, or any portion thereof, to the Participant (or, in the event of the Participant's death, to the person to whom the Award has passed by will or the laws of descent and distribution). No shares of Stock will be issued pursuant to this Award unless and until all legal requirements applicable to the issuance or transfer of such shares have been complied with to the satisfaction of the Administrator.

4. Forfeiture; Recovery of Compensation.

The Administrator may cancel, rescind, withhold or otherwise limit or restrict this Award at any time if the Participant is not in compliance with all applicable provisions of this Agreement and the Plan. By accepting this Award, the Participant expressly acknowledges and agrees that his or her rights, and those of any permitted transferee of this Award, under this Award, including the right to any shares of Stock acquired under this Award or proceeds from the disposition thereof, are subject to Section 6(a)(5) of the Plan (including any successor provision). Nothing in the preceding sentence shall be construed as limiting the general application of Section 11 of this Agreement.

5. Dividends; Other Rights.

This Award shall not be interpreted to bestow upon the Participant any equity interest or ownership in the Company or any Affiliate prior to the date on which the Company delivers shares of Stock (if any) to the Participant. The Participant is not entitled to vote any shares of Stock by reason of the granting of this Award nor is the Participant entitled to receive or be credited with any dividends declared and payable on any share of Stock prior to the date on which any such share is delivered to the Participant hereunder. The Participant shall have the rights of a shareholder only as to those shares of Stock, if any, that are actually delivered under this Award.

6. Certain Tax Matters.

The Participant expressly acknowledges that because this Award consists of an unfunded and unsecured promise by the Company to deliver Stock in the future, subject to the terms hereof, it is not possible to make a so-called "83(b) election" with respect to this Award. In no event shall the Company have any liability relating to the failure or alleged failure of any payment or benefit under this Agreement to comply with, or be exempt from, the requirements of Section 409A.

7. Covered Transaction.

In the event of a Covered Transaction, the Administrator may require that any amounts delivered, exchanged, or otherwise paid in respect of the outstanding and then unvested portion of this Award be placed in escrow or otherwise made subject to such restrictions as the Administrator deems appropriate to carry out the intent of the Plan.

8. Withholding.

- (a) No shares of Stock will be delivered pursuant to this Award unless and until the Participant shall have remitted to the Company in cash or by check an amount sufficient to satisfy any federal, state or local withholding tax requirements or tax payments, or shall have made other arrangements satisfactory to the Administrator with respect to such taxes.
- (b) The Participant acknowledges and agrees that the minimum federal, state and local tax withholding due in connection with the vesting and settlement of the Restricted Stock Units (or portion thereof) may, in the Administrator's sole discretion, be satisfied by the Company, pursuant to such procedures as it may specify from time to time, withholding a number of shares of Stock otherwise deliverable upon settlement of the Restricted Stock Units (or portion thereof) having an aggregate fair market value sufficient to satisfy all or part, as determined by the Administrator, of such federal, state and local withholding tax requirements. In addition, the Administrator hereby reserves the discretion to use any one or more methods permitted by the Plan to satisfy the Participant's obligations with respect to the federal, state and local withholding tax requirements attributable to the Restricted Stock Units, or portion thereof, being settled.
- (c) The Participant authorizes the Company and its subsidiaries to withhold any amounts due in respect of any required tax withholdings or payments from any amounts otherwise owed to the Participant, but nothing in this sentence shall be construed as relieving the Participant of any liability for satisfying his or her obligation under the preceding provisions of this Section 8.

9. Transfer of Award.

This Award may not be transferred except as expressly permitted under Section 6(a)(3) of the Plan.

10. Effect on Employment.

Neither the grant of this Award, nor the issuance of Stock upon the vesting of this Award, will give the Participant any right to be retained in the employ or service of the Company or any of its Affiliates, affect the right of the Company or any of its Affiliates to discharge or discipline the Participant at any time, or affect any right of the Participant to terminate his or her Employment at any time.

11. Provisions of the Plan.

This Agreement is subject in its entirety to the provisions of the Plan, which are incorporated herein by reference. A copy of the Plan as in effect on the Date of Grant has been furnished to the Participant. By accepting all or any part of this Award, the Participant agrees to be bound by the terms of the Plan and this Agreement. In the event of any conflict between the

terms of this Agreement and the Plan, the terms of the Plan shall control (except as otherwise expressly provided in Section 12 below).

12. Meaning of Certain Terms.

Except as otherwise defined herein, all capitalized terms used herein have the same meaning as in the Plan. For purposes of this Award, the following term has the following meaning:

“Employment” means, unless otherwise determined by the Administrator, the Participant’s employment with the Company or its Affiliates. Unless otherwise determined by the Administrator, the Participant’s Employment will terminate at such time as the Participant ceases to be an employee of the Company or its Affiliates.¹

13. Acknowledgements.

The Participant acknowledges and agrees that (i) this Agreement may be executed in two or more counterparts, each of which shall be an original and all of which together shall constitute one and the same instrument, (ii) this agreement may be executed and exchanged using facsimile, portable document format (PDF) or electronic signature, which, in each case, shall constitute an original signature for all purposes hereunder and (iii) such signature by the Company will be binding against the Company and will create a legally binding agreement when this Agreement is countersigned by the Participant.

[Signature page follows.]

¹Note: Not applicable to non-employee directors.

IN WITNESS WHEREOF, the Company has caused this Agreement to be executed by its duly authorized officer.

ACCELERON PHARMA INC.

By: _____

Name:

Title:

Dated:

Acknowledged and Agreed:

By: _____

[Participant's Name]

In connection with grants of restricted stock units under the 2013 Equity Incentive Plan, it is the Company's policy to provide the recipient with a copy of the Prospectus for the Plan. Please sign below to acknowledge receipt of the Prospectus. If you have not received the Prospectus, please contact a representative of the Company.

I acknowledge receipt of a Prospectus for the 2013 Equity Incentive Plan.

By: _____

[Participant's Name]

Name:	[●]
Target Number of PSUs subject to Award:	[●]
Date of Grant:	[●]

ACCELERON PHARMA INC.
2013 EQUITY INCENTIVE PLAN
PERFORMANCE-BASED RESTRICTED STOCK UNIT AWARD AGREEMENT

This agreement (including any exhibits hereto, this “Agreement”) evidences an award (this “Award”) of performance-based restricted stock units (the “PSUs”) granted by Acceleron Pharma Inc. (the “Company”) to the undersigned (the “Participant”) pursuant and subject to the terms and conditions of the Acceleron Pharma Inc. 2013 Equity Incentive Plan (as amended from time to time, the “Plan”), which is incorporated herein by reference. Except as otherwise defined herein, all capitalized terms used herein have the same meaning as in the Plan.

1. PSU Award.

On the date of grant set forth above (the “Date of Grant”), the Company granted to the Participant this Award consisting of the target number of PSUs set forth above (the “Target Award”) and giving the Participant the conditional right to receive, on the terms and conditions provided herein and in the Plan, one share of Stock with respect to each PSU forming part of this Award, in each case, subject to adjustment pursuant to Section 7 of the Plan in respect of transactions occurring after the date hereof. The percentage of the Target Award that may be earned by the Participant will be determined in accordance with Exhibit A hereto.

2. Earned PSUs. The PSUs shall be eligible to become earned as set forth on Exhibit A, subject to the Compensation Committee determining, in its sole discretion, the level of achievement of the applicable performance milestones.

3. Vesting Conditions; Termination of Employment; Change in Control.

- (a) Vesting Conditions. Except as provided in Section 3(b) below, this Award shall vest on the later of (1) “Final Determination Date” (as such term is defined in Exhibit A) and (2) [●] as to any PSUs that are then determined to have been earned; provided, that no PSUs shall vest pursuant to this Section 3(a) unless the Participant has remained in continuous Employment from the Date of Grant through such date. For purposes of this Agreement, “Employment” means, unless otherwise determined by the Administrator, the Participant’s employment with the Company or one of its Affiliates. Unless otherwise determined by the Administrator, the Participant’s Employment will terminate at such time as the Participant ceases to be an employee of the Company and its Affiliates.

- (b) Termination of Employment. Automatically and immediately upon the termination of the Participant's Employment for any reason, all outstanding PSUs shall terminate and be forfeited for no consideration. Notwithstanding the foregoing, if the Participant's Employment is terminated by the Company or its Affiliates without Cause and in the absence of any Cause Circumstances, any PSUs that have been determined to be earned on any Determination Date prior to, or are determined to be earned in connection with, such termination shall vest as of immediately prior to such termination. "Cause Circumstances" means a termination of the Participant's Employment that occurred in circumstances that in the determination of the Administrator would have entitled the Company or its Affiliates to terminate the Participant's Employment for Cause.
- (c) Change in Control. Notwithstanding anything to the contrary in the Plan or this Agreement, in the event of a Change in Control (as such term is defined in Exhibit A hereto), any PSUs that are determined to be earned in connection with such Change in Control shall vest as of immediately prior to the consummation of the Change in Control, subject to the Participant's continued Employment through such Change in Control.

4. Delivery of Shares.

The Company shall, as soon as practicable upon the vesting of any PSU hereunder but in no event later than thirty (30) days following the date of vesting, transfer one (1) share of Stock to the Participant (or, in the event of the Participant's death, to the person to whom this Award has passed by will or the laws of descent and distribution) for each PSU that vests pursuant to Section 3 above. No shares of Stock will be transferred pursuant to this Award unless and until all legal requirements applicable to the issuance or transfer of such shares have been satisfied. Subject to the immediately preceding sentence and to Section 7 of the Plan, any shares of Stock to be transferred in connection with PSUs vesting under Section 3(c) shall be transferred on a basis that to the satisfaction of the Administrator is consistent with the Participant being treated as a shareholder with respect to such shares in connection with the Change in Control.

5. Forfeiture; Recovery of Compensation.

The Administrator may cancel, rescind, withhold or otherwise limit or restrict this Award at any time if the Participant is not in compliance with all applicable provisions of this Agreement and the Plan. By accepting this Award, the Participant expressly acknowledges and agrees that his or her rights under this Award, and those of any permitted transferee of this Award, including the right to any shares of Stock acquired under this Award or proceeds from the disposition thereof, are subject to Section 6(a)(5) of the Plan (including any successor provision). Nothing in the preceding sentence shall be construed as limiting the general application of Section 11 of this Agreement.

6. Dividends; Other Rights.

This Award shall not be interpreted to bestow upon the Participant any equity interest or ownership in the Company or any Affiliate prior to the date on which the Company delivers shares of Stock (if any) to the Participant. The Participant is not entitled to vote any shares of Stock by reason of the granting of this Award nor is the Participant entitled to receive or be credited with any dividends declared and payable on any share of Stock prior to the date on which any such share is delivered to the Participant hereunder. The Participant shall have the rights of a shareholder only as to those shares of Stock, if any, that are actually delivered under this Award.

7. Certain Tax Matters.

The Participant expressly acknowledges that because this Award consists of an unfunded and unsecured promise by the Company to deliver Stock in the future, subject to the terms hereof, it is not possible to make a so-called "83(b) election" with respect to this Award. This Award is intended to be exempt from Section 409A as a "short term deferral" arrangement and shall be so construed, but in no event shall the Company or any of its Affiliates have any liability relating to the failure or alleged failure of any payment or benefit under this Agreement to comply with, or be exempt from, the requirements of Section 409A.

8. Covered Transaction.

In the event of a Covered Transaction that is not a Change in Control, the Award shall be subject to Section 7(a) of the Plan.

9. Withholding.

- (a) No shares of Stock will be delivered pursuant to this Award unless and until the Participant shall have remitted to the Company in cash or by check an amount sufficient to satisfy any federal, state or local withholding tax requirements or tax payments, or shall have made other arrangements satisfactory to the Administrator with respect to such taxes.
- (b) The Participant acknowledges and agrees that the minimum federal, state and local tax withholding due in connection with the vesting and settlement of the PSUs (or portion thereof) may, in the Administrator's sole discretion, be satisfied by the Company, pursuant to such procedures as it may specify from time to time, withholding a number of shares of Stock otherwise deliverable upon settlement of the PSUs (or portion thereof) having an aggregate fair market value sufficient to satisfy all or part, as determined by the Administrator, of such federal, state and local withholding tax requirements. In addition, the Administrator hereby reserves the discretion to use any one or more methods permitted by the Plan to satisfy the Participant's obligations with respect to the federal, state and local withholding tax requirements attributable to the PSUs being settled. The Participant authorizes the Company and its subsidiaries to withhold any amounts due in respect of any required tax withholdings or payments from any amounts

otherwise owed to the Participant. Nothing in this Section 9(b) shall be construed as relieving the Participant of any liability for satisfying his or her obligation under the preceding provisions of this Section 9.

- (c) If the Participant does not satisfy the Participant's obligations with respect to the federal, state and local withholding tax requirements within sixty (60) days following the vesting of this Award, the Administrator may, in its discretion, cancel this Award for no consideration payable to the Participant.

10. Transfer of Award.

This Award may not be transferred except as expressly permitted under Section 6(a)(3) of the Plan.

11. Effect on Employment.

Neither the grant of this Award, nor the issuance of Stock upon the vesting of this Award, will give the Participant any right to be retained in the employ or service of the Company or any of its Affiliates, affect the right of the Company or any of its Affiliates to discharge or discipline the Participant at any time, or affect any right of the Participant to terminate his or her Employment at any time.

12. Provisions of the Plan.

This Agreement is subject in its entirety to the provisions of the Plan, which are incorporated herein by reference. A copy of the Plan as in effect on the Date of Grant has been furnished to the Participant. By accepting all or any part of this Award, the Participant agrees to be bound by the terms of the Plan and this Agreement. In the event of any conflict between the terms of this Agreement and the Plan, the terms of the Plan shall control (except as otherwise expressly provided herein).

13. Acknowledgements.

The Participant acknowledges and agrees that (i) this Agreement may be executed in two or more counterparts, each of which shall be an original and all of which together shall constitute one and the same instrument, (ii) this agreement may be executed and exchanged using facsimile, portable document format (PDF) or electronic signature, which, in each case, shall constitute an original signature for all purposes hereunder and (iii) such signature by the Company will be binding against the Company and will create a legally binding agreement when this Agreement is countersigned by the Participant.

[Signature page follows.]

IN WITNESS WHEREOF, the Company has caused this Agreement to be executed by its duly authorized officer.

ACCELERON PHARMA INC.

By: _____
Name:
Title:

Dated:

Acknowledged and Agreed:

By: _____
[•]

In connection with grants of PSUs under the 2013 Equity Incentive Plan, it is the Company's policy to provide the recipient with a copy of the Prospectus for the Plan. Please sign below to acknowledge receipt of the Prospectus. If you have not received the Prospectus, please contact a representative of the Company.

I acknowledge receipt of a Prospectus for the 2013 Equity Incentive Plan.

By: _____
[•]

Exhibit A

1. General. The PSUs will be eligible to be earned subject to the terms and conditions of Section 3 of this Exhibit A based on achievement of the Milestones (as defined below).
2. Definitions. The terms set forth below, as used in this Exhibit A, shall have the following meanings:
 - a. "Change in Control" means (i) the acquisition of beneficial ownership (as defined in Rule 13d-3 under the Securities Exchange Act of 1934, as amended (the "Exchange Act")) directly or indirectly by any "person" (as such term is used in Sections 13(d) and 14(d) of the Exchange Act) of securities of the Company representing a majority or more of the combined voting power of the Company's then outstanding securities, other than an acquisition of securities for investment purposes pursuant to a bona fide financing of the Company; (ii) a merger or consolidation of the Company with any other corporation in which the holders of the voting securities of the Company prior to the merger or consolidation do not own more than 50% of the total voting securities of the surviving corporation; or (iii) the sale or disposition by the Company of all or substantially all of the Company's assets other than a sale or disposition of assets to an entity whose equity interests are held, directly or indirectly, entirely by the same persons and in the same proportions as the equity interests of the Company.
 - b. "Determination Date" shall mean any date on which the Compensation Committee determines, based on the achievement of one or more Milestones, whether any PSUs have been earned, which determinations are expected to occur on at least a calendar quarter basis.
 - c. "Final Determination Date" shall mean the last Determination Date on which the Compensation Committee determines the number of earned PSUs, which date shall occur not later than thirty (30) days after the close of the Performance Period and may, for the avoidance of doubt, be a Determination Date prior to the end of the Performance Period if the Compensation Committee determines on or prior to such date (i) that all of the Milestones have been achieved or (ii) no further Milestones are capable of being achieved or reasonably likely to be achieved (in which case the Compensation Committee shall resolve that such Determination Date is the "Final Determination Date").
 - d. "Milestones" means

i. [●];

ii.[●]; and

iii. [●].

e. “Performance Period” means the period beginning on the Performance Period Start Date and ending on the Performance Period End Date or, if earlier than the Performance Period End Date, immediately prior to the consummation of a Change in Control.

f. “Performance Period End Date” means [●].

g. “Performance Period Start Date” means [●].

3. Earning of PSUs. No portion of the PSUs shall be earned unless one or more of the Milestones is achieved during the Performance Period. If one or more of the Milestones is achieved during the Performance Period, the number of PSUs that are earned shall be equal to the Target Award multiplied by the “Percentage of Target Award Earned” set forth in the table below opposite the applicable number of Milestones achieved during the Performance Period.

Number of Milestones Achieved During Performance Period	Percentage of Target Award Earned
3	200%
2	150%
1	100%
0	0%

Notwithstanding the foregoing, if a Change in Control is consummated prior to the Performance Period End Date, the number of PSUs that become earned shall be equal to the greater of (i) the Target Award multiplied by the “Percentage of Target Award Earned” set forth in the table above opposite the applicable number of Milestones achieved during the Performance Period or (ii) the number of PSUs equal to 100% of the Target Award.

4. Determinations by Compensation Committee. No PSUs shall be earned or shall vest until the Compensation Committee determines that one or more of the Milestones has been achieved. On each Determination Date, the Compensation Committee shall determine the extent to which, if any, the Milestones have been achieved and the number of PSUs that are earned hereunder. No PSUs may be earned hereunder following the Final Determination Date. PSUs that are earned shall vest and be settled as set forth in Section

3 and 4 of this Agreement, with any PSUs rounded down to the nearest whole number of shares of Stock and any fractional PSUs shall be disregarded. All determinations under this Exhibit A shall be made by the Compensation Committee and will be final and binding on the Participant.

List of Subsidiaries of Acceleron Pharma Inc.

Name	State or other Jurisdiction of Incorporation or Organization
Acceleron Securities Corp.	Massachusetts
Acceleron Holding Ltd.	Bermuda

Consent of Independent Registered Public Accounting Firm

We consent to the incorporation by reference in the following Registration Statements:

- (1) Registration Statement (Form S-8 No. 333-192789) pertaining to the Acceleron Pharma Inc. 2003 Stock Option and Restricted Stock Plan and the Acceleron Pharma Inc. 2013 Equity Incentive Plan,
- (2) Registration Statement (Form S-8 No. 333-198259) pertaining to the Acceleron Pharma Inc. 2013 Employee Stock Purchase Plan and the Acceleron Pharma Inc. 2013 Equity Incentive Plan,
- (3) Registration Statement (Form S-8 No. 333-203354) pertaining to the Acceleron Pharma Inc. 2013 Equity Incentive Plan,
- (4) Registration Statement (Form S-8 No. 333-211867) pertaining to the Acceleron Pharma Inc. 2013 Equity Incentive Plan,
- (5) Registration Statement (Form S-8 No. 333-219661) pertaining to the Acceleron Pharma Inc. 2013 Equity Incentive Plan,
- (6) Registration Statement (Form S-3 No. 333-220522) of Acceleron Pharma Inc.,
- (7) Registration Statement (Form S-8 No. 333-223270) pertaining to the Acceleron Pharma Inc. 2013 Equity Incentive Plan, and
- (8) Registration Statement (Form S-8 No. 333-229911) pertaining to the Acceleron Pharma Inc. 2013 Equity Incentive Plan;

of our reports dated February 27, 2020, with respect to the consolidated financial statements of Acceleron Pharma Inc. and the effectiveness of internal control over financial reporting of Acceleron Pharma Inc. included in this Annual Report (Form 10-K) of Acceleron Pharma Inc. for the year ended December 31, 2019.

/s/ Ernst & Young LLP

Boston, Massachusetts
February 27, 2020

**CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER
PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002**

I, Habib J. Dable, certify that:

1. I have reviewed this Annual Report on Form 10-K of Acceleron Pharma Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent function):
 - 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.

February 27, 2020

/s/ Habib J. Dable

Date

Habib J. Dable
Chief Executive Officer and President
(Principal Executive Officer)

**CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER
PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002**

I, Kevin F. McLaughlin, certify that:

1. I have reviewed this Annual Report on Form 10-K of Acceleron Pharma Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent function):
 - 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.

February 27, 2020

/s/ Kevin F. McLaughlin

Date

Kevin F. McLaughlin
Senior Vice President, Chief Financial Officer and Treasurer (Principal
Financial Officer)

**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 Acceleron Pharma Inc. (the "Company") for the fiscal year ended December 31, 2019, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), each of the undersigned officers of the Company hereby certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, 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: February 27, 2020

By: /s/ Habib J. Dable
Habib J. Dable
President and Chief Executive Officer
(Principal Executive Officer)

Date: February 27, 2020

By: /s/ Kevin F. McLaughlin
Kevin F. McLaughlin
Senior Vice President, Chief Financial Officer and Treasurer
(Principal Financial Officer)