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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, 2020

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	**27-0072226**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)
128 Sidney Street	
Cambridge, MA	**02139**
(Address of principal executive offices)	(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 ý No o

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 o No ý

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 ý No o

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 ý No o

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	ý	Accelerated filer	o
Non-accelerated filer	o	Smaller reporting company	☐
		Emerging growth company	☐

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

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

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

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 $4.4 billion.

As of January 31, 2021, the registrant had 60,549,898 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 2021 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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SUMMARY OF MATERIAL RISKS ASSOCIATED WITH OUR BUSINESS

Our business is subject to numerous risks and uncertainties that you should be aware of before making an investment decision, including those highlighted in "Risk Factors" section of this Annual Report on Form 10-K These risks include, but are not limited to, the following:

Risks Related to Development and Commercialization of REBLOZYL, Sotatercept and Our Other Therapeutic Candidates

- The COVID-19 pandemic, including recurring surges and waves of infection, may affect our ability to initiate and complete preclinical studies and conduct our ongoing clinical trials, delay the initiation of planned and future clinical trials, interrupt sales of REBLOZYL® (luspatercept-aamt), disrupt regulatory activities, or have other adverse effects on our business and operations. In addition, this pandemic has caused substantial disruption in the financial markets and economies worldwide which could result in adverse effects on our business and operations.
- 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 Bristol Myers Squibb, or BMS, for commercialization of our first approved product, REBLOZYL. There is no assurance that the marketing and sale of REBLOZYL or any future products will be successful.
- Our commercial success depends upon attaining significant market acceptance of, and reimbursement for, REBLOZYL and our therapeutic candidates, if approved, among physicians, patients, healthcare payers and acceptance by the operators of major medical providers.
- The market opportunities for REBLOZYL, sotatercept or any of our other 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.
- Price controls and price pressure may be imposed in foreign and U.S. markets, which may adversely affect our future profitability.
- Recent and future healthcare reform legislation and other changes in the healthcare industry and in healthcare spending may adversely affect our business model.
- We face substantial competition, which may result in others discovering, developing or commercializing products before, or more successfully, than we do.
- There is a high risk of clinical failure at any stage of clinical development and there is no guarantee that any of our therapeutic candidates will be safe or effective, or receive regulatory approval.
- If we fail to demonstrate the safety and efficacy of our therapeutic candidates, or REBLOZYL in new indications, 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 our therapeutic candidates, or REBLOZYL in new indications.

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

- If we or our partners do not obtain regulatory approval for luspatercept-aamt in additional target indications or in additional territories, sotatercept, or our other current and future therapeutic candidates, our business will be adversely affected.
- Our results to date do not guarantee that we or our current or future partners will succeed in developing our therapeutic candidates into marketable products.
- 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.

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. 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 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.
- In addition to our internal manufacturing, we rely on single-source 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.

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

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 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.
- 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.

Risks Related to Our Business Operations

- We may encounter difficulties in managing our organizational changes and successfully adjusting our operations.
- Our operations, including 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.

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.
- We could be subject to securities class action litigation.

The summary risk factors described above should be read together with the text of the full risk factors below, in the section entitled "Risk Factors" and the other information set forth in this annual report on Form 10-K, including our consolidated financial statements and the related notes, as well as in other documents that we file with the U.S. Securities and Exchange Commission. The risks summarized above or described in full below are not the only risks that we face. Additional risks and uncertainties not precisely known to us, or that we currently deem to be immaterial may also materially adversely affect our business, financial condition, results of operations and future growth prospects.

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:

- the impact on our business of the COVID-19 pandemic and the government's efforts to contain it;
- 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-1334, and our other potential therapeutic candidates;
- our and Bristol Myers Squibb'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 generate 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 focus and prioritize our commercialization, research and development activities within two key therapeutic areas: pulmonary and hematology.

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 Bristol Myers Squibb, or BMS (which acquired Celgene Corporation in November 2019), 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 June 2020, we presented results of the PULSAR Phase 2 trial of sotatercept in patients with PAH on stable background PAH-specific therapies during the "Breaking News: Clinical Trials in Pulmonary Medicine" session of the American Thoracic Society, or ATS, 2020 Virtual Conference. Study investigators reported that the trial met its primary endpoint, pulmonary vascular resistance, and its key secondary endpoint, six-minute walk distance, and showed concordance of results across multiple additional endpoints and regardless of baseline characteristics. Sotatercept was generally well tolerated in the trial and adverse events observed in the study were generally consistent with previously published data on sotatercept in clinical trials in other patient populations. We presented additional cardiac and pulmonary function data at the virtual 2020 American Heart Association Scientific Sessions in November 2020 showing improvement in right ventricular-pulmonary arterial (RV-PA) coupling, which represents the match between the output of the RV and the resistance of the pulmonary vasculature, as well as improvement in RV function. The 18-month extension period of the PULSAR trial is ongoing and we initiated our registrational Phase 3 trial, the STELLAR trial, in patients with PAH at the end of 2020. In mid 2021, we also plan to initiate the early intervention Phase 3 HYPERION trial in patients with PAH, and the later intervention Phase 3 ZENITH trial in World Health Organization (WHO) functional class IV PAH patients.

We have completed enrollment in an exploratory study called SPECTRA to provide us with greater understanding of sotatercept's potential impact on PAH. We presented preliminary interim results in November 2020 at the virtual 2020 American Heart Association Scientific Sessions, and we expect to announce additional results in the first half of 2021. We also previously announced that the U.S. Food and Drug Administration, or FDA, has granted Breakthrough Therapy designation to sotatercept for the treatment of patients with PAH, and that the European Medicines Agency, or EMA, has granted Priority Medicines, or PRIME, designation to sotatercept for the treatment of patients with PAH. In December 2020, the European Commission granted Orphan Drug designation to sotatercept for the treatment of patients with PAH.

If sotatercept is approved and commercialized to treat PAH, then we will recognize revenue from global net sales and owe BMS a royalty in the low 20% range.

In addition to sotatercept, we are currently advancing our second pulmonary therapeutic candidate, ACE-1334. ACE-1334 is a wholly owned TGF-beta superfamily-based ligand trap designed to bind and inhibit TGF-beta 1 and 3 ligands but not TGF-beta 2. We recently completed an ascending-dose Phase 1 clinical trial in healthy volunteers, and the FDA has granted Fast Track designation to ACE-1334 in patients with systemic sclerosis-associated interstitial lung disease, or SSc-ILD, as well as Orphan Drug designation for the treatment of systemic sclerosis. SSc-ILD is a rare, progressive, autoimmune connective tissue disorder characterized by immune dysregulation. We intend to initiate a Phase 1b/Phase 2 clinical trial with ACE-1334 in patients with SSc-ILD in 2021.

Hematology

Our first commercial product, REBLOZYL® (luspatercept-aamt), is a first-in-class erythroid maturation agent designed to promote red blood cell, or RBC, production through a novel mechanism, and is partnered with BMS. REBLOZYL is currently

approved to treat certain adult patients with beta-thalassemia or MDS in the United States, European Union and Canada, as further described below.

For additional patient populations, 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 results currently expected in the first half of 2021, and a Phase 3 clinical trial, the COMMANDS trial, in first-line, lower-risk MDS patients, with topline results expected in or after 2022. In myelofibrosis, BMS is conducting a Phase 2 clinical trial with luspatercept-aamt in patients with myelofibrosis-associated anemia, and is in the process of initiating the Phase 3 INDEPENDENCE study in patients with myelofibrosis-associated anemia who are being treated with JAK inhibitor therapy and require RBC transfusions.

We believe that there is a global annual peak sales opportunity for REBLOZYL in excess of $4 billion for all currently approved indications and those in development, including future clinical development expansion.

BMS is responsible for paying 100% of the development costs for all clinical trials for luspatercept-aamt. We may receive a maximum of $100.0 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.

Funding

As of December 31, 2020 our operations have been funded primarily by $105.1 million in equity investments from venture investors, $1.3 billion from public investors, $164.1 million in equity investments from our collaboration partners and $431.7 million in upfront payments, milestones, royalties, and net research and development payments from our collaboration partners.

Our Goals and Objectives in the Year 2021

By building on the milestones achieved in 2020, we intend to advance and expand our pipeline in 2021, while continuing to successfully commercialize REBLOZYL, and we plan to achieve the following goals and objectives:

Pulmonary

- ***Sotatercept***
  - Continue to enroll and execute the STELLAR Phase 3 clinical trial
  - Announce PULSAR open-label extension study results in the first half of 2021
  - Announce additional results from the exploratory SPECTRA study in the first half of 2021
  - Initiate the HYPERION Phase 3 early intervention clinical trial in patients with PAH in mid 2021
  - Initiate the ZENITH Phase 3 clinical trial in WHO functional class IV patients with PAH in mid 2021
  - Evaluate the development of sotatercept in broader pulmonary hypertension indications
- ***ACE-1334***
  - Initiate a Phase 1b/2 clinical trial in patients with SSc-ILD

Hematology

- ***REBLOZYL® (luspatercept-aamt)***
  - Focus on continuing a successful commercial launch in the United States, expanding the commercial launch in the European Union, and launching in Canada
  - Present results for the BEYOND Phase 2 clinical trial in the first half of 2021
  - Initiate the INDEPENDENCE Phase 3 clinical trial in the first quarter of 2021
  - Potential clinical development expansion into other diseases

Corporate Priorities

- Research and development day planned for mid 2021

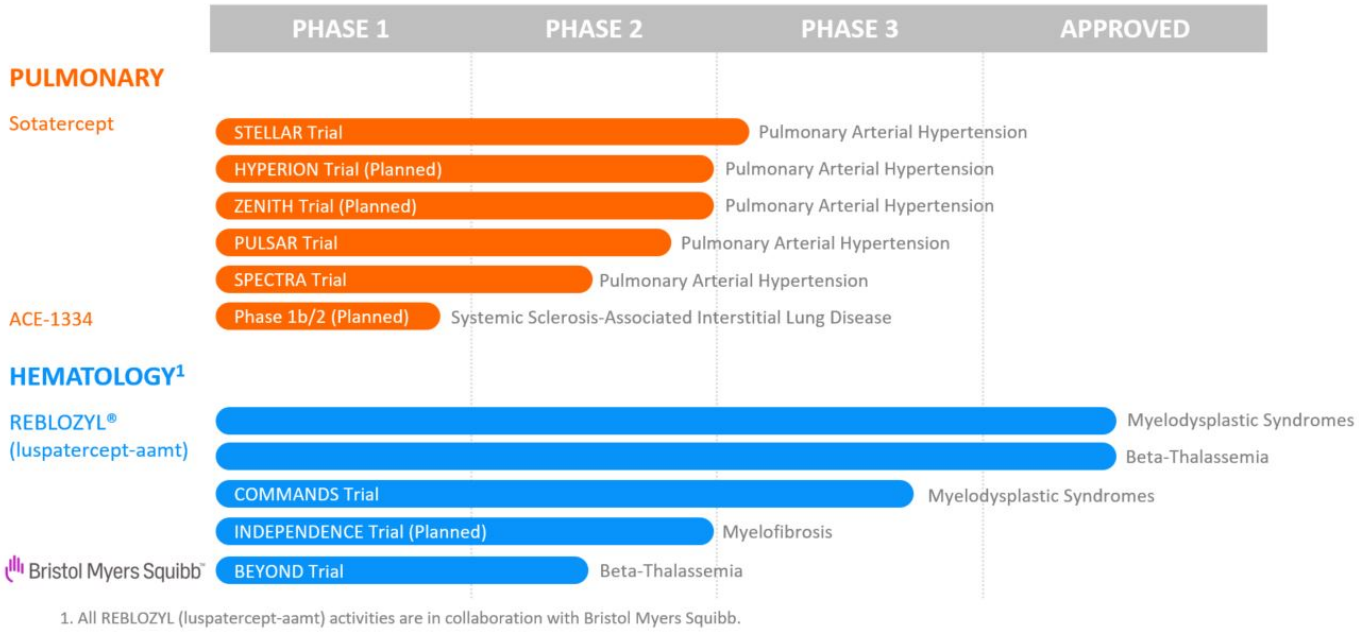
The Acceleron Discovery Platform: Novel Approaches to Potent Biology

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



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. We are currently developing sotatercept for the treatment of 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. 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

The PULSAR Phase 2 trial is a randomized, double blind, placebo-controlled study designed to evaluate the efficacy and safety of sotatercept in PAH patients. The primary endpoint of the trial was the change from baseline in pulmonary vascular resistance, or PVR, over a 24-week treatment period. PVR, as measured by right heart catheterization, is the resistance that the heart must overcome to pump blood through the pulmonary circulatory system. The key secondary endpoint was six-minute walk distance, or 6MWD, a measure of functional capacity/endurance. Other exploratory analyses included changes in amino-terminal brain natriuretic propeptide, or NT-proBNP, a hormone secreted by cardiac muscle cells in response to stretching caused by increased blood volume in the heart; mean pulmonary arterial pressure, a hemodynamic measure of average pressure in the main pulmonary arteries, which is elevated in PAH patients; and World Health Organization, or WHO, functional class.

A total of 106 patients were randomized in a 3:3:4 ratio to receive placebo, 0.3 mg/kg of sotatercept, or 0.7 mg/kg of sotatercept subcutaneously every 21 days in combination with stable background PAH-specific therapies, including mono, double, and triple therapy, over a 24-week treatment period. Of the 106 patients participating in the trial, 35% were receiving double background PAH-specific therapies and 56% were receiving triple background PAH-specific therapies. The trial was powered to detect an 18% reduction in the primary endpoint of PVR and a 24-meter improvement in the secondary endpoint of 6MWD.

In June 2020, we presented results of the PULSAR Phase 2 trial of sotatercept in patients with pulmonary arterial hypertension. During the "Breaking News: Clinical Trials in Pulmonary Medicine" session of the American Thoracic Society, or ATS, 2020 Virtual Conference, study investigators reported that patients on stable background PAH-specific therapies treated with sotatercept experienced a statistically significant mean reduction in PVR, the trial's primary endpoint, at week 24 versus placebo.

The trial achieved its primary endpoint and key secondary endpoint, and showed concordance of results across multiple additional endpoints and regardless of baseline characteristics. Patients on stable background therapy who were treated with 0.3 mg/kg or 0.7 mg/kg of sotatercept experienced mean PVR reductions of approximately 21% and 34%, respectively. The trial

also achieved a statistically significant all-dose mean improvement from baseline of 54 meters in the key secondary endpoint of six-minute walk distance and a placebo corrected improvement of 25 meters (all doses combined).

Primary Endpoint:

Treatment*	**% Reduction in PVR**	**P-Value**
Sotatercept 0.3 mg/kg (n=32)	20.5%	0.0027
Sotatercept 0.7 mg/kg (n=42)	33.9%	<0.0001
Placebo (n=32)	2.1%	

*All cohorts include stable background PAH-specific therapies.

The trial also achieved the protocol-defined improvement in the key secondary endpoint of 6MWD at 24 weeks. Both sotatercept dose groups achieved at least a 50-meter (LS mean) increase from baseline, as demonstrated in the 0.3 mg/kg group (58 meters) and the 0.7 mg/kg group (50 meters), allowing for a pre-specified pooled analysis. Overall, treatment with sotatercept (pooled analysis) achieved a 54-meter (LS mean) change from baseline and a placebo-corrected (LS mean) difference of 25 meters (nominal p=0.03).

Treatment with sotatercept also demonstrated improvement across multiple exploratory study endpoints at week 24, including a 51% reduction in NT-proBNP and 20% reduction in mean pulmonary arterial pressure. In addition, 23% of subjects improved their WHO functional class.

Sotatercept was generally well tolerated in the trial. Adverse events observed in the study were generally consistent with previously published data on sotatercept in clinical trials in other patient populations. Serious treatment-emergent adverse events, or TEAEs, were reported in 6% (2/32) of patients receiving 0.3 mg/kg of sotatercept plus background therapy, 24% (10/42) of patients receiving 0.7 mg/kg of sotatercept plus background therapy, and in 9% (3/32) of patients receiving placebo plus background therapy. Hemoglobin increase was reported in one patient (3%) in the 0.3 mg/kg sotatercept dose group and in 6 patients (14%) in the 0.7 mg/kg sotatercept dose group. No patient in the placebo group experienced an increase in hemoglobin. Two patients (6%) in the 0.3 mg/kg sotatercept dose group and 5 patients (12%) in the 0.7 mg/kg sotatercept dose group experienced thrombocytopenia. One patient in the 0.7 mg/kg sotatercept dose group who had many pre-existing risk factors died due to a cardiac arrest deemed unrelated to study treatment. A total of 5 patients (2 in the 0.3 mg/kg sotatercept dose group and 3 in the 0.7 mg/kg sotatercept dose group) experienced TEAEs leading to treatment discontinuation as opposed to 1 patient in the placebo group. TEAEs occurring in 10% or more of all patients in any arm were headache, diarrhea, peripheral edema, dizziness, fatigue, hypokalemia, and nausea.

Following the 6-month double-blind treatment period, participants in the PULSAR Phase 2 trial were eligible to continue in the 18-month extension period. As of February 22, 2021, 91 of 97 patients who opted to participate in the 18-month extension period of the trial were still enrolled, and 94 patients had been treated with sotatercept for at least 12 months.

In November 2020, we presented additional cardiac and pulmonary function data at the virtual 2020 American Heart Association Scientific Sessions showing improvement in right ventricular-pulmonary arterial (RV-PA) coupling, which represents the match between the output of the RV and the resistance of the pulmonary vasculature, as well as improvement in RV function.

SPECTRA

We have completed enrollment in an exploratory study called SPECTRA to provide us with greater understanding of sotatercept's potential impact on PAH. In November 2020, we presented preliminary interim results from the SPECTRA trial at the virtual 2020 American Heart Association Scientific Sessions showing that patients treated with sotatercept experienced substantial improvements in multiple hemodynamic measures as well as in exercise tolerance and exercise capacity. These early outcomes, obtained from the first 10 patients participating in the trial, were shared as part of an Invited Talk entitled, “SPECTRA and Beyond: Signs of Disease Modification?” presented virtually during the American Heart Association (AHA) 2020 Scientific Sessions. Among the largest resting hemodynamic improvements observed were reductions in pulmonary vascular resistance (PVR; as measured in dynes-sec/cm5) from a mean of 576 at baseline to 369 at week 24 (35.9% reduction) and mean pulmonary arterial pressure (mPAP) as measured in mmHg from 43.4 to 30.6. (29.5% reduction). Sotatercept was generally well tolerated in the trial. Adverse events observed in the study were generally consistent with previously published data on sotatercept in PAH and in other diseases.

We expect to announce additional results from the SPECTRA trial in the first half of 2021.

REBLOZYL® (luspatercept-aamt)

REBLOZYL is a first-in-class erythroid maturation agent designed to promote RBC production through a novel mechanism. To date, REBLOZYL has received regulatory approval in the following regions for the following indications:

Date	Region	Indication
November 2019	United States	Treatment of anemia in adult patients with beta thalassemia who require regular red blood cell transfusions.
April 2020	United States	Treatment of anemia failing an erythropoiesis stimulating agent and requiring 2 or more red blood cell units over 8 weeks in adult patients with very low- to intermediate-risk myelodysplastic syndromes with ring sideroblasts or with myelodysplastic/myeloproliferative neoplasm with ring sideroblasts and thrombocytosis.
June 2020	European Union	Treatment of: Adult patients with transfusion-dependent anemia due to very low-, low- and intermediate-risk myelodysplastic syndromes with ring sideroblasts, who had an unsatisfactory response or are ineligible for erythropoietin-based therapy. Adult patients with transfusion-dependent anemia associated with beta thalassemia.
September 2020	Canada	Treatment of adult patients with red blood cell transfusion-dependent anemia associated with beta-thalassemia.
February 2021	Canada	Treatment of adult patients with transfusion-dependent anemia requiring at least two red blood cell units over 8 weeks resulting from very low-to intermediate-risk myelodysplastic syndromes who have ring sideroblasts and who have failed or are not suitable for erythropoietin-based therapy.

The regulatory approvals in patients with beta-thalassemia listed above are based on data from the Phase 3 BELIEVE trial, which compared luspatercept-aamt + best supportive care versus placebo + best supportive care in adult beta-thalassemia patients who require regular red blood cell transfusions. The approvals in patients with MSA listed above are based on data from the Phase 3 MEDALIST trial evaluating the safety and efficacy of luspatercept-aamt in patients with very low-, low-, or intermediate-risk non-del(5q) MDS.

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, as further described below.

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 betibeglogene autotemcel gene therapy (beti-cel; formerly LentiGlobin™ for β-thalassemia), 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 announced that its submission of a BLA to the FDA for transfusion dependent beta thalassemia is expected to occur in mid-2021.

BEYOND

In addition to the approved indications in beta-thalassemia based on the BELIEVE Phase 3 trial, 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 results currently expected in the first half of 2021.

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.

COMMANDS

In addition to the approved indications in MDS based on the MEDALIST Phase 3 trial, BMS is currently conducting the COMMANDS Phase 3 trial with luspatercept-aamt in first-line, lower-risk MDS patients and enrollment is ongoing, with topline results expected in or after 2022.

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 2020, updated results from the Phase 2 clinical trial with luspatercept-aamt in patients with myelofibrosis associated anemia were presented at the 62nd ASH Annual Meeting and Exposition. Seventy-nine patients were enrolled in the trial as of the cut-off date for the updated analysis (March 29, 2020) in multiple cohorts of patients including two groups with anemia only (hemoglobin level equal to or below 9.5 grams per deciliter (g/dL) and with no red blood cell, or RBC, transfusions in the 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 6-12 RBC units per 84 days in the 12 weeks prior to the date of the first dose or 4-12 RBC units per 84 days for the three patients enrolled in the

expansion cohort in Cohort 3B) patients without concomitant ruxolitinib (Cohort 2; n=21) and with concomitant ruxolitinib (Cohort 3B; n=22).

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; the three additional patients enrolled in the expansion cohort in Cohort 3B were on a stable dose of ruxolitinib for 40 weeks. 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 (the three patients in the expansion cohort of Cohort 3B began at a starting dose of 1.33 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 initial clinical data cutoff date (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 27% (6/22) of patients achieved the primary endpoint, respectively. Additionally, 38% (8/21) of Cohort 2 and 46% (10/22) of Cohort 3B patients achieved at least a 50% reduction in RBC transfusion burden from baseline (minimum 4 RBC units). Additionally, 19% (4/21) and 36% (8/22) of patients in Cohorts 2 and 3B, respectively, achieved RBC-TI for at least 12 weeks anytime during the entire treatment duration. Among the patients who reached 24 weeks of treatment, 4 of 15 (27%) and 8 of 14 (57%) in Cohorts 2 and 3B achieved clinical benefit (defined as RBC transfusion burden reduction by ≥ 50% and by ≥ 4 RBC U for ≥ 12 weeks) and therefore continued to receive luspatercept after 24 weeks

Six percent (5/79) of patients had grade 3 or higher treatment-emergent adverse events, or TEAEs. The most common related TEAEs of any grade occurring in at least 5% of patients were hypertension (13%), bone pain (9%), and diarrhea (5%). Treatment discontinuations as the result of related TEAEs occurred in eight (10%) patients. There were no treatment-related deaths.

As a result of the phase 2 study, BMS is in the process of initiating the pivotal Phase 3 INDEPENDENCE study in patients with myelofibrosis-associated anemia who are being treated with JAK inhibitor therapy and require RBC transfusions.

ACE-1334

ACE-1334 is a wholly owned TGF-beta superfamily-based ligand trap designed to bind and inhibit TGF-beta 1 and 3 ligands but not TGF-beta 2. We recently completed an ascending-dose Phase 1 clinical trial in healthy volunteers, and the FDA has granted Fast Track designation to ACE-1334 in patients with systemic sclerosis-associated interstitial lung disease, or SSc-ILD, as well as Orphan Drug designation for the treatment of systemic sclerosis. We intend to initiate a Phase 1b/Phase 2 clinical trial with ACE-1334 in patients with SSc-ILD in 2021.

Systemic sclerosis-associated interstitial lung disease (SSc-ILD)

SSc-ILD, also known as systemic scleroderma-associated interstitial lung disease, is a rare, progressive, autoimmune connective tissue disorder characterized by immune dysregulation. It is reported to be the most common cause of death among patients with systemic scleroderma. Patients with SSc-ILD ultimately experience severely compromised pulmonary function, with the disease initially causing cough, shortness of breath, and fatigue. SSc-ILD, which affects an estimated 50,000 patients in the United States and Europe, is thought to arise from a combination of genetic susceptibility, autoimmunity, inflammation, fibrotic activity, and vascular insult. The disease has an estimated 10-year survival rate of approximately 56%. Current treatment for SSc-ILD includes a range of potentially high-risk approaches, including immunosuppression, hematopoietic stem cell transplantation, and lung transplantation.

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 $595.8 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 clarified certain responsibilities of the Company and BMS in a letter agreement to the Restated Sotatercept Agreement on March 10, 2020. We refer to the amended and restated agreement, as clarified in the letter 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, 2020, we have received $45.0 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. Pursuant to the Restated Sotatercept Agreement, we have aligned with BMS through the Joint Commercialization Committee that we will be the distributing party for the commercialization of sotatercept in the PH field, and that if sotatercept is approved and commercialized to treat PAH, we will recognize revenue from global net sales and owe BMS a royalty in the low 20% range. 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. BMS declined its option to manufacture additional clinical supply and any commercial supply of sotatercept in the PH Field, and we are responsible for our future supply of sotatercept in the PH field. 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, 2020, we have received $256.6 million in research and development funding, milestone payments, and royalties 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 $100.0 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.

REBLOZYL and our clinical stage therapeutic candidates, if approved, 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

- 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, betibeglogene autotemcel gene therapy (beti-cel; formerly LentiGlobin™ for β-thalassemia), 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 announced that its submission of a BLA to the FDA for transfusion dependent beta thalassemia is expected to occur in mid-2021.
- 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, and announced that it would initiate a pivotal study in 2021 evaluating mitapivat in thalassemia, including both alpha- and beta-thalassemia, as well as transfusion dependent and non-transfusion dependent patient populations.

MDS

- 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.
- hypomethylating agents azacitidine, which is approved by the FDA to treat certain French-American-British MDS subtypes, which includes some lower risk MDS patients, and Inqovi (decitabine and cedazuridine) tablets approved by the FDA for treatment of adult patients with myelodysplastic syndromes (MDS) and chronic myelomonocytic leukemia (CMML).
- 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, and is now approved under the name Onureg (azacitidine tablets) as a maintenance treatment for adult patients with acute myeloid leukemia;
- an anti-cancer therapy being developed by Onconova to treat patients with high risk MDS;
- a telemorase 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; and
- KER-050, a modified activin receptor type IIA Fc fusion protein, is being developed by Keros Therapeutics, Inc. in a Phase 2 study to treat cytopenias, including anemia in patients with MDS.

Myelofibrosis

- 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, is being studied by Geron to treat intermediate-2 or high-risk in patients with myelofibrosis, and Geron has announced plans to initiate a Phase 3 study in the first quarter of 2021.
- 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.
- Keros Therapeutics, Inc. has announced plans to initiate a Phase 2 study in 2021 with KER-050, a modified activin receptor type IIA Fc fusion protein, to treat patients with myelofibrosis-associated cytopenias.

Pulmonary Arterial Hypertension

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 Adcira® (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 cylase (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)); for inhalation (Tyvaso® (trepostinil, United Therapeutics), Ventavis® (iloprost, Actelion/J&J)); and for infusion (Remodulin® (trepostinil, United Therapeutics), Veletri® (epoprostenol, Actelion/J&J)). Uptravi (selexipag, Actelion/J&J) is a potent, orally delivered selective IP receptor agonist which activates a prostacyclin receptor, helping pulmonary vessels to relax.

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

- Gossamer Bio is studying seralutinib (GB002), an inhaled platelet-derived growth factor receptor, or PDGFR, kinase inhibitor, in a Phase 2 study 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 BMPR2 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.

Systemic Sclerosis-Associated Interstitial Lung Disease (SSc-ILD)

We are planning to initiate a Phase 1b/2 clinical study with ACE-1334 for the treatment of patients with SSc-ILD in 2021. Immunosuppressive therapies, or ISTs, are currently used to manage decline in SSc patients both with and without lung involvement. Primary ISTs used to treat SSc-ILD include mycophenolate mofetil, cyclophosphamide, and azathioprine. OFEV (nintedanib), an anti-fibrotic, is the first and only approved therapy for SSc-ILD specifically. Lung transplantation may be evaluated for patients with significant decline in lung function and that can tolerate the procedure.

If ACE-1334 is approved in SSc-ILD, it may compete with several classes of products in development. These classes include anti-fibrotics, anti-inflammatory, and cell and gene therapy, as follows:

- Anti-fibrotic products Esbriet (pirfenidone, Roche) and HZN-825 (Horizon). Esbriet, which is already approved in idiopathic pulmonary fibrosis, is in Phase III in the US. HZN-825 is in Phase II in the US.
- Anti-inflammatory products Romilkimab (Sanofi), ifetroban (Cumberland Pharmaceuticals), and EHP-101 (Emerald Health Therapeutics) are in Phase II development in the US.
- Products with both an anti-inflammatory and anti-fibrotic effects such as Actemra (tocilizumab, Genentech) and lenabasum (Corbus) recently completed Phase III trials in SSc patients with and without ILD. These trials failed primary endpoints on mRSS and ACR CRISS respectively; however, they may continue development in SSc-ILD. Additional pipeline products in this class include belumosudil (Kadmon Holdings) in Phase 2 development and CM-101 (Chemomab Therapeutics) in Phase 1 development for SSc-ILD, as well as GSK-2330811 (GlaxoSmithKline) in Phase 1 development for SSc.
- Cell and gene therapies for SSc with and without ILD are in Phase I/II trials, such as FCR-001 from Talaris and FCX-013 from Fibrocell.

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-1334. We intend to build a pulmonary disorder focused specialty sales force globally, and we have already established a hematology specialty sales force in the United States to support the launch of REBLOZYL. 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 two indications, 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 1,061 issued patents and approximately 823 pending patent applications, with pending and issued claims relating to all of our current advanced clinical stage therapeutic candidates, sotatercept and ACE-1334, 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 2040, 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, two issued patents in Europe (registered in most countries of the European Patent Convention) and additional patents issued or pending patent applications in many other major jurisdictions worldwide, including the United States, Europe, Australia, Canada, Japan, China, South Korea, Brazil, Mexico, Russia and India. The expected expiration dates for these composition of matter patents and applications ranges from 2028 to 2029, exclusive of possible patent term extensions.

We hold five issued patents covering the treatment of anemia by administration of REBLOZYL in the United States and similar patents issued or pending patent applications 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 and applications is 2029, exclusive of possible patent term extensions.

We also hold patents and patent applications directed to a variety of other uses for REBLOZYL. The expected expiration date for these method of treatment patents and applications ranges from 2029 to 2040 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 patent applications in many other major jurisdictions worldwide, including the United States, Europe, 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 two issued patents covering the treatment of PAH by administration of sotatercept in the United States and similar pending patent applications in other major jurisdictions worldwide, including the United States, Europe, Australia, Canada, Japan, South Korea, Brazil, Mexico and Russia. The expected expiration date for these method of treatment patents and applications is 2037, exclusive of possible patent term extensions,

We also hold patents and pending 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 and applications ranges from 2026 to 2040 exclusive of possible patent term extensions.

ACE-1334 Patent Coverage

We hold one pending patent application covering the ACE-1334 composition of matter in the United States, which is expected to expire in 2038, exclusive of possible patent term extensions. We hold additional pending patent applications covering the ACE-1334 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 2038, exclusive of possible patent term extensions.

We also hold patent applications directed to a variety of uses for ACE-1334, including the treatment of systemic sclerosis and interstitial lung disease. The expected expiration date for these method of treatment patent applications, should they issue as patents, ranges from 2038 to 2040, 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-1334 to be, regulated by the FDA as biologics and reviewed by the Center for Biologics Evaluation and Research (CBER) 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 for five years 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. The application fee is 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 developed a number of distinct approaches to make new drugs available as rapidly as possible in cases where there is no available treatment or there are advantages over existing treatments.

The FDA may grant “accelerated approval” to products that have been studied for their safety and effectiveness in treating serious or life-threatening illnesses and that provide meaningful therapeutic benefit to patients over existing treatments. For accelerated approval, the product must have an effect on a surrogate endpoint or an intermediate clinical endpoint that is considered reasonably likely to predict the clinical benefit of a drug, such as an effect on irreversible morbidity and mortality. When approval is based on surrogate endpoints or clinical endpoints other than survival or morbidity, the sponsor will be required to conduct additional post-approval clinical studies to verify and describe the clinical benefit. These studies are known as “confirmatory trials.” Approval of a drug may be withdrawn, or the labeled indication of the drug changed if these trials fail to verify clinical benefit or do not demonstrate sufficient clinical benefit to justify the risks associated with the drug.

The FDA may grant “fast track” status to products that treat serious diseases or conditions and demonstrate the potential to address an unmet medical need. Fast track is a process designed to facilitate the development and expedite the review of such products by providing, among other things, more frequent meetings with the FDA to discuss the product’s development plan and rolling review, which allows submission of individually completed sections of an NDA or BLA for FDA review before the entire submission is completed. Fast track status does not ensure that a product will be developed more quickly or receive FDA approval.

“Breakthrough Therapy” designation is a process designed to expedite the development and review of drugs that are intended to treat a serious condition and preliminary clinical evidence indicates that the drug may demonstrate substantial improvement over available therapy on a clinically significant endpoint. For drugs and biologics that have been designated as

Breakthrough Therapies, robust FDA-sponsor interaction and communication can help to identify the most efficient and expeditious path for clinical development while minimizing the number of patients placed in ineffective control regimens.

The FDA may grant “priority review” status to products that, if approved, would provide significant improvement in the safety or effectiveness of the treatment, diagnosis, or prevention of serious conditions. Priority review is intended to reduce the time it takes for the FDA to review a BLA, with the goal to take action on the application within six months from when the application is filed, compared to ten months for a standard review.

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. Managed entry agreements, arrangements between pharmaceutical companies and third-party payors that allow for coverage of new products while managing uncertainty around their financial impact or performance, may be increasingly needed in near future to secure appropriate valuation and reimbursement for new innovative therapies.

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. Medicare Part D coverage may vary from plan to plan and the plans may implement formularies and certain utilization management activities (such as tired co-pay structures and prior authorization requirements) as well as negotiate rebates with pharmaceutical manufacturers to manage access and costs. Manufacturers must also provide discounts on Medicare Part D brand name prescription drugs sold to Medicare beneficiaries in the Medicare Part D coverage gap (i.e., the so called “donut hole”), which discount increased from 50% to 70% in 2019.

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 were ongoing efforts to modify or repeal all or certain provisions of the Healthcare Reform Act. The new Biden Administration has taken the opposite position, seeking to preserve and strengthen the 2010 Healthcare Reform Act.

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. 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 an active comparator clinical trial to demonstrate the relative effectiveness of our therapeutic candidates or products to other available therapies to support our pricing, 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, including reference price grouping, 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 and Related Regulatory 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. State laws may also require disclosure of pharmaceutical pricing information and marketing expenditures. Manufacturers must also submit information to the FDA on the identity and quantity of drug samples requested and distributed by a manufacturer during each year. 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, our activities 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 utilized single use, disposable technology to maximize efficiency and flexibility, minimizing the need for cleaning and sterilization. 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. 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.

Approximately 50 full time employees focus on our process development and manufacturing activities. Our strategic investment in manufacturing capabilities allows us to advance our therapeutic candidates efficiently 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 through quality control testing and quality assurance disposition and release. Providing the infrastructure to efficiently transfer multiple preclinical stage lead molecules into manufacturing avoiding costly commitments of funds before clinical data are available. We leverage third-party contract manufacturers for fill-finish, assembly, label, pack operations and distribution.

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.

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 additional sotatercept clinical trials and commercial supply in the PH field, we intend to use third-party contract manufacturers.

Human Capital

As of December 31, 2020, the company employed 312 full-time employees.

Attraction and Recruitment

We believe that our future success largely depends upon our continued ability to attract, retain and motivate highly skilled employees. We provide our employees with competitive salaries and bonuses. We offer a competitive benefits package to promote employee well-being across all facets of their lives, including health care, retirement planning, and paid time off.

Recognizing the achievements of our employees is important to Acceleron. We realize that Acceleron's employees work hard throughout the year to achieve the Company's goals. Our annual TEAM-ACE Awards recognize employees who embody our core values: Team Collaboration, Accelerating Drug Discovery, Commitment to Patients, and Employee Development. The program provides an opportunity for fellow employees to reward their peers who work alongside them and go above and beyond to contribute to Acceleron's success while demonstrating Acceleron's core values. We also recognize team achievement with our Quarterly Team Awards and multiple individual spot awards programs ("Note of Thanks", "Above and Beyond", and "Major Impact").

We employ a variety of tools to facilitate open and direct communication including open forums with executives, employee surveys, focus groups, town halls and committees. We endeavor to further refine our employee programs through our annual employee engagement survey.

Employee Retention and Engagement

Employee retention and turnover rates are monitored monthly by the human resources team. We analyze our results and compare our metrics to industry benchmarks. During 2020, our voluntary turnover rate was lower than industry average. We also conduct an annual employee engagement survey to receive feedback on the level of employee engagement and satisfaction.

Diversity and Inclusion

A diverse and inclusive workforce is a business imperative and key to our long-term success. To champion our efforts in this area, our Director of Talent Management and Inclusion & Diversity monitors Acceleron's diversity and inclusion practices which ensures continuous dialogue on the topic with our CEO and Executive Committee. Acceleron values diversity and inclusion and undertakes various efforts throughout its operations to promote these initiatives. Our current efforts are focused around a safe work environment, equal employment opportunity, and commitment to our community.

Conduct and Ethics

At Acceleron, we are committed to fostering a culture of integrity and ensuring each of our employees is equipped with resources to help them do the right thing. We believe it is imperative that the board of directors and senior management strongly support a no-tolerance stance for workplace harassment, biases and unethical behavior. All employees are required to abide by, review and confirm compliance to the Company's Code of Business Conduct and Ethics and Insider Trading policies upon hire and on an annual basis thereafter.

Response to COVID-19

The health and safety of our employees is our highest priority and in particular, in response to the COVID-19 pandemic. We have supported our employees and government efforts to curb the COVID-19 pandemic through a multifaceted communication, infrastructure, and behavior modification and enforcement effort. We convened a committee comprised of physicians and other scientists that provides guidance while continuously monitoring the pandemic. The following outlines the primary actions recommended by this committee:

- Established clear and regular COVID-19 policies, safety protocols, and updates to all employees;
- Decreased density and configured work areas to enable physical distancing for onsite employees and staggered shifts to minimize human contact;
- Upgraded HVAC systems for maximum air flow;
- Enhanced flexibility policies for those working from home;
- Adjusted our sick leave policy to encourage those who are sick to stay home;
- Increased cleaning protocols across all locations;
- Provided additional personal protective equipment and cleaning supplies;
- Established mandatory COVID-19 surveillance testing of two tests per week for employees working on-site;
- Implemented protocols to address actual and suspected COVID-19 cases and potential exposure;
- Prohibited all domestic and international non-essential travel for all employees; and
- Required that masks to be worn in all locations.

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 Development and Commercialization of REBLOZYL, Sotatercept and Our Other Therapeutic Candidates

The COVID-19 pandemic, including recurring surges and waves of infection, may affect our ability to initiate and complete preclinical studies and conduct our ongoing clinical trials, delay the initiation of planned and future clinical trials, interrupt sales of REBLOZYL® (luspatercept-aamt), disrupt regulatory activities, or have other adverse effects on our business and operations. In addition, this pandemic has caused substantial disruption in the financial markets and economies worldwide which could result in adverse effects on our business and operations.

COVID-19 has been declared by the World Health Organization to be a global pandemic. It has impacted, and is continuing to impact, all aspects of society, including the operation of the healthcare system and other business and economic activity worldwide. The COVID-19 pandemic, and other similar outbreaks of contagious diseases, may adversely impact our business, financial condition and results of operations.

With respect to clinical development, we, Bristol Myers Squibb, or BMS (which acquired Celgene Corporation in November 2019), and the third-party clinical trial sites or investigators involved in our current and future clinical trials may experience interruptions or delays as a result of this pandemic. For example, due to disruptions related to the COVID-19 pandemic, we experienced temporary delays in enrollment in our Phase 2 SPECTRA trial of sotatercept in pulmonary arterial hypertension, or PAH, and BMS temporarily paused certain clinical development activities in 2020, including enrollment in their Phase 3 COMMANDS trial of luspatercept-aamt in first-line, lower-risk myelodysplastic syndromes, or MDS, patients. Any significant interruptions or delays could impact the conduct of our and BMS's clinical trials and our ability to complete them in a timely manner or at all, which in turn could delay and/or negatively impact the regulatory review and approval of our therapeutic candidates.

In addition, commercial sales of REBLOZYL may be adversely impacted as a result of developments that have transpired, and may continue to transpire, in response to this pandemic, including the implementation of "shelter-in-place" policies, social distancing and other measures. REBLOZYL is administered via injections in a clinic or hospital setting by a healthcare professional. Treating COVID-19 patients has become the priority for many healthcare facilities and workers, so it has become, and may continue to be, difficult for some of our patients to receive our therapies that are administered by injection. Some patients may also choose to skip injections because they do not want to risk exposure to COVID-19 by leaving their home and entering a healthcare facility.

Further, we have implemented work-at-home policies for employees whose jobs do not require them to be on-site, and our sales force for REBLOZYL has transitioned to online video conferences with healthcare professionals. Increased reliance by us and the companies with which we do business on personnel working from home and through video conferencing may negatively impact productivity, increase cyber security risk, create data accessibility issues, increase the risk for communication disruptions, or otherwise disrupt or delay normal business operations. For our employees whose jobs require them to be on-site, we have taken precautions to avoid the spread of COVID-19 among our employees, but we cannot guarantee our workforce will not face an outbreak that could adversely impact our operations.

The COVID-19 pandemic may also impact the third parties on which we or our partners rely for goods and services in the manufacture of REBLOZYL and our therapeutic candidates, which may negatively impact the ability to continue to manufacture and supply REBLOZYL and our therapeutic candidates, or the ability of third parties in our or our partners' distribution channels to deliver REBLOZYL and our therapeutic candidates in a timely manner or at all. Further, this pandemic and measures to mitigate the spread of COVID-19 have had, and may continue to have, an adverse effect on global economic conditions, which could have an adverse effect on our business and financial condition, including our ability to obtain financing if needed on favorable terms or at all.

The extent to which the COVID-19 pandemic may impact our business, financial condition and results of operations will depend on the manner in which this pandemic continues to evolve and future developments in response thereto, which are highly uncertain and which may include, among other things, the effectiveness and availability of any vaccine or other treatment; governmental, business or other actions that have been, or will be, taken in response to this pandemic, including restrictions on travel and mobility; impacts of the pandemic on the vendors or distribution channels in our or our partners'

supply chain and ability to continue to manufacture REBLOZYL and our therapeutic candidates, including the availability of manufacturing inputs; impacts of the pandemic on the conduct of our or our partners' clinical trials, including with respect to enrollment rates, availability of investigators and clinical trial sites or monitoring of data; and impacts of the pandemic on the regulatory agencies with which we interact in the development, review, approval and commercialization of our medicines.

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 our first approved product, REBLOZYL. There is no assurance that the marketing and sale of REBLOZYL or any future products will be successful.

For REBLOZYL, 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 in 2020 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 in North America, we rely extensively on BMS, and we will need to continue to establish and maintain our own adequate marketing, sales and distribution capabilities. To commercialize REBLOZYL outside North America, we rely entirely on BMS.

We intend to commercialize sotatercept in pulmonary hypertension, which we refer to as the PH field, if approved, without a partner. To successfully commercialize sotatercept and our wholly-owned therapeutic candidates 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 sotatercept or any wholly-owned 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.

Our commercial success depends upon attaining significant market acceptance of, and reimbursement for, 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 our therapeutic candidates, 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.

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, sotatercept or any of our other 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, sotatercept 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, sotatercept or our other 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 certain patient populations with beta-thalassemia or MDS, and we may never achieve profitability without obtaining regulatory approval for luspatercept-aamt in additional indications, such as myelofibrosis.

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, sotatercept or our other 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, sotatercept and our other 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, sotatercept and ACE-1334.

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, sotatercept or the other therapeutic candidates that we develop obsolete. As a result of all of these factors, our competitors may succeed in obtaining patent protection and/or U.S. Food and Drug Administration, 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.

There is a high risk of clinical failure at any stage of clinical development and there is no 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 clinical trial results for sotatercept are not necessarily indicative or predictive of our ongoing and future Phase 2 or Phase 3 clinical trials. Likewise, 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 REBLOZYL has been approved in the United States, European Union and Canada in certain patient populations, it is impossible to predict when or if REBLOZYL will receive regulatory approval in new indications or countries 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, this could materially harm our business.

If we fail to demonstrate the safety and efficacy of our therapeutic candidates, or REBLOZYL in new indications, 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 our therapeutic candidates, or REBLOZYL in new indications.

Undesirable side effects caused by REBLOZYL, sotatercept or our other 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 and planning to conduct a number of clinical trials for sotatercept and REBLOZYL, respectively, and we are planning to initiate a clinical trial

for ACE-1334 in 2021. Serious adverse events deemed to be caused by REBLOZYL or our therapeutic candidates could have a material adverse effect on the development of these compounds or our business as a whole.

Our understanding of the relationship between REBLOZYL, sotatercept and our other therapeutic candidates and these events may change as we gather more information, and additional unexpected adverse events may occur. 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, takes many years to complete and is uncertain as to outcome. In addition, we have limited experience conducting 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. Although we reported positive results with sotatercept in the PULSAR Phase 2 study, this does not guarantee that we will be successful in other current or future clinical studies with sotatercept even for the same indication, or that we will eventually receive regulatory approval.

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 sotatercept, our other 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, particularly in light of the COVID-19 pandemic;
- 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, sotatercept or our other therapeutic candidates for various reasons, including a finding that the participants are being exposed to unacceptable health risks, including potential exposure to COVID-19 in their geography;
- 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, including potential exposure to COVID-19 in their geography;
- the cost of clinical trials sotatercept or our other therapeutic candidates may be greater than we anticipate, particularly in light of the uncertainties associated with the outbreak of COVID-19;
- the supply or quality of REBLOZYL, sotatercept or our other therapeutic candidates or other materials necessary to conduct clinical trials of our therapeutic candidates may be insufficient or inadequate, including as a result of any supply chain disruption caused by the COVID-19 pandemic; and
- REBLOZYL, sotatercept 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 beyond those that we currently contemplate or are unable to successfully complete our clinical trials or other testing, or if the results of these trials or tests are not positive or are only modestly positive or identify undesirable side effects caused by our compounds, 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 sotatercept, our other therapeutic candidates or REBLOZYL in new indications or regions;
- 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.

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 manufacture ACE-1334 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. In addition, although we have taken precautions to avoid the spread of COVID-19 among our employees who need to be on-site at our manufacturing facility, we cannot guarantee our workforce will not face an outbreak that could adversely impact our operations, including partially or completely interrupting production at this facility. Any such issues may have a substantial negative effect on our business.

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

Because we have limited financial and managerial resources, we focus on research programs and therapeutic candidates that we identify for specific indications. As a result, we may forego or delay pursuit of opportunities with other therapeutic candidates or for other indications that later prove to have greater commercial potential. Our resource allocation decisions may cause us to fail to capitalize on viable commercial medicines or profitable market opportunities. Our spending on current and future research and development programs and therapeutic candidates for specific indications may not yield any commercially viable medicines. If we do not accurately evaluate the commercial potential or target market for a particular therapeutic candidate, we may relinquish valuable rights to that therapeutic candidate through collaboration, licensing or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such therapeutic candidate.

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 Regulatory Review and Approval of REBLOZYL, Sotatercept and Our Other Therapeutic Candidates

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

REBLOZYL, sotatercept and our other 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-1334 or any other therapeutic candidates 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.

We and our current or future partners intend to market 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. For example, although the FDA, the European Commission and Health Canada approved REBLOZYL for the treatment of certain patients with beta-thalassemia and MDS, there can be no assurance that REBLOZYL will gain regulatory approval in these indications in other territories for which regulatory approval may be sought, or in any other indications being evaluated now or in the future.

Our results to date do not guarantee that we or our current or future partners will succeed in developing our therapeutic candidates into marketable products.

Our encouraging preclinical and clinical results to date for luspatercept-aamt, sotatercept, and ACE-1334 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 indications or to obtain regulatory approval for luspatercept-aamt in any 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.

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 clinical research organizations, or 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.

In addition, as of June 23, 2020, the FDA noted it is continuing to ensure timely reviews of applications for medical products during the COVID-19 pandemic in line with its user fee performance goals. On July 16, 2020, the FDA noted that it is continuing to expedite oncology product development with its staff teleworking full-time. However, the FDA may not be able to continue its current pace and review timelines could be extended. Furthermore, we and BMS have experienced some temporary delays or disruptions in our ongoing clinical trials due to the COVID-19 pandemic. For example, due to disruptions related to the COVID-19 pandemic, we experienced temporary delays in enrollment in our Phase 2 SPECTRA trial of sotatercept in PAH, and BMS temporarily paused certain clinical development activities in 2020, including enrollment in their Phase 3 COMMANDS trial of luspatercept-aamt in first-line, lower-risk MDS patients. We anticipate we and BMS may experience additional delays or disruptions in the future due to the COVID-19 pandemic and changes in local site or IRB policies, availabilities of site staff, re-prioritization of hospital resources, restricted access to healthcare professionals and testing sites and other containment measures or concerns among patients about participating in clinical trials during a pandemic. 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.

We and, for luspatercept-aamt, 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.

A Fast Track designation or Breakthrough Therapy designation by the FDA or a Priority Medicines, or PRIME, Designation by the EMA, may not actually lead to a faster development or regulatory review or approval process.

If a therapeutic candidate is intended for the treatment of a serious or life-threatening condition and demonstrates the potential to address unmet medical needs for this condition, the drug sponsor may apply for FDA Fast Track designation. Similarly, Breakthrough Therapy designation may be granted by the FDA, or PRIME designation may be granted by the EMA,

to product candidates for serious conditions that have preliminary clinical evidence indicating the product candidate may offer substantial improvement over available therapy. The FDA and EMA have broad discretion whether or not to grant these designations, and even if we believe a particular product candidate is eligible for these designations, we cannot assure you that the FDA or EMA would decide to grant them. We have been granted PRIME designation and Breakthrough Therapy designation for sotatercept, and Fast Track designation for luspatercept-aamt in certain indications and ACE-1334 in patients with systemic sclerosis-associated interstitial lung disease, but this is no assurance we will receive these designations for any future therapeutic candidates, and we may not experience a faster development process, review or approval compared to conventional FDA or EMA procedures. The FDA or EMA may withdraw these designations if it believes that they are no longer supported by data from our clinical development program.

While we have received Orphan Drug designation for REBLOZYL, sotatercept and ACE-1334 for specified indications, we may not be successful in obtaining or maintaining the benefits associated with Orphan Drug designation, including the potential for market exclusivity, and such exclusivity may not prevent the FDA or the EMA from approving competing products.

Regulatory authorities in some jurisdictions, including the United States and Europe, may designate drugs and biologics for relatively small patient populations as orphan drugs. Under the Orphan Drug Act, the FDA may designate a product as an orphan drug if it is a drug or biologic intended to treat a rare disease or condition, which is generally defined as a patient population of fewer than 200,000 individuals annually in the United States. Generally, if a product with an Orphan Drug designation subsequently receives the first marketing approval for the indication for which it has such designation, the product is entitled to a period of marketing exclusivity, which precludes the approval of another marketing application for the same product for the same indication for that time period. The applicable period is seven years in the United States and ten years in Europe, although the European exclusivity period can be reduced to six years if a product no longer meets the criteria for orphan drug designation or if, at the end of the fifth year, available evidence establishes that the product is sufficiently profitable not to justify maintenance of market exclusivity.

We have received Orphan Drug designation for REBLOZYL in the United States and Europe for the treatment of beta-thalassemia and for the treatment of MDS, for sotatercept in the United States and Europe for the treatment of pulmonary arterial hypertension, or PAH, and for ACE-1334 in the United States for the treatment of systemic sclerosis. However, there is no guarantee that we will enjoy, or continue to enjoy, the benefits of those designations or of any Orphan Drug designations we might receive for our other therapeutic candidates. Even after an orphan drug is approved, the FDA can subsequently approve a marketing application for the same drug, or a product with the same active moiety, for treatment of the same disease or condition if it concludes that the later drug is clinically superior in that it is shown to be safer, more effective or makes a major contribution to patient care. In addition, a designated orphan drug may not receive orphan drug exclusivity if it is approved for a use that is broader than the indication for which it received Orphan Drug designation. Even if a product receives Orphan Drug designation, orphan drug exclusivity may be lost if the FDA or EMA determines that the request for designation was materially defective or if the manufacturer is unable to assure sufficient quantity of the product to meet the needs of patients with the rare disease or condition.

Orphan Drug designation neither shortens the development time or regulatory review time of a drug nor gives the drug any advantage in the regulatory review or approval process. Moreover, even if we obtain orphan drug exclusivity for a product, that exclusivity may not effectively protect the designated drug from competition because different drugs can be approved for the same condition. While we intend to continue seek Orphan Drug designation for other therapeutic candidates, we may never receive such designations.

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, other U.S. agencies, including the Department of Justice, or the DOJ, and corresponding regulatory agencies outside the United States 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.

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. 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 a collaboration agreement with BMS to develop and commercialize REBLOZYL, pursuant to which we are eligible to receive tiered royalty payments from BMS on net sales of REBLOZYL as well as 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 commercialization plan and budget to support the commercialization of REBLOZYL are at our own expense.

Pursuant to the REBLOZYL agreement, as of the first FDA approval of REBLOZYL in November 2019, BMS is solely responsible for determining the development plan, and conducting all product development activities, for REBLOZYL. We may disagree with BMS about the development strategy it employs, but we have no rights to impose our development strategy on BMS. Similarly, BMS may decide to seek regulatory approval for REBLOZYL in, and limit commercialization of REBLOZYL to, narrower additional indications than we would pursue. We would be prevented from developing or commercializing REBLOZYL in an indication that BMS has chosen not to pursue. 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.

As such, our ability to generate royalty and milestone revenues from sales of REBLOZYL is largely dependent on BMS's performance of its development and commercialization obligations. There is no guarantee that BMS will continue or be successful in developing REBLOZYL in additional indications, that the marketing and sale of REBLOZYL in its approved indications will be successful, or that we will be able to generate meaningful revenues or revenues at the levels or on the timing we expect or as necessary to support our goals. 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 additional 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 REBLOZYL by BMS.
- BMS may develop and commercialize, either alone or with others, products that are similar to or competitive with REBLOZYL.
- 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 REBLOZYL 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 delay our ability to receive rights back to the relevant product or therapeutic candidates. If we were to terminate the agreement with BMS due to BMS's breach or BMS terminated the agreement without cause, the development and commercialization of REBLOZYL could be delayed, curtailed or terminated because we may not have sufficient financial resources or capabilities to continue development and commercialization of REBLOZYL on our own if we choose not to, or are unable to, enter into a new collaboration for it.
- 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.

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-1334, 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. 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. For example, we principally rely on a single CRO to manage, monitor and otherwise carry out our ongoing and planned clinical trials of sotatercept, and if such CRO terminated all or any of such engagements the development and potential commercialization of sotatercept would be delayed.

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. For example, if the CRO principally responsible for managing, monitoring and otherwise carrying out our ongoing and planned clinical trials of sotatercept does not successfully carry out its duties under their agreements, such sotatercept clinical trials 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 single-source 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 and commercial supply of sotatercept in the PH field, we use contract manufacturing organizations. As a general matter, these manufacturers represent our sole source of supply and we do not currently have arrangements in place for redundant supply or a second source for sotatercept drug substance or drug product. This reliance on third parties increases the risk that we will not have sufficient quantities of sotatercept or such quantities at an acceptable cost or quality or in a timely manner, which could delay, prevent, or impair our development or commercialization efforts. Although we actively manage these third-party relationships to ensure continuity, quality, and compliance with regulations, some events beyond our control, including global instability due to political unrest or from an outbreak of pandemic or contagious disease, such as COVID-19, could result in supply chain disruptions or the complete or partial failure of these manufacturing services.

We also expect to use contract manufacturing organizations for Phase 3 clinical trials and, if approved, commercial supply of our therapeutic candidates that we have not partnered. 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. Even if we are able to establish agreements with third-party manufacturers, reliance on third-party manufacturers entails additional risks, including:

- reliance on the third party for regulatory, compliance, and quality assurance;
- the possible breach of the manufacturing agreement by the third party;
- if the third party ceased its operations for any reason;
- our relative importance as a customer to the third party and whether the third party subordinates our needs to its other customers;
- the possible misappropriation of our proprietary information, including our trade secrets and know how; and
- the possible termination or nonrenewal of the agreement by the third party, including sole source suppliers, at a time that is costly or inconvenient for us.

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. 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 REBLOZYL.

BMS is responsible for manufacturing all clinical and commercial supplies of REBLOZYL. BMS generally does not perform the manufacture of the drug substance or drug product for REBLOZYL itself. BMS has used and may continue to use contract manufacturers for the manufacture of drug substance and drug product for REBLOZYL, and we have no expectation that BMS plans to perform the manufacture of bulk drug substance or drug product for REBLOZYL in the future. However, BMS would have the right to manufacture REBLOZYL for clinical and 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 REBLOZYL bulk drug substance with contract manufacturers with considerable biotherapeutics manufacturing experience. If any of these manufacturers is unwilling or unable to manufacture sufficient quantities of REBLOZYL to meet clinical or

commercial demand, either for technical or business reasons, the development and commercialization of REBLOZYL may be delayed, and sales of REBLOZYL may be materially harmed.

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

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 agreement with BMS for 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.

Changes to the patent law in the United States and other jurisdictions could diminish the value of patents in general, thereby impairing our ability to protect our products.

As is the case with other biopharmaceutical companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biopharmaceutical industry involves both technological and legal

complexity and is therefore costly, time consuming, and inherently uncertain. Changes in either the patent laws or interpretation of the patent laws in the United States could increase the uncertainties and costs surrounding the prosecution of patent applications and the enforcement or defense of issued patents. Recent patent reform legislation in the United States and other countries, including the Leahy-Smith America Invents Act (the Leahy-Smith Act), signed into law in September 2011, could increase those uncertainties and costs. The Leahy-Smith Act includes a number of significant changes to U.S. patent law. These include provisions that affect the way patent applications are prosecuted, redefine prior art, and provide more efficient and cost-effective avenues for competitors to challenge the validity of patents. For example, the Leahy-Smith Act allows third-party submission of prior art to the USPTO during patent prosecution and additional procedures to attack the validity of a patent by USPTO administered post-grant proceedings, including post-grant review, *inter partes* review, and derivation proceedings. In addition, the Leahy-Smith Act has transformed the U.S. patent system from a "first-to-invent" system to a "first-to-file" system in which, assuming that other requirements for patentability are met, the first inventor to file a patent application will be entitled to the patent on an invention regardless of whether a third party was the first to invent the claimed invention. The first-to-file provisions, however, only became effective on March 16, 2013. Accordingly, it is not yet clear what, if any, impact the Leahy-Smith Act will have on the operation of our business. However, the Leahy-Smith Act and its implementation could make it more difficult to obtain patent protection for our inventions and increase the uncertainties and costs surrounding the prosecution of our or our collaboration partners' patent applications and the enforcement or defense of our or our collaboration partners' issued patents, all of which could harm our business, results of operations, financial condition, and prospects.

The U.S. Supreme Court has ruled on several patent cases in recent years, either narrowing the scope of patent protection available in certain circumstances or weakening the rights of patent owners in certain situations. Additionally, there have been recent proposals for additional changes to the patent laws of the U.S. and other countries that, if adopted, could impact our ability to enforce our proprietary technology. Depending on future actions by the U.S. Congress, the U.S. courts, the USPTO, and the relevant law-making bodies in other countries, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future.

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 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 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, 2020, we had an accumulated deficit of $877.4 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, since receiving our first regulatory approval from the FDA in November 2019.

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 the PH field and ACE-1334;
- 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, including any delays resulting from the COVID-19 pandemic.

Although we anticipate that these increased expenses will be partially offset by royalty and milestone payments we expect to receive under our REBLOZYL agreement with BMS, if we do not receive the anticipated royalty or milestone payments or do not enter into partnerships for our wholly-owned 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. In addition, we or our other current or future partners must succeed in developing sotatercept and 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, 2020, our cash, cash equivalents and investments were $857.5 million. We believe that we will continue to expend substantial resources for the foreseeable future developing sotatercept in the PH field, ACE-1334 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 as approved in the budgets agreed to between us and BMS. 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-1334, such as:

- 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;
- the impact of COVID-19 on the initiation or completion of preclinical studies or clinical trials and the supply of our other therapeutic candidates; and
- the timing, receipt, and amount of sales of, or royalties on, REBLOZYL or 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-1334 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 approvals by the FDA and other regulatory authorities of REBLOZYL and the limited historical sales data, our royalty revenue from product sales will be difficult to predict from period to period. This uncertainty is heightened by the unpredictable scope of the impact of the COVID-19 pandemic, which has adversely affected the operations of third parties upon which we rely in our commercialization efforts, patient access to hospitals, physicians' offices, clinics and other administration sites, and global economic conditions, as well as caused a re-prioritization of healthcare services.

Our revenues will also depend on the receipt of milestone payments from 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, further exacerbated by the impacts of the ongoing COVID-19 pandemic on healthcare systems and economic conditions, 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 Our Business Operations

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.

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 within the United States and internationally, 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.

Changes in tax laws or in their implementation or interpretation could adversely affect our business and financial condition.

Changes in tax law may adversely affect our business or 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. Further, the Coronavirus Aid, Relief, and Economic Security Act, or CARES Act, was enacted on March 27, 2020, which, among other things, suspends the 80% limitation on the deduction for net operating losses in taxable years beginning before January 1, 2021, permits a 5-year carryback of net operating losses arising in taxable years beginning after December 31, 2017 and before January 1, 2021, and generally caps the limitation on the deduction for net interest expense at 50% of adjusted taxable income for taxable years beginning in 2019 and 2020.

Regulatory guidance under the TJCA and the CARES Act is and continues to be forthcoming, and such guidance could ultimately increase or lessen impact of these laws on our business and financial condition. It is also possible that Congress will enact additional legislation in connection with the COVID-19 pandemic, some of which could have an impact on our business. In addition, it is uncertain if and to what extent various states will conform to the TJCA or the CARES Act.

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

As of December 31, 2020, we had federal NOLs of approximately $871.4 million and state NOLs of approximately $788.3 million available to reduce future taxable income, if any. These federal and state NOL carryforwards generally expire at various times through 2040, 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.

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.

Our operations, including 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 operations, including 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. Such laws and regulations may constrain our operation and the business or financial arrangements through which we market, sell and distribute any medicines for which we obtain marketing approval. Restrictions under applicable U.S. federal and state healthcare laws and regulations, as well as foreign laws, 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 $11,665 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, or FCPA, 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 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
- federal laws that require pharmaceutical manufacturers to report certain calculated product prices to the government or provide certain discounts or rebates to government authorities or private entities, often as a condition of reimbursement under government healthcare programs;
- the so-called federal “sunshine” law or Open Payments which requires pharmaceutical manufacturers to track and report annually to the government information related to certain payments and other transfers of value to physicians, non-physician practitioners and teaching hospitals as well as ownership and investment interests held by physicians and their immediate family members;
- state laws requiring 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; 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.

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.

In connection with the COVID-19 pandemic, we have implemented work-at-home policies for employees whose jobs do not require them to be on-site, and our sales force for REBLOZYL has transitioned to online video conferences with healthcare professionals. Increased reliance by us and the companies with which we do business on personnel working from home and through video conferencing may increase cyber security risk and create data accessibility issues. 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, including as a result of disruption in the financial markets and economies worldwide in connection with the COVID-19 pandemic. 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 $143.62 on February 22, 2021. 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 our therapeutic candidates, if approved;
- 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, including outbreaks of contagious disease such as the COVID-19 pandemic;
- 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.

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.

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 May 2026.

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, 2021, there were approximately 48 holders of record of our common stock. This number does not include stockholders for whom shares are held in "nominee" or "street" name.

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

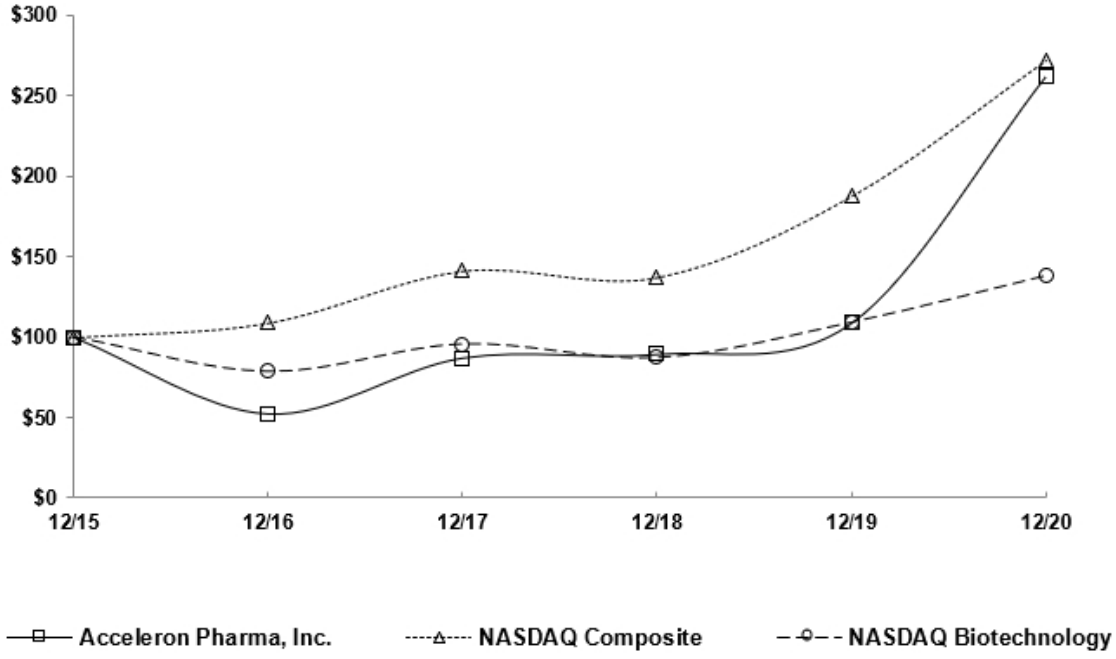
Information about our equity compensation plans is incorporated herein by reference to Item 12 of Part III of this Annual Report on Form 10-K.

Performance Graph

The following graph shows a comparison from December 31, 2015 through December 31, 2020 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, 2015 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 Company has applied the amendment to Regulation S-K Item 301 which became effective on February 10, 2021.

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 generate 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 focus and prioritize our commercialization, research and development activities within two key therapeutic areas: pulmonary and hematology.

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 Bristol Myers Squibb, or BMS (which acquired Celgene Corporation in November 2019), 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 June 2020, we presented results of the PULSAR Phase 2 trial of sotatercept in patients with PAH on stable background PAH-specific therapies during the "Breaking News: Clinical Trials in Pulmonary Medicine" session of the American Thoracic Society, or ATS, 2020 Virtual Conference. Study investigators reported that the trial met its primary endpoint, pulmonary vascular resistance, and its key secondary endpoint, six-minute walk distance, and showed concordance of results across multiple additional endpoints and regardless of baseline characteristics. Sotatercept was generally well tolerated in the trial and adverse events observed in the study were generally consistent with previously published data on sotatercept in clinical trials in other patient populations. We presented additional cardiac and pulmonary function data at the virtual 2020 American Heart Association Scientific Sessions in November 2020 showing improvement in right ventricular-pulmonary arterial (RV-PA) coupling, which represents the match between the output of the RV and the resistance of the pulmonary vasculature, as well as improvement in RV function. The 18-month extension period of the PULSAR trial is ongoing and we initiated our registrational Phase 3 trial, the STELLAR trial, in patients with PAH at the end of 2020. In mid 2021, we also plan to initiate the early intervention Phase 3 HYPERION trial in patients with PAH, and the later intervention Phase 3 ZENITH trial in World Health Organization (WHO) functional class IV PAH patients.

We have completed enrollment in an exploratory study called SPECTRA to provide us with greater understanding of sotatercept's potential impact on PAH. We presented preliminary interim results in November 2020 at the virtual 2020 American Heart Association Scientific Sessions, and we expect to announce additional results in the first half of 2021. We also previously announced that the U.S. Food and Drug Administration, or FDA, has granted Breakthrough Therapy designation to sotatercept for the treatment of patients with PAH, and that the European Medicines Agency, or EMA, has granted Priority Medicines, or PRIME, designation to sotatercept for the treatment of patients with PAH. In December 2020, the European Commission granted Orphan Drug designation to sotatercept for the treatment of patients with PAH.

If sotatercept is approved and commercialized to treat PAH, then we will recognize revenue from global net sales and owe BMS a royalty in the low 20% range.

In addition to sotatercept, we are currently advancing our second pulmonary therapeutic candidate, ACE-1334. ACE-1334 is a wholly owned TGF-beta superfamily-based ligand trap designed to bind and inhibit TGF-beta 1 and 3 ligands but not TGF-beta 2. We recently completed an ascending-dose Phase 1 clinical trial in healthy volunteers, and the FDA has granted Fast Track designation to ACE-1334 in patients with systemic sclerosis-associated interstitial lung disease, or SSc-ILD, as well as Orphan Drug designation for the treatment of systemic sclerosis. SSc-ILD is a rare, progressive, autoimmune connective tissue

disorder characterized by immune dysregulation. We intend to initiate a Phase 1b/Phase 2 clinical trial with ACE-1334 in patients with SSc-ILD in 2021.

Hematology

Our first commercial product, REBLOZYL® (luspatercept-aamt), is a first-in-class erythroid maturation agent designed to promote red blood cell, or RBC, production through a novel mechanism, and is partnered with BMS. REBLOZYL is currently approved to treat certain adult patients with beta-thalassemia or MDS in the United States, European Union and Canada, as further described in "Business" above.

For additional patient populations, 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 results currently expected in the first half of 2021, and a Phase 3 clinical trial, the COMMANDS trial, in first-line, lower-risk MDS patients, with topline results expected in or after 2022. In myelofibrosis, BMS is conducting a Phase 2 clinical trial with luspatercept-aamt in patients with myelofibrosis-associated anemia, and is in the process of initiating the Phase 3 INDEPENDENCE study in patients with myelofibrosis-associated anemia who are being treated with JAK inhibitor therapy and require RBC transfusions.

We believe that there is a global annual peak sales opportunity for REBLOZYL in excess of $4 billion for all currently approved indications and those in development, including future clinical development expansion.

BMS is responsible for paying 100% of the development costs for all clinical trials for luspatercept-aamt. We may receive a maximum of $100.0 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.

Funding and Expense

As of December 31, 2020, our operations have been funded primarily by $105.1 million in equity investments from venture investors, $1.3 billion from public investors, $164.1 million in equity investments from our collaboration partners and $431.7 million in upfront payments, milestones, royalties, and net research and development payments from our collaboration partners. We have spent approximately $173.9 million, 154.0 million, and 103.9 million, on research and development for the years ended December 31, 2020, 2019, and 2018, respectively.

We expect our expenses will increase substantially in connection with our ongoing activities, if and as we:

- conduct clinical trials for sotatercept in the PH field or any future therapeutic candidates;
- prepare for the potential launch and commercialization of sotatercept in the PH field;
- 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 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 royalty revenue from the sale of our first and only commercial product, REBLOZYL, and potentially from the sale of equity, debt financings or other sources, including potential additional collaborations. However, we may not generate sufficient royalty revenue and 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 generate

significant revenue or 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 our first regulatory approval from the FDA in November 2019. Our ability to generate product revenue and become profitable depends upon our and our partners' ability to successfully commercialize products. We expect our expenses to increase and to incur losses as we continue the development of, and seek regulatory approvals for, sotatercept in the PH field and any future therapeutic candidates, and potentially begin to commercialize any additional approved products. For a description of the numerous risks and uncertainties associated with product development, see "Risk Factors" elsewhere in this Annual Report on Form 10-K.

Financial Operations Overview

Impact of COVID-19 on our Business

A novel strain of coronavirus (COVID-19) was declared a global pandemic by the World Health Organization (WHO) in March 2020 and has caused an economic downturn on a global scale, as well as significant volatility in the financial markets. As of December 31, 2020, we have not experienced a significant financial or supply chain impact directly related to the pandemic, but have experienced some disruptions to clinical operations with regard to timelines to complete patient enrollment in our ongoing Phase 2 SPECTRA trial, and may experience similar disruptions in our planned Phase 3 sotatercept clinical trials. We have also experienced disruptions in our commercialization efforts for REBLOZYL with regard to customer engagement and in-person promotion. In addition, as various geographies in the United States and worldwide adapt to surging COVID-19 infections, we may experience additional setbacks to our operations that could have a material impact on our business.

For a discussion of the risks presented by the COVID-19 pandemic to our results, see Risk Factors in Part I, Item 1A elsewhere in this Annual Report on Form 10-K.

Revenue

Collaboration Revenue

Our revenue to date has been predominantly derived from collaboration revenue, which includes license and milestone revenue, cost-sharing revenue, and royalties, 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. Royalty revenue is recognized in the period that the related sales occur.

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 approvals 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, 2020, we have incurred $986.6 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 luspatercept-aamt, 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 Phase 2 clinical trials for luspatercept-aamt, sotatercept, ACE-1334, and ACE-083, of which the luspatercept-aamt clinical trials are reimbursed by BMS. Our Phase 2 clinical trial for ACE-083 was discontinued and all remaining material expenses were incurred as of the end of 2020. With respect to the luspatercept-aamt 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 luspatercept-aamt costs for the purposes of billing BMS. Our external research and development expenses during the years ended December 31, 2020, 2019 and 2018, were as follows:

	Year ended December 31,		
(in thousands)	**2020**	**2019**	**2018**
Luspatercept-aamt (1)	$ 2,286	$ 4,387	$ 6,518
Sotatercept (2)	54,756	19,027	8,633
ACE-083 (3)	7,287	27,958	11,778
ACE-1334 (4)	4,159	5,282	2,064
Total direct research and development expenses	68,488	56,654	28,993
Other expenses (5)	105,429	97,299	74,909
Total research and development expenses	$ 173,917	$ 153,953	$ 103,902

(1) These expenses associated with luspatercept-aamt are reimbursed 100% by BMS.

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

(3) Development of ACE-083 was discontinued. All remaining material expenses were incurred as of the end of 2020.

(4) These expenses are associated with our development of ACE-1334 in SSc-ILD.

(5) Other expenses include employee and unallocated contractor-related expenses, facility expenses, lab supplies and miscellaneous expenses, including expenses associated with preclinical and other development programs.

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. Selling, general and administrative expenses also include directors' fees, professional fees for accounting and legal services, other miscellaneous costs associated with supporting our sales, marketing and investor relations activities, and allocated facilities, depreciation, and other expenses, such as rent and maintenance of facilities, insurance and other supplies.

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 operations.

Other Income (Expense), Net

Other income (expense), net consists primarily of the re-measurement gain or loss associated with the change in the fair value of our common stock warrant liabilities and interest income earned on cash, cash equivalents and investments.

To estimate the fair value of our liability classified warrants, we use 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. We base the estimates in the pricing models, in part, on subjective assumptions, including stock price volatility, risk-free interest rate, dividend yield, and the fair value of the common stock underlying the warrants. All remaining outstanding warrants were remeasured using the Black-Scholes model upon their expiration on July 9, 2020. At December 31, 2020, there were no warrants outstanding.

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.

Our revenue to date has been predominantly derived from collaboration revenue, which includes license and milestone revenue, cost-sharing revenue, and royalties, 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, adjusts 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 $20.0 million, which would result from approval by a regulatory authority in Asia (as defined in the REBLOZYL Agreement) of a Biologics License Application (BLA) or equivalent for luspatercept-aamt in either myelodysplastic syndromes or beta-thalassemia. 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, 2020, we cannot determine if it is probable that the regulatory agency will approve the application.

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). Royalty revenues on commercial sales for REBLOZYL by BMS are estimated based on information provided by BMS. We exercise judgment in determining whether the information provided is sufficiently reliable for us to base our royalty revenue recognition thereon. If actual royalties vary from estimates, we may need to adjust the prior period, which would affect royalty revenue and collaboration receivable in the period of adjustment.

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. 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 $30.2 million, $23.0 million and $24.6 million for the years ended December 31, 2020, 2019 and 2018, 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, 2020 and 2019

(in thousands)	Year Ended December 31, 2020	2019	Increase (Decrease)
Revenue:			
Collaboration revenue:			
License and milestone	$ 25,000	$ 60,000	$ (35,000)
Cost-sharing, net	12,674	13,993	(1,319)
Royalty	54,849	—	54,849
Total revenue (all amounts are with a related party)	92,523	73,993	18,530
Costs and expenses:			
Research and development	173,917	153,953	19,964
Selling, general and administrative	85,912	56,485	29,427
Total costs and expenses	259,829	210,438	49,391
Loss from operations	(167,306)	(136,445)	(30,861)
Other (expense) income, net	(1,576)	819	(2,395)
Interest income	2,873	10,706	(7,833)
Other income, net	1,297	11,525	(10,228)
Loss before income taxes	(166,009)	(124,920)	(41,089)
Income tax (provision) benefit	(21)	62	(83)
Net loss	$ (166,030)	$ (124,858)	$ (41,172)

Revenue. We recognized revenue of $92.5 million in the year ended December 31, 2020, compared to $74.0 million in the year ended December 31, 2019. All of the revenue in both periods was derived from the BMS agreements. This increase in revenue of $18.5 million is primarily due to the following factors:

- an increase in royalty revenue from REBLOZYL sales of $54.8 million; offset by
- a decrease in milestone revenue of $35.0 million due to the recognition of multiple milestones in 2019 from BMS (then Celgene) for the acceptance of the BLA and validation of the MAA, as well as approval of the BLA for REBLOZYL, compared to the recognition of one milestone in 2020 for the approval by the EMA; and
- a decrease in cost-sharing revenue of $1.3 million primarily due to a decrease in trial management fees and development costs, offset by an increase in reimbursable commercial fees as we continue to expand our commercial footprint.

Research and Development Expenses. Research and development expenses were $173.9 million in the year ended December 31, 2020, compared to $154.0 million in the year ended December 31, 2019. This $19.9 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 and facilities-related expense of $14.1 million related to increased headcount to support our growth;
- an increase in contract manufacturing, drug supply, and development expenses of $20.3 million related to our ongoing clinical and preclinical programs; and
- an increase in miscellaneous research expense of $4.1 million; offset by
- a decrease in external clinical trial expense of $9.2 million due to the discontinuation of our ACE-083 program, as well as decreased clinical activities for the luspatercept-aamt Phase 2 clinical trials, offset by an increase in clinical trial expenses for sotatercept; and
- a decrease in in-licensing expense of $9.3 million primarily due to an upfront payment made in 2019 of $10.0 million related to the execution of the license and collaboration agreement with Fulcrum Therapeutics.

Selling, General and Administrative Expenses. Selling, general and administrative expenses were $85.9 million in the year ended December 31, 2020, compared to $56.5 million in the year ended December 31, 2019. This $29.4 million increase was primarily due to the following factors:

- an increase in personnel and facilities-related expense of $16.7 million related to increased headcount to support our growth;

- an increase in selling expense of $6.7 million associated with the launch of REBLOZYL, which was approved for its second indication by the FDA in April 2020, as well as market research and market development activities for sotatercept;

- an increase in royalty expense related to our agreements with the Salk Institute of $2.8 million; and

- an increase in other miscellaneous expenses of $3.1 million.

Other Income, Net. Other income, net was $1.3 million in the year ended December 31, 2020, compared to $11.5 million in the year ended December 31, 2019. This $10.2 million decrease was primarily due to a $7.8 million decrease in the interest earned on our investment portfolio as a result of lower interest yields throughout the year, a $1.5 million decrease in the expense associated with marking the common warrant liability to market upon auto exercise in July 2020, and a $1.0 million decrease in sublease income.

Income Tax Provision. Income tax provision for the year ended December 31, 2020 was attributable to state income taxes on interest income earned on our investment portfolio, compared to an income tax benefit for the year ended December 31, 2019 related to realization of losses that offset unrealized gains from our investment portfolio.

Comparison of the Years Ended December 31, 2019 and 2018

(in thousands)	Year Ended December 31, 2019	2018	Increase (Decrease)
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. The 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 was 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. The $22.0 million increase was primarily due to an increase in personnel expenses 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.

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, 2020, we had an accumulated deficit of $877.4 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, 2020, our operations have been primarily funded by $105.1 million in equity investments from venture investors, $1.3 billion from public investors, $164.1 million in equity investments from our collaboration partners, and $431.7 million in upfront payments, milestones, royalties, and net research and development payments from our collaboration partners.

As of December 31, 2020, we had $857.5 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, 2020	2019	2018
Net cash (used in) provided by:			
Operating activities	$ (130,327)	$ (93,804)	$ (94,706)
Investing activities	25,596	(71,291)	122,927
Financing activities	538,006	258,720	16,146
Net increase in cash, cash equivalents and restricted cash	$ 433,275	$ 93,625	$ 44,367

Operating Activities.

Net cash used in operating activities was $130.3 million for the year ended December 31, 2020, compared to $93.8 million and $94.7 million for the years ended December 31, 2019 and 2018, respectively. The increase in operating expenses relates to headcount and facilities, contract manufacturing, consulting, and other external expenses to support sotatercept and our wholly-owned therapeutic programs, as well as expenses for commercial activities for REBLOZYL. 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, 2020, a net loss of $166.0 million inclusive of $54.8 million of royalty revenue; non-cash adjustments of $35.5 million, primarily from $30.2 million of stock-based compensation expense; change in operating assets and liabilities of $0.2 million, primarily from an increase in accounts payable and accrued expenses of $5.8 million and $19.5 million respectively, offset by an increase in prepaid expenses and other current assets of $7.2 million, and collaboration receivable of $17.6 million;

- for the year ended December 31, 2019, a net loss of $124.9 million adjusted for non-cash items primarily made up of $23.0 million of stock-based compensation expense and depreciation and amortization expense of $3.9 million; change in operating assets and liabilities of $4.0 million, primarily from an increase in accrued expenses of $6.3 million offset by an increase in collaboration receivable of $1.5 million; and

- for the year ended December 31, 2018, a net loss of $118.9 million adjusted for non-cash items primarily made up of $24.6 million of stock-based compensation expense and depreciation and amortization expense of $3.7 million; change in operating assets and liabilities of $4.6 million, primarily from an increase in prepaid expenses of $3.0 million for start-up activities from the PULSAR clinical trial and an increase in collaboration receivables of $3.5 million.

Investing Activities.

Net cash provided by investing activities was $25.6 million for the year ended December 31, 2020, compared to net cash used in investing activities of $71.3 million for the year ended December 31, 2019 and net cash provided by investing activities of $122.9 million for the year ended December 31, 2018. Net cash provided by or used in investing activities primarily relates to activity within our investment portfolio as follows:

- for the year ended December 31, 2020, net maturities of investments of $29.8 million;

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

- for the year ended December 31, 2018, net maturities of investments of $125.5 million.

Net maturities for the years ended December 31, 2020 and December 31, 2018 were the result of managing our investment portfolio to meet our projected cash requirements. Net purchases for the year ended December 31, 2019 were due to the implementation of our investment policy when we began to invest the money raised in our January 2019 public offering in marketable securities.

Financing Activities.

Net cash provided by financing activities was $538.0 million for the year ended December 31, 2020, compared to $258.7 million and $16.1 million for the years ended December 31, 2019 and 2018, respectively. Net cash provided by financing activities primarily consisted of the following:

- for the year ended December 31, 2020, $492.4 million in net cash proceeds from our July 2020 public offering and the underwriter's full exercise of their option to purchase additional shares, as well as $45.6 million in cash proceeds from the exercise of stock options and the issuance of common stock related to the employee stock purchase plan;

- 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; and

- 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.

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 our first regulatory approval from the FDA in November 2019. We expect our expenses to increase and to incur losses as we continue the development of, and seek regulatory approvals for, 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 inherent 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, along with the expected royalty revenue from REBLOZYL sales, will be sufficient to fund our projected operating requirements for the foreseeable future.

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 generate sufficient revenue or 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 costs of preparing for the potential launch and commercialization of sotatercept or our other 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, 2020.

(in thousands)	Total	2021	2022 through 2023	2024 through 2025	After 2025
Operating lease obligations (1)	$ 27,584	$ 8,926	$ 16,531	$ 1,754	$ 373
Total	$ 27,584	$ 8,926	$ 16,531	$ 1,754	$ 373

(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 May 2026. Our leasehold improvements are amortized over 2-5 years, 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 $282.2 million as of December 31, 2020, 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, 2020, we had federal NOL carryforwards of approximately $871.4 million and state NOL carryforwards of $788.3 million available to reduce future taxable income, if any. Of these federal and state NOL carryforwards, $438.0 million and $787.7 million, respectively, will expire at various times through 2040. The federal NOL of $433.4 million and state NOL of $0.6 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, 2020 and December 31, 2019, we had cash, cash equivalents and investments of $857.5 million and $453.8 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, 2020, 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, 2020, 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, 2020 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, 2020.

The effectiveness of our internal control over financial reporting as of December 31, 2020 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, 2020, 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, 2020, 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, 2020, 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, 2020 and 2019, 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, 2020, and the related notes and our report dated February 25, 2021 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 25, 2021

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 2021 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 2021 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 2021 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 2021 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 2021 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.

(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.

Acceleron Pharma Inc.

Index to Consolidated Financial Statements

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, 2020 and 2019, 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, 2020, 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, 2020 and 2019, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2020, 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, 2020, 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 25, 2021 expressed an unqualified opinion thereon.

Adoption of ASU No. 2016-02

As discussed in Note 2 to the consolidated financial statements, the Company changed its method of accounting for leases in 2019 due to the adoption of Accounting 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 $44.7 million at December 31, 2020, which included the estimated obligation for clinical trial expenses incurred as of December 31, 2020 but not paid as of that date. In addition, the Company's total prepaid expenses were $17.3 million at December 31, 2020, 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, 2020 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 25, 2021

Acceleron Pharma Inc.

Consolidated Balance Sheets

(amounts in thousands except share and per share data)

	December 31,	
	2020	2019
Assets		
Current assets:		
Cash and cash equivalents	$ 670,952	$ 237,677
Short-term investments	178,951	193,692
Collaboration receivables (all amounts are with a related party)	26,101	8,547
Prepaid expenses and other current assets	17,265	10,000
Total current assets	893,269	449,916
Property and equipment, net	7,768	6,812
Operating lease - right of use asset, net	21,988	23,908
Long-term investments	7,585	22,477
Other assets	1,727	1,793
Total assets	$ 932,337	$ 504,906
Liabilities and stockholders' equity		
Current liabilities:		
Accounts payable	$ 8,472	$ 2,295
Accrued expenses	44,681	24,895
Operating lease liability - right of use	7,010	6,183
Total current liabilities	60,163	33,373
Warrants to purchase common stock	—	1,856
Operating lease liability - right of use, net of current portion	17,067	20,201
Total liabilities	77,230	55,430
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; 60,383,867 and 53,123,567 shares issued and outstanding at December 31, 2020 and 2019, respectively	60	53
Additional paid-in capital	1,732,772	1,160,807
Accumulated deficit	(877,437)	(711,407)
Accumulated other comprehensive (loss) income	(288)	23
Total stockholders' equity	855,107	449,476
Total liabilities and stockholders' equity	$ 932,337	$ 504,906

See accompanying notes to consolidated financial statements.

Acceleron Pharma Inc.

Consolidated Statements of Operations and Comprehensive Loss

(amounts in thousands except share and per share data)

	Year Ended December 31,		
	2020	2019	2018
Revenue:			
Collaboration revenue:			
Milestone	$ 25,000	$ 60,000	$ —
Cost-sharing, net	12,674	13,993	13,991
Royalty	54,849	—	—
Total revenue (all amounts are with a related party)	92,523	73,993	13,991
Costs and expenses:			
Research and development	173,917	153,953	103,902
Selling, general and administrative	85,912	56,485	34,503
Total costs and expenses	259,829	210,438	138,405
Loss from operations	(167,306)	(136,445)	(124,414)
Other (expense) income, net	(1,576)	819	(52)
Interest income	2,873	10,706	5,568
Other income, net	1,297	11,525	5,516
Loss before income taxes	(166,009)	(124,920)	(118,898)
Income tax (provision) benefit	(21)	62	27
Net loss	$ (166,030)	$ (124,858)	$ (118,871)
Other comprehensive income (loss):			
Net unrealized holding (losses) gains on short- and long-term investments during the period, net of tax	(311)	583	335
Comprehensive loss	$ (166,341)	$ (124,275)	$ (118,536)
Net loss per share- basic and diluted	$ (2.92)	$ (2.38)	$ (2.59)
Weighted-average number of common shares used in computing net loss per share- basic and diluted	56,800	52,453	45,898

See accompanying notes to consolidated financial statements.

Acceleron Pharma Inc.

Consolidated Statements of Stockholders' Equity

(amounts in thousands except per share data)

	Common Stock					
	Number of Shares	$0.001 Par Value	Additional Paid-In Capital	Accumulated Deficit	Accumulated Other Comprehensive (Loss) Income	Total Stockholders' Equity
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
Stock-based compensation	—	—	30,237	—	—	30,237
Issuance of common stock, net of expense $505	5,594,593	6	492,408	—	—	492,414
Exercise of stock options	1,455,899	1	46,297	—	—	46,298
Vesting of restricted stock units, net of shares withheld for taxes	137,062	—	(2,370)	—	—	(2,370)
Issuance of common stock related to ESPP	35,673	—	1,664	—	—	1,664
Net exercise of warrants to purchase common stock	37,073	—	3,729	—	—	3,729
Unrealized loss on available-for-sale securities, net of tax	—	—	—	—	(311)	(311)
Net loss	—	—	—	(166,030)	—	(166,030)
Balance at December 31, 2020	60,383,867	$ 60	$1,732,772	$ (877,437)	$ (288)	$ 855,107

See accompanying notes to consolidated financial statements.

Acceleron Pharma Inc.

Consolidated Statements of Cash Flows

(amounts in thousands)

	Year Ended December 31,		
	2020	**2019**	**2018**
Operating Activities			
Net loss	$ (166,030)	$ (124,858)	$ (118,871)
Adjustments to reconcile net loss to net cash used in operating activities:			
Depreciation and amortization	3,845	3,941	3,747
Stock-based compensation	30,237	22,995	24,569
Other non-cash items	1,378	128	409
Changes in assets and liabilities:			
Prepaid expenses and other current assets	(7,198)	(2,429)	(2,986)
Collaboration receivables	(17,554)	(1,508)	(3,470)
Non-cash lease expense	5,769	5,143	—
Accounts payable	5,830	1,876	(673)
Accrued expenses	19,535	6,258	1,904
Operating lease obligations (Note 14)	(6,156)	(5,333)	—
Other changes in operating assets and liabilities	17	(17)	665
Net cash used in operating activities	(130,327)	(93,804)	(94,706)
Investing Activities			
Purchase of investments	(238,228)	(395,138)	(73,570)
Proceeds from maturity or sale of securities	268,027	327,134	199,087
Purchases of property and equipment	(4,203)	(3,287)	(2,590)
Net cash provided by (used in) investing activities	25,596	(71,291)	122,927
Financing Activities			
Proceeds from issuance of common stock from public offering, net of issuance costs	492,414	248,130	—
Payments for capital lease expenditures	—	—	(139)
Net proceeds from exercises and vesting of stock awards, and ESPP contributions	45,592	10,590	16,285
Net cash provided by financing activities	538,006	258,720	16,146
Net increase in cash, cash equivalents and restricted cash	433,275	93,625	44,367
Cash, cash equivalents and restricted cash at beginning of period	239,274	145,649	101,282
Cash, cash equivalents and restricted cash at end of period	$ 672,549	$ 239,274	$ 145,649
Supplemental Disclosure of Non-Cash Investing and Financing Activities:			
Reclassification of warrant liability to additional paid-in capital	$ 3,729	$ —	$ 797
Capitalized follow-on public offering costs included in accrued expenses	$ —	$ —	$ 221
Purchase of property and equipment included in accounts payable and accrued expenses	$ 579	$ 444	$ 1,159

See accompanying notes to consolidated financial statements.

Acceleron Pharma Inc.

Notes to Consolidated Financial Statements

Years Ended December 31, 2020, 2019 and 2018

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 or successfully commercializes its products, 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 subsidiaries. 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, contract manufacturing expense, 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 writes off uncollectible receivables at the time the Company determines the receivable is no longer collectible. The Company estimates an allowance for credit losses to

present the net amount expected to be collected on the receivable balance. The Company evaluates the creditworthiness each collaboration partner and customer, and disaggregates receivables into pools of similar risk characteristics, as deemed necessary. The evaluation considers even a remote risk of loss. The Company did not have an allowance for credit losses at December 31, 2020 or 2019.

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), contract manufacturing organizations (CMOs), 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 acquisition to be cash equivalents. Cash and cash equivalents include cash held in banks and amounts held in interest-bearing money market accounts. Cash equivalents are carried at cost, which approximates their fair 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, 2020 and 2019 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, 2020, 2019 and 2018.

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. Accrued interest receivable relating to our available-for-sale securities is presented within prepaid expenses and other current assets in the accompanying consolidated balance sheets, and amounted to $0.3 million and $1.1 million at December 31, 2020 and 2019, respectively.

In June 2016, the FASB issued Accounting Standards Update 2016-13, *Financial Instruments-Credit Losses*. The new standard requires an estimate of expected credit losses only when the fair value of an available-for-sale debt security is below its amortized cost basis, and credit losses are limited to the amount by which the security’s amortized cost basis exceeds its fair value. Credit-related impairment is recognized as an allowance for credit losses on the balance sheet with a corresponding adjustment to earnings.

The standard additionally requires an investor to determine whether a decline in the fair value below the amortized cost basis of an available-for-sale debt security is due to credit-related factors or noncredit-related factors. Any impairment that is not credit related is recognized in other comprehensive income, net of applicable taxes. The Company adopted ASU 2016-13 effective January 1, 2020, with no material impact on its consolidated financial statements and related disclosures.

The following is a summary of available-for-sale securities with unrealized losses as of December 31, 2020 (in thousands):

	Less than 12 months	
	Fair Value	Unrealized Losses
Corporate obligations	54,724	(13)
U.S. Treasury securities	72,289	(7)
Mortgage and other asset backed securities	4,998	(2)
Total available-for sale securities in an unrealized loss position	$ 132,012	$ (22)

At December 31, 2020, our security portfolio consisted of 41 securities related to investments in debt securities available-for-sale, of which 27 securities were in an unrealized loss position. There were no securities in an unrealized loss position for greater than 12 months as of December 31, 2020. The unrealized losses on the Company's available-for-sale securities were caused by central bank and market interest rate decreases on securities purchased at a premium. The contractual terms of these investments do not permit the issuer to settle the securities at a price less than the amortized cost bases of the investments. The Company does not intend to sell the investments and it is not more likely than not that the Company will be required to sell the investments before recovery of their amortized cost bases. The Company did not record an allowance for credit losses as of December 31, 2020.

Prior to January 1, 2020, the Company reviewed marketable securities for other-than-temporary impairment whenever the fair value of a marketable security was less than the amortized cost and evidence indicated that a marketable security's carrying amount was not recoverable within a reasonable period of time. Other-than-temporary impairments of investments were recognized in the consolidated statements of operations if the Company had experienced a credit loss, had the intent to sell the marketable security, or if it was more likely than not that the Company would be required to sell the marketable security before recovery of the amortized cost basis. Evidence considered in this assessment included 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 was $35.8 million. 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 was zero. The aggregate unrealized loss for those securities in an unrealized loss position for more than twelve months was zero. The Company determined it did not hold any investments with any other-than-temporarily impairment as of December 31, 2019.

Concentrations of Credit Risk and Off-Balance Sheet Risk

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 collaboration partner. 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 allowance for credit losses has been recorded for the Company's collaboration receivables as of December 31, 2020.

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, 2020 and 2019 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 prior to their exercise on July 9, 2020 (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, 2020 and 2019 (in thousands):

	December 31, 2020			
	Quoted Prices in Active Markets for Identical Items (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
Assets:				
Money market funds	$ 266,562	$ —	$ —	$ 266,562
Corporate obligations	—	60,982	—	60,982
U.S. Treasury securities	—	215,310	—	215,310
Certificates of deposit	—	246	—	246
Mortgage and other asset backed securities	—	4,998	—	4,998
Total assets	$ 266,562	$ 281,536	$ —	$ 548,098

	December 31, 2019			
	Quoted Prices in Active Markets for Identical Items (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)	Total
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

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, 2020 and 2019.

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,	
	2020	2019
Beginning balance	$ 1,856	$ 1,491
Change in fair value	1,873	365
Exercises	(3,729)	—
Ending balance	$ —	$ 1,856

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. Due to the nature of these inputs, the valuation of the warrants is considered a Level 3 measurement. At each reporting period, the Company evaluates the best valuation methodology. All remaining outstanding warrants were remeasured using the Black-Scholes model upon their exercise on July 9, 2020. At December 31, 2020, there were no warrants outstanding.

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, 2020 or 2019.

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, 2020, 2019 and 2018.

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

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

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 limited 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, 2020, 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 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, 2020.

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, 2020 or 2019, 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, 2020, 2019 and 2018, 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,		
	2020	2019	2018
Outstanding stock options	3,378	3,820	3,513
Common stock warrants	—	39	39
Shares issuable under employee stock purchase plan	19	23	18
Restricted stock units	569	397	608
Total excluded common stock equivalents	3,966	4,279	4,178

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, 2020 and 2019.

Leases

Adoption of Accounting Standards Codification Topic 842, Leases

Effective 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 all leases with terms of more than 12 months. The Company elected to employ the transitionary relief offered by the FASB under ASU 2018-11 which allowed the new standard to be implemented without the restatement of comparative periods' financial information. The Company also elected to employ the package of practical expedients offered under ASC 842 and as a result did not assess (1) the presence of a lease in any expired or existing contracts, (2) the lease classification for any existing or expired leases, or (3) the initial direct costs for any existing leases. Additionally, the Company elected to account for the lease components and non-lease components as a single lease component. 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 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). 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%.

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 (ROU) 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 or the consolidated statement of cash flows.

Subsequent Lease Recognition

At inception of a contract, the Company determines whether an arrangement is or contains a lease. For all leases, the Company determines the classification as either operating or financing. As of December 31, 2020, the Company does not have any leases that are classified as finance leases.

ROU assets represent our right to use an underlying asset for the lease term, and lease liabilities represent our obligation to make lease payments under the lease. Lease recognition occurs at the commencement date, and lease liability amounts are based on the present value of lease payments made during the lease term. Renewals are not assumed in the determination of the lease term unless they are deemed to be reasonably assured at the inception of the lease. If a lease does not provide information to determine an implicit interest rate, the Company utilizes an incremental borrowing rate in determining the present value of lease payments. ROU assets also include any lease payments made prior to the commencement date less lease incentives received. Operating lease expense is recognized on a straight-line basis over the lease term.

The Company has elected not to apply the recognition requirements to short-term leases with a term of 12 months or less. Instead, the Company recognizes the lease payments in the consolidated statements of operations and comprehensive loss on a straight-line basis over the lease term.

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 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. On January 1, 2020 the Company adopted ASU 2016-13 using the modified retrospective transition method. The adoption of ASU 2016-13 did not result in a cumulative-effect adjustment to retained earnings. The comparative prior period information continues to be reported under the accounting standards in effect during those periods.

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. On January 1, 2020, the Company adopted ASU 2018-15 on a prospective basis, with no 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. On January 1, 2020, the Company early adopted ASU 2019-12 on a prospective basis, 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.

3. Property and Equipment, Net

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

	December 31,	
	2020	2019
Computer equipment and software	$ 1,786	$ 1,767
Office equipment	770	672
Laboratory equipment	23,691	22,079
Leasehold improvements	12,908	12,347
Construction in progress	1,628	1,181
Total property and equipment	40,783	38,046
Accumulated depreciation and amortization	(33,015)	(31,234)
Property and equipment, net	$ 7,768	$ 6,812

Depreciation and amortization expense was $3.8 million, $3.9 million and $3.7 million for the years ending December 31, 2020, 2019 and 2018, 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,		
	2020	2019	2018
Cash and cash equivalents	$ 670,952	$ 237,677	$ 144,052
Restricted cash	1,597	1,597	1,597
Total cash, cash equivalents and restricted cash shown in the statement of cash flows	$ 672,549	$ 239,274	$ 145,649

As of December 31, 2020, 2019, and 2018, the Company maintained letters of credit totaling $1.6 million held in the form of certificates of deposit as collateral for the Company's facility lease obligations and its credit cards. Restricted cash is included within other assets in our condensed consolidated balance sheet.

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, 2020 and December 31, 2019 (in thousands):

	December 31, 2020			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
Cash and cash equivalents due in 90 days or less	$ 670,952	$ —	—	$ 670,952
Available-for-sale securities:				
Corporate obligations	45,989	5	(13)	45,981
U.S. Treasury securities	135,315	3	(7)	135,311
Certificates of deposit	245	1	—	246
Mortgage and other asset backed securities	5,000	—	(2)	4,998
Total available-for-sale securities (1)	$ 186,549	$ 9	$ (22)	$ 186,536
Total cash, cash equivalents and available-for-sale securities	$ 857,501	$ 9	$ (22)	$ 857,488

	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 (1)	$ 215,872	$ 325	$ (28)	$ 216,169
Total cash, cash equivalents and available-for-sale securities	$ 453,549	$ 325	$ (28)	$ 453,846

(1) All available-for-sale securities mature within two and three years as of December 31, 2020 and 2019, respectively.

6. Accrued Expenses

Accrued expenses consist of the following (in thousands):

	December 31,	
	2020	2019
Research and development	$ 22,205	$ 11,844
Commercial	1,361	1,027
Royalty payable	1,191	—
Employee compensation	17,637	9,932
Professional services	1,276	976
Accrued purchases	256	119
Other	755	997
Total accrued expenses	$ 44,681	$ 24,895

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		Balance Sheet Classification	
	December 31, 2020	December 31, 2019	Price Per Share	Expiration	December 31, 2020	December 31, 2019
Warrants to purchase common stock	—	39	$ 5.88	July 9, 2020	N/A (1)	Liability

(1) All remaining outstanding warrants were automatically cashless exercised in full upon their expiration on July 9, 2020.

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 were 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 remeasured the fair value of the outstanding warrants until they exercised or expired. All remaining outstanding warrants were automatically cashless exercised in full upon their expiration on July 9, 2020.

8. Commitments and Contingencies

Operating Leases

The Company leases its facilities under non-cancelable operating leases that expire at various dates from September 2023 through May 2026. All of the Company's leases contain escalating rent clauses, which require higher rent payments in future years. 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 sheets as of December 31, 2020 and 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.

On October 16, 2020, the Company entered into an amendment for its office space at 125 Sidney Street and corresponding parking lot to extend the lease term through May 31, 2026. See Note 2 and Note 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. The Company was not subject to any material legal proceedings during the years ended December 31, 2020, 2019 and 2018, 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, 2020 and 2019, 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.

9. Stockholders' Equity

On January 18, 2019, the Company completed the sale in an underwritten public offering of 6,151,163 shares of common stock, including 802,325 shares of common stock sold pursuant to the underwriter's full exercise of their option to purchase additional shares, at a public offering price of $43.00 per share, resulting in net proceeds to the Company of $248.2 million.

On July 6, 2020, the Company completed the sale in an underwritten public offering of 5,594,593 shares of common stock, including 729,729 shares of common stock sold pursuant to the underwriter's full exercise of their option to purchase additional shares, at a public offering price of $92.50 per share, resulting in net proceeds to the Company of $492.4 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, 2020 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, 2020.

Common Stock Reserved for Future Issuance

At December 31, 2020, the Company has reserved for future issuance the following number of shares of common stock (in thousands):

	December 31, 2020
Outstanding stock options to purchase common stock	3,378
Outstanding restricted stock units	569
Shares available for future issuance under equity incentive plan	5,436
Warrants to purchase common stock	—
Shares available for future issuance under the employee stock purchase plan	87
Additional shares reserved for unissued, but designated, Preferred Stock	25,000
Total shares of authorized common stock reserved for future issuance	34,470

10. Significant Agreements

BMS (Bristol Myers Squibb)

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, and clarified certain responsibilities of the Company and BMS in a letter agreement to the Restated Sotatercept Agreement on March 10, 2020 (collectively, 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

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. Pursuant to the Restate Sotatercept Agreement, the Company has aligned with BMS through the Joint Commercialization Committee that the Company will be the distributing party for the commercialization of sotatercept in the PH field, and that if sotatercept is approved and commercialized to treat PAH, the Company will recognize revenue from global net sales and owe BMS a royalty in the low 20% range. 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 provided 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.

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 $20.0 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 Acceleron 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

- 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, 2020, the Company is eligible to receive remaining future regulatory and commercial milestones of up to $100.0 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

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, 2020, the last remaining regulatory milestone payment for REBLOZYL would be $20.0 million and would result from approval by a regulatory authority in Asia (as defined in the REBLOZYL Agreement) of a Biologics License Application (BLA) or equivalent for luspatercept-aamt in either myelodysplastic syndromes or beta-thalassemia. 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, 2020, 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 was 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

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

In June 2020, the European Commission, which has the authority to approve medicines for the European Union, approved REBLOZYL based on the recommendation of the European Medicines Agency, or EMA, for the treatment of adult patients with transfusion-dependent anemia due to very low-, low- and intermediate-risk MDS with ring sideroblasts, who had an unsatisfactory response or are ineligible for erythropoietin-based therapy, and adult patients with transfusion-dependent anemia associated with beta-thalassemia. As a result, the $25.0 million milestone from the EMA approval of a BLA or equivalent for REBLOZYL was no longer constrained. As the Company did not have any remaining performance obligations under the agreement with BMS, the full $25.0 million was recognized as revenue during the three months ended June 30, 2020.

Through December 31, 2020, under all BMS arrangements, the Company has received net cost-share payments, milestones, and royalties of $256.6 million and $45.0 million for REBLOZYL and sotatercept, respectively.

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, 2020, 2019 and 2018, the Company expensed $1.8 million, $3.7 million and $0.1 million, respectively, of milestones and fees. Milestones and fees associated with development related activities are recorded as research and development expense. During the years ended December 31, 2020, 2019 and 2018, the Company expensed $2.8 million, zero, and zero, respectively, of royalties. Costs related to royalties on sales of commercial products are recorded as selling, general and administrative 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, 2020, 2019, and 2018, the Company expensed milestones and fees totaling $0.6 million, $2.1 million, and $0.1 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, 2020, 2019, and 2018, the Company expensed milestones and fees totaling $4.2 million, $10.0 million, and zero, respectively, which is recorded as research and development expense.

11. Stock-Based Compensation

At December 31, 2020, 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 5,435,860 at December 31, 2020.

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 $0.8 million, $0.4 million, and $0.4 million of stock-based compensation expense during the years ended December 31, 2020, 2019, and 2018, respectively related to the 2013 ESPP. The number of shares available for future issuance was 87,016 at December 31, 2020.

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, 2020, 2019 and 2018, the Company recognized $1.8 thousand, $1.0 million, and $2.4 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,		
	2020	2019	2018
Research and development	$ 14,331	$ 9,943	$ 12,669
Selling, general and administrative	15,906	13,052	11,900
	$ 30,237	$ 22,995	$ 24,569

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,		
	2020	2019	2018
Expected volatility	55.8 %	58.6 %	62.8 %
Expected term (in years)	6.0	6.0	6.0
Risk-free interest rate	1.26 %	2.39 %	2.70 %
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 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, 2020 (in thousands, except per share amounts and years):

	Number of Shares (in thousands)	Weighted-Average Exercise Price Per Share	Weighted-Average Contractual Life (in years)	Aggregate Intrinsic Value(1)
Outstanding at December 31, 2019	3,820	$ 36.26		
Granted	1,206	$ 69.80		
Exercised	(1,456)	$ 31.80		
Canceled or forfeited	(192)	$ 42.94		
Outstanding at December 31, 2020	3,378	$ 49.78	7.35	$ 264,046
Exercisable at December 31, 2020	1,732	$ 39.10	6.15	$ 153,852

(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, 2020.

During the years ended December 31, 2020, 2019 and 2018, the Company granted stock options to purchase an aggregate of 1,206,469; 923,508; and 942,271 shares of its common stock, respectively, with weighted-average grant date fair values of $36.57, $23.65, and $25.05, respectively.

During the years ended December 31, 2020, 2019 and 2018, current and former employees of the Company exercised a total of 1,455,899; 344,257; and 779,711 options, respectively, resulting in total proceeds of $46.3 million, $10.1 million, and $15.9 million, respectively.

The aggregate intrinsic value of options exercised during the years ended December 31, 2020, 2019, and 2018, under the Company's stock option plans, was $95.2 million, $4.9 million, and $19.3 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, 2020, there was $47.9 million of unrecognized compensation expense that is expected to be recognized over a weighted-average period of 2.6 years.

Restricted Stock Units

The following table summarizes the restricted stock unit (RSU) activity under the 2013 Plan during the year ended December 31, 2020:

	Number of Stock Units (in thousands)	Weighted-Average Grant Date Fair Value Per Share
Unvested balance at December 31, 2019	397	$ 39.20
Granted	304	$ 71.87
Vested	(164)	$ 38.62
Forfeited	(43)	$ 43.00
Unvested balance at December 31, 2020	494	$ 59.16

At December 31, 2020, there was approximately $21.1 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

On January 22, 2020, the Company granted performance-based restricted stock units (PSU) whereby vesting depends upon the occurrence of certain milestones events by December 31, 2022. As of December 31, 2020, none of the PSU milestones had been achieved. When achievement of a milestone becomes probable, compensation cost will be recognized from the grant date over the requisite service period. As of December 31, 2020, no related compensation cost has been recognized. The following table summarizes PSU activity under the 2013 Plan during the year ended December 31, 2020:

	Number of Stock Units (in thousands)	Weighted-Average Grant Date Fair Value Per Share
Unvested balance at December 31, 2019	—	$ —
Granted	78	$ 52.99
Vested	—	$ —
Forfeited	(3)	$ 52.99
Unvested balance at December 31, 2020	75	$ 52.99

As of December 31, 2020, there was approximately $4.0 million of related unrecognized compensation cost. Depending on the actual number of awards earned, the actual expense recognized could range between 0% and 200% of this amount.

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 2020, 2019, and 2018, the Board approved matching contributions of up to $10,000, $10,000, and $8,500, 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 $2.6 million, $1.7 million, and $1.1 million for the years ended December 31, 2020, 2019, and 2018, 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.

Deferred tax assets and valuation allowance

The Company recognized current income tax expense of $21,000 for the year ended December 31, 2020 related to state income taxes on its interest income. 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's loss before income taxes was $166.0 million, $124.9 million and $118.9 million for the years ended December 31, 2020, 2019 and 2018, respectively. For the years ended December 31, 2019 and 2018, the loss was generated entirely in the United States and worldwide where REBLOZYL is approved. For the year ended December 31, 2020, the losses were generated in the United States, Bermuda, and worldwide where REBLOZYL is approved.

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,	
	2020	2019
Deferred tax assets:		
U.S. and state net operating loss carryforwards	$ 233,647	$ 184,355
Research and development credits	28,301	21,345
Stock compensation	12,678	14,024
Lease liabilities	6,528	7,090
Accruals and other temporary differences	7,013	5,584
Total deferred tax assets	288,167	232,398
Right of use asset	(5,961)	(6,429)
Less valuation allowance	(282,206)	(225,969)
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, 2020 and 2019. The valuation allowance increased by $56.2 million, $43.0 million, and $37.3 million during the years ended December 31, 2020, 2019, and 2018, respectively, due primarily to the generation of net operating losses during these periods.

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,		
	2020	2019	2018
Federal income tax expense at statutory rate	21.0 %	21.0 %	21.0 %
Foreign rate differential	(3.4)%	— %	— %
State income tax, net of federal benefit	3.7 %	9.9 %	7.0 %
Permanent differences	8.2 %	0.2 %	2.0 %
Research and development credit	4.4 %	4.2 %	3.2 %
Other	(0.1)%	(0.9)%	(0.6)%
Change in valuation allowance	(33.8)%	(34.4)%	(32.6)%
Effective income tax rate	— %	— %	— %

As of December 31, 2020 and 2019, the Company had U.S. federal net operating loss carryforwards of $871.4 million and $666.3 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 2024 through 2037. $433.4 million of the federal net operating loss carryforward can be carried forward indefinitely. As of December 31, 2020 and 2019, the Company also had U.S. state net operating loss carryforwards of $788.3 million and $689.8 million, respectively, which may be available to offset future income tax liabilities. State net operating loss carryforwards of $787.7 million will expire at various dates from 2030 through 2040. State net operating loss carryforwards of $0.6 million can be carried forward indefinitely.

As of December 31, 2020 and 2019, the Company had federal research and development and orphan drug tax credit carryforwards of $19.9 million and $14.5 million, respectively, available to reduce future tax liabilities which expire at various dates through 2040. As of December 31, 2020 and 2019, the Company had state tax credit carryforwards of approximately $10.7 million and $8.7 million, respectively, available to reduce future tax liabilities which expire at various dates through 2035.

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, 2020 and 2019, 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, 2020, 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, 2020 and 2019. 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, 2017 through December 31, 2020. 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.

14. Leases

Accounting under ASC 842

The Company adopted ASC 842 effective January 1, 2019. Certain required disclosures have been made on a prospective basis in accordance with the standard's guidance. See Note 2, Summary of significant accounting policies.

The Company currently leases approximately 125,000 square feet of office and laboratory space in five adjacent buildings in Cambridge, Massachusetts (the Leases). Each of the Leases have options to renew for periods ranging from three to five years, which were not included in the initial measurement of these leases.

The Company leases its facilities under non-cancelable operating leases that expire at various dates from September 2023 to May 2026. 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.

On October 16, 2020, the Company entered into an amendment for its office space at 125 Sidney Street and corresponding parking lot to extend the lease term through May 31, 2026. The renewal operates under the same terms and conditions as the original lease, with the option to renew for one additional five-year term. As a result of the renewal, the ROU asset and lease liability were remeasured at the present value of the lease payments not yet paid, discounted by the incremental borrowing rate (IBR) at the remeasurement date. This resulted in a net increase to the lease liability and ROU asset of $3.8 million. There was no impact on the consolidated statement of operations and comprehensive loss or the consolidated statement of cash flows as a result of the lease renewal.

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

	As of December 31, 2020
2021	$ 8,926
2022	9,235
2023	7,296
2024	867
2025	888
2026	373
Total lease payments	$ 27,585
Less: imputed interest	(3,508)
Total operating lease liabilities	$ 24,077

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, 2020, the Company recognized rent expense of $8.2 million.

The Company paid $8.6 million and $8.4 million in rent relating to the Leases for the year ended December 31, 2020 and 2019, respectively. This 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, 2020:

	As of December 31,	
	2020	2019
Weighted average remaining lease term	3.2 years	3.7 years
Weighted average discount rate	9.59 %	10.59 %

15. Related Party Transactions

Celgene (BMS)

In connection with the Company's July 2020 and January 2019 public offerings, BMS purchased 108,018 and 706,206 shares of common stock, respectively. On July 9, 2020, all remaining outstanding warrants held by Celgene (now BMS) were automatically cashless exercised in full upon their expiration. In connection with these and prior transactions, BMS owned 10.8% and 12.0% of the Company's fully diluted equity as of December 31, 2020 and 2019, respectively.

During the years ended December 31, 2020, 2019 and 2018, 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)			
2020				
Total revenue	$ 4,344	$ 39,752	$ 22,561	$ 25,866
Total costs and expenses	55,916	58,665	61,789	83,461
Loss from operations	(51,572)	(18,913)	(39,228)	(57,595)
Net loss	(50,939)	(18,451)	(39,245)	(57,396)
Net loss per share- basic and diluted	$ (0.95)	$ (0.34)	$ (0.66)	$ (0.95)
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 income (loss)	(38,053)	(17,862)	(45,369)	(23,575)
Net loss per share- basic and diluted	$ (0.74)	$ (0.34)	$ (0.86)	$ (0.44)

(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	Description of Capital Stock		Form 10-K (Exhibit 4.4)	2/27/2020	001-36065
10.1*	Form of 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
10.2.1	Letter Agreement to Amended and Restated Collaboration, License and Option Agreement between Acceleron Pharma Inc. and Celgene Corporation, dated as of March 10, 2020		Form 10-Q (Exhibit 10.1)	5/11/2020	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*	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
10.10*	Employment Agreement between Adam M. Veness, Esq. and Acceleron Pharma Inc., dated as of June 5, 2019	X			
10.11*	Offer Letter between Jay T. Backstrom, M.D., M.P.H. and Acceleron Pharma Inc., dated as of December 4, 2019	X			
10.12*	Employment Agreement between Jay T. Backstrom, M.D., M.P.H. and Acceleron Pharma Inc., dated as of December 10, 2019	X			

Exhibit Number	Exhibit Description	Filed with this Report	Incorporated by Reference herein from Form or Schedule	Filing Date	SEC File/Reg. Number
10.13*	Acceleron Pharma Inc. Short-Term Incentive Compensation Plan		Form 8-K (Exhibit 10.1)	6/6/2016	001-36065
10.14*	Employee Stock Purchase Plan		Form S-1/A (Exhibit 10.20)	9/6/2013	333-190417
10.15*	Acceleron Pharma Inc. 2003 Stock Option and Restricted Stock Plan		Form S-1 (Exhibit 10.15)	8/7/2013	333-190417
10.16*	Acceleron Pharma Inc. 2013 Equity Incentive Plan		Form S-8 (Exhibit 4.4)	12/12/2013	333-192789
10.17*	Form of Incentive Stock Option Agreement under the 2013 Equity Incentive Plan		Form S-1 (Exhibit 10.22)	1/9/2014	333-193252
10.18*	Form of Non-Statutory Stock Option Agreement for Company Employees under the 2013 Equity Incentive Plan	X			
10.19*	Form of Non-Statutory Stock Option Agreement for Non-Employee Directors under the 2013 Equity Incentive Plan	X			
10.20*	Form of Restricted Stock Unit Award Agreement for Company Employees under the 2013 Equity Incentive Plan	X			
10.21*	Form of Restricted Stock Unit Award Agreement for Non-Employee Directors 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.

Signatures

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

ACCELERON PHARMA INC.

Date: February 25, 2021

By: /s/ HABIB J. DABLE
Habib J. Dable
Chief Executive Officer, President and Director

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

Signature	Title	Date
/s/ HABIB J. DABLE Habib J. Dable	Chief Executive Officer, President and Director (Principal Executive Officer)	February 25, 2021
/s/ KEVIN F. MCLAUGHLIN Kevin F. McLaughlin	Senior Vice President, Chief Financial Officer and Treasurer (Principal Financial Officer and Principal Accounting Officer)	February 25, 2021
/s/ FRANCOIS NADER, M.D. Francois Nader, M.D.	Chair of the Board of Directors	February 25, 2021
/s/ LAURA J. HAMILL Laura J. Hamill	Director	February 25, 2021
/s/ CHRISTOPHER HITE Christopher Hite	Director	February 25, 2021
/s/ TERRENCE C. KEARNEY Terrence C. Kearney	Director	February 25, 2021
/s/ KEMAL MALIK, M.B. B.S. Kemal Malik, M.B. B.S.	Director	February 25, 2021
/s/ THOMAS A. MCCOURT Thomas A. McCourt	Director	February 25, 2021
/s/ KAREN L. SMITH, M.D., PH.D. Karen L. Smith, M.D., Ph.D.	Director	February 25, 2021
/s/ JOSEPH S. ZAKRZEWSKI Joseph S. Zakrzewski	Director	February 25, 2021