UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

(Mark One)

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

For the fiscal year ended December 31, 2019

OR

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

Commission File Number 001-39208

Beam Therapeutics Inc.

(Exact name of Registrant as specified in its Charter)

Delaware	**81-5238376**
(*State or other jurisdiction of incorporation or organization*)	**(*I.R.S. Employer Identification No.*)**
26 Landsdowne Street **Cambridge, MA**	**02139**
(*Address of principal executive offices*)	**(*Zip Code*)**

Registrant's telephone number, including area code: 857-327-8775

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

Title of each class	**Trading Symbol(s)**	**Name of each exchange on which registered**
Common Stock, par value $0.01 per share	**BEAM**	**Nasdaq Global Select Market**

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

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

Indicate by check mark if the Registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. YES ☐ NO ☒

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

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

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

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

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

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

As of June 28, 2019, the last business day of the registrant's most recently completed second quarter, there was no public market for the registrant's common stock. The registrant's common stock began trading on the Nasdaq Global Select Market ("Nasdaq") on February 6, 2020. The aggregate market value of the voting and non-voting common stock held by non-affiliates of the registrant, based on the closing price of the registrant's common stock on Nasdaq on March 25, 2020, was approximately $684,460,600.

The number of shares of registrant's common stock outstanding as of March 25, 2020 was 51,339,708.

DOCUMENTS INCORPORATED BY REFERENCE

No items are incorporated by reference into this Annual Report on Form 10-K.

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FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended (the "Securities Act"), and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). Such forward-looking statements reflect, among other things, our current expectations and anticipated results of operations, all of which are subject to known and unknown risks, uncertainties and other factors that may cause our actual results, performance or achievements, market trends, or industry results to differ materially from those expressed or implied by such forward-looking statements. Therefore, any statements contained herein that are not statements of historical fact may be forward-looking statements and should be evaluated as such. Without limiting the foregoing, the words "anticipate," "expect," "suggest," "plan," "believe," "intend," "project," "forecast," "estimates," "targets," "projections," "should," "could," "would," "may," "might," "will," and the negative thereof and similar words and expressions are intended to identify forward-looking statements. These forward-looking statements are subject to a number of risks, uncertainties and assumptions, including those described in "Risk Factors" in Part I, Item 1A of this report. Unless legally required, we assume no obligation to update any such forward-looking information to reflect actual results or changes in the factors affecting such forward-looking information.

When we use the terms "Beam," the "Company," "we," "us" or "our" in this Annual Report on Form 10-K, we mean Beam Therapeutics Inc. and its subsidiaries on a consolidated basis, unless the context indicates otherwise.

TRADEMARKS

We use BEAM, REPAIR and RESCUE and other marks as trademarks in the United States and/or in other countries. This Annual Report on Form 10-K contains references to our trademarks and service marks and to those belonging to other entities. Solely for convenience, trademarks and trade names referred to in this report, including logos, artwork and other visual displays, may appear without the ® or TM symbols, but such references are not intended to indicate in any way that we will not assert, to the fullest extent under applicable law, our rights or the rights of the applicable licensor to these trademarks and trade names. We do not intend our use or display of other entities' trade names, trademarks or service marks to imply a relationship with, or endorsement or sponsorship of us by, any other entity.

MARKET AND INDUSTRY DATA

Unless otherwise indicated, information contained in this Annual Report on Form 10-K concerning our industry and the markets in which we operate, including our general expectations, market position and market opportunity, is based on our management's estimates and research, as well as industry and general publications and research, surveys and studies conducted by third parties. We believe that the information from these third-party publications, research, surveys and studies included in this report is reliable. Management's estimates are derived from publicly available information, their knowledge of our industry and their assumptions based on such information and knowledge, which we believe to be reasonable. This data involves a number of assumptions and limitations which are necessarily subject to a high degree of uncertainty and risk due to a variety of factors, including those described in "Risk Factors" in Part I, Item 1A of this report. These and other factors could cause our future performance to differ materially from our assumptions and estimates.

PART I

Item 1. Business.

Overview

We are a biotechnology company committed to creating a new class of precision genetic medicines based on our proprietary base editing technology, with a vision of providing life-long cures to patients suffering from serious diseases.

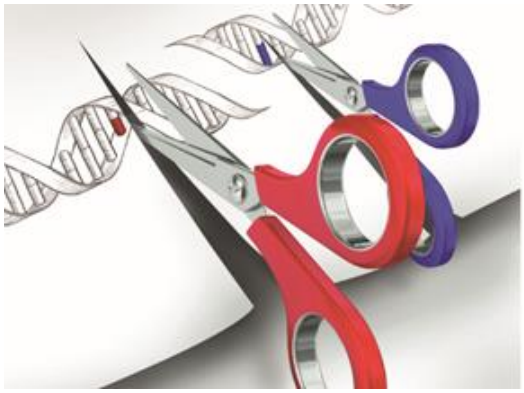
The most common class of genetic mutations are errors of a single base, known as point mutations. These point mutations represent approximately 58% of all the known genetic errors associated with disease. Other natural genetic variations of a single base among human populations, revealed by population-level genomic studies, are known to protect against disease. To maximize the impact of these genetic insights, the ability to alter the human genome at the foundational level of genetic information – a single base – is crucial.

In the last decade, the field of genetic medicine has reached an inflection point, with groundbreaking advances in gene therapy, cell therapy, oligonucleotides, and, more recently, gene editing. While these technologies represent dramatic advancements for genetic medicines, the ability to edit genes at the single base level has been elusive. Existing gene editing technologies, such as CRISPR, Zinc Fingers, Arcuses, and TAL Nucleases, operate by creating a targeted double-stranded break in the DNA, and then rely on cellular mechanisms to complete the editing process. Such approaches can be effective in the disruption of gene expression; however, they lack control of the editing outcome, have low efficiency of precise gene correction, and can result in unwanted DNA modifications.

Our proprietary base editing technology potentially enables an entirely new class of precision genetic medicines that targets a single base in the genome without making a double-stranded break in the DNA. This approach uses a chemical reaction designed to create precise, predictable and efficient genetic outcomes at the targeted sequence, which we believe will dramatically increase the impact of gene editing for a broad range of therapeutic applications. By building on the significant recent advances in the field of genetic medicine, we believe we will be able to rapidly advance our portfolio of novel base editing.

Our novel base editors have two principal components that are fused together to form a single protein: (i) a CRISPR protein, bound to a guide RNA, that leverages the established DNA-targeting ability of CRISPR, but modified to not cause a double-stranded break, and (ii) a base editing enzyme, such as a deaminase, which carries out the desired chemical modification of the target DNA base.

If existing gene editing approaches are “scissors” for the genome, our base editors are “pencils,” erasing and rewriting one letter in the gene.



CRISPR, Zinc Finger, Arcuses, TAL Nucleases

Base Editors

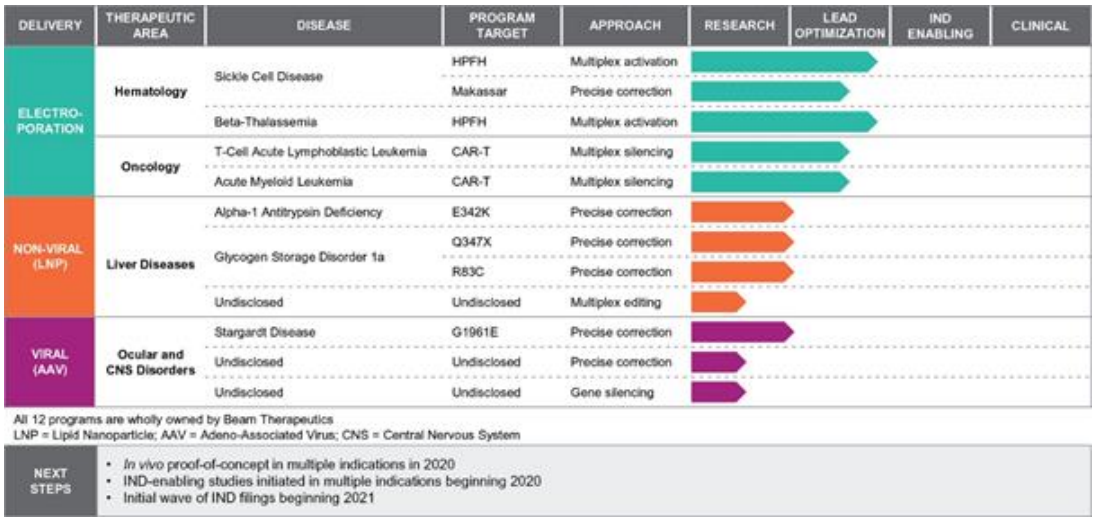
The elegance and simplicity of the “pencils” approach provides the basis for an efficient, precise, and highly versatile gene editing system, capable of gene correction, gene modification, gene silencing/gene activation, and multiplex editing of several genes simultaneously. Our base editor programs will be developed for genetically defined patient populations, which can potentially enable early proof-of-concept in Phase 1 testing and create a rapid path to pivotal trials and potential approval.

We believe base editors may have broad therapeutic applicability and transformational potential for the field of precision genetic medicines. In addition to base editing, we have assembled a suite of additional next generation gene editing technologies, including RNA base editing, Cas12b nuclease editing, and prime editing, giving us a versatile platform for gene editing of serious diseases.

We are currently advancing a broad, diversified portfolio of 12 base editing programs against distinct editing targets, with each program progressing along a clearly defined scientific path and utilizing the full range of our development capabilities. To unlock the full potential of our base editing technology across a wide range of therapeutic applications, we are pursuing a comprehensive suite of clinically validated delivery modalities in parallel. For a given tissue type, we use the delivery modality with the most compelling biodistribution.

Our programs are organized by delivery modality into three distinct pipelines: electroporation for efficient delivery to blood cells and immune cells *ex vivo*; lipid nanoparticles, or LNPs, for non-viral *in vivo* delivery to the liver and potentially other organs in the future; and adeno-associated viral vectors, or AAV, for viral delivery to the eye and central nervous system, or CNS. We believe our base editing programs are well-positioned to leverage the clinical, regulatory, and manufacturing advancements made to date across gene therapy, gene editing, and delivery modalities to accelerate progression to clinical trials and potential approval.

Our current portfolio includes the following 12 programs:



We have achieved proof-of-concept *in vivo* with long-term engraftment of *ex vivo* base edited human CD34 cells in mice for our HPFH program, and we have demonstrated base editing of cells *in vitro* at therapeutically relevant levels for the majority of our remaining programs. We have also successfully demonstrated feasibility of base editing with each of our three delivery modalities in relevant cell types for electroporation and AAV and *in vivo* in mice for LNP. Our portfolio includes a novel approach to elevating levels of fetal hemoglobin for sickle cell disease and beta-thalassemia, as well as direct correction of the sickle cell mutation itself; engineered allogeneic CAR-T products through multiplex editing of T cells from healthy donors, initially for pediatric T-cell Acute Lymphoblastic Leukemia, or T-ALL, and pediatric Acute Myeloid Leukemia, or AML; precise correction of key point mutations in two severe liver disorders, Alpha-1 Antitrypsin Deficiency and Glycogen Storage Disorder 1a; and a precise gene correction approach to treating the most prevalent point mutation causing Stargardt disease, a progressive ocular disorder for which there are no approved treatments.

We expect to achieve additional preclinical proofs-of-concept *in vivo* for additional programs in 2020, which could include engraftment results for the Makassar precise correction sickle cell program, xenograft models for our CAR-T programs or *in vivo* base editing in our programs using LNP or AAV delivery. If successful, and provided the coronavirus disease of 2019, or COVID-19, does not cause our timelines to slip materially, this will allow us to initiate investigational new drug, or IND, enabling studies for multiple programs beginning in 2020. We expect to file an initial wave of IND filings beginning in 2021.

Since our founding in 2017, we have developed and consolidated significant technology and intellectual property covering the elements of base editing, as well as additional gene editing technologies and delivery modalities, with exclusive licenses from Harvard University, or Harvard, Broad Institute of MIT and Harvard, or Broad Institute, Editas Medicine, and Bio Palette.

Base editors: A potential new class of medicines that perform precision chemistry on genes

The human genome has four types of bases found in DNA: adenine (A), cytosine (C), guanine (G), and thymine (T). Adenine pairs with thymine, and cytosine pairs with guanine. The genome is comprised of over three billion of these base pairs in two intertwining strands of DNA; the sequence of these bases encodes genes. In a living cell, these DNA sequences are continuously copied into short ribonucleic acid transcripts, called messenger RNA, or mRNA, which are then translated into proteins that perform the functions of life. Misspellings in genes, known as mutations, can yield proteins that are dysfunctional or missing altogether, causing disease. Errors of a single base, known as point mutations, are the most common class of genetic mutations, representing approximately 58% of all

the known genetic errors associated with disease. Other natural genetic variations of a single base among human populations, revealed by population-level genomic studies, are known to protect against disease. To maximize the impact of these genetic insights, the ability to alter the human genome at the foundational level of genetic information – a single base – is crucial.

Existing gene editing technologies, including CRISPR, Zinc Fingers, Arcuses and TAL Nucleases, do not edit at the single base level. Instead, these technologies operate by creating a targeted double-stranded break in the DNA, and then rely on cellular mechanisms to complete the editing process. Such approaches can be effective in disruption of gene expression; however, they lack control of the editing outcome, have low efficiency of precise gene correction, and can result in unwanted DNA modifications.

Our base editing technology is an entirely new therapeutic approach capable of changing one base in the genome without making a double-stranded break in the DNA. Base editing involves the enzymatic modification of a single type of base at a targeted location directly on the gene, specifically C-to-T or A-to-G.

If existing gene editing approaches are “scissors” for the genome, our base editors are “pencils,” erasing and rewriting one letter in the gene.

The elegance and simplicity of the “pencils” approach is designed to create precise, predictable and efficient genetic outcomes at a targeted sequence. We believe base editors may have broad therapeutic applicability and transformational potential for the field of precision genetic medicines.

Background on current methods in genetic medicines

In the last decade, the field of genetic medicine has reached an inflection point, with groundbreaking advances in gene therapy, cell therapy, oligonucleotides and, most recently, gene editing. Several medicines have been approved using a number of these technologies, including gene therapies, such as Luxturna™, Zolgensma®, Strimvelis®, and Zynteglo™; genetically modified cell therapies, such as Kymriah® and Yescarta®; oligonucleotide therapies, such as Onpattro® and Spinraza®; as well as the successful progression of several gene editing approaches to clinical trials in the United States and Europe. With the exception of oligonucleotides, which must be dosed chronically, each of these therapies has the potential for life-long outcomes with a single treatment.

We believe we are well-positioned to accelerate progression of our base editing programs to clinical trials through potential approval by leveraging the clinical, regulatory, and manufacturing advancements made to date in the field of genetic medicine. In addition, we believe base editing technology has the potential to provide life-long cures after a single treatment by overcoming challenges associated with current methods in gene therapy and gene editing.

Current challenges in gene therapy

Gene therapy involves using viral vectors, including AAV or retroviruses such as lentiviruses, to deliver new copies of genes, or transgenes, to cells. Fine-tuning the level of expression of the transgene in different cell types and/or diseases can be challenging. Because transgenes may often not get inserted into the appropriate locus of the host genome, they do not benefit from endogenous regulation. In addition, since the mutated gene is still present, the effectiveness of the transgene may be diminished due to competition with the mutated protein.

In the case of AAV gene therapy, life-long expression of the transgene is a significant hurdle, as the persistence of AAV expression has not yet been achieved in several organs, especially in muscles and the liver. Lack of persistence can be further exacerbated when treating children, since the transgene becomes diluted as the child grows and cells are rapidly dividing. Finally, preexisting immunity may limit use in some patients altogether and certain immune responses may prevent redosing in the context of lack of persistence.

Retroviral vectors, including lentiviral vectors, work by inserting a gene payload into the patient’s chromosome, typically *ex vivo*, and have demonstrated improved durability compared to AAV therapies. However, these vectors bear the risk of random genomic integration, which creates the potential of disrupting important genes or activating cancer-causing genes.

Current challenges in gene editing

Gene editing works by disrupting, inserting, or modifying genes in the natural context of the genome. The vast majority of existing gene editing methods rely on a class of enzymes, called nucleases, to make a double-stranded break in the DNA at a targeted location. These enzymes include CRISPR, Zinc Fingers, Arcuses, and TAL Nucleases, and, while these approaches have distinct technical features, they make the same type of edit and, therefore, share several similar limitations.

First, there is a lack of predictability in genetic outcomes when altering gene sequences with nucleases. The dominant naturally occurring DNA repair system that corrects double-stranded breaks within cells is called Non-Homologous End Joining, or NHEJ. This system can patch the broken ends of the chromosomes back together but can simultaneously insert or delete sequences at random near the location where the break occurs. While this NHEJ approach is effective if the desired outcome is to knock out or switch off the whole gene, it does not allow for precise control of the specific genetic outcome at the target site.

Second, there are potential toxicities associated with double-stranded breaks, such as cell death response and genomic instability. In addition, if the double-stranded break occurs in the wrong place, the break can also lead to unwanted gene disruptions. Multiple edits, and thus multiple double-stranded breaks, can compound this issue and lead to large-scale genomic translocations and rearrangements, potentially limiting the applicability of nuclease-based approaches in multiplex editing.

Third, while gene disruption with nucleases is highly efficient, making specific sequence changes to correct or modify genes remains largely inefficient. To change a gene sequence, gene editing using nucleases relies on a DNA repair pathway called Homology Directed Repair, or HDR. HDR is a low-efficiency DNA repair pathway, typically yielding single digit percentage editing. This pathway also requires the simultaneous delivery of an additional DNA template containing the desired, corrected gene sequence, which needs to be positioned at the precise location where the double-stranded break has occurred. The requirement of an additional DNA template also significantly increases the complexity of delivery. More recently, approaches have been developed to insert sequences into certain highly expressed genes, such as the albumin locus in liver cells. This strategy can only be used to address diseases that are associated with circulating proteins, and the efficiency of these approaches remains low.

Finally, gene editing through HDR does not allow for the correction of genes in non-dividing cells, since this DNA repair machinery is only expressed in dividing cells, further limiting their applications.

Advantages of base editing

Base editing is an emerging new class of precision genetic medicines using a completely novel mechanism for editing DNA, creating potential therapeutic options designed to overcome the limitations of existing approaches and expand the potential of genetic medicines:

- **Highly precise and predictable gene editing.** Our base editing approach uses a chemical reaction that enables precise genetic outcomes, making only one type of base edit at the desired target location.

- **Highly efficient levels of gene correction.** In contrast to HDR, the efficiency and precision of base editing allows therapeutically relevant levels of editing at targeted locations, which are unachievable by HDR methods in most cell types. For our most advanced programs, these levels range from 50%-90% editing of the target base, whereas HDR-based methods have typically shown less than 10% editing of the target base.

- **Broad therapeutic application.** Base editing enables a wide variety of editing strategies, including gene correction, gene modification, gene silencing/gene activation, and multiplex editing, with therapeutic potential in many areas.

- **Activity in both dividing and non-dividing cells.** Precise gene correction with base editing is not reliant on HDR, which is only expressed in dividing cells. As a result, base editing can be effective in both dividing and non-dividing cells.

- **No requirement for a DNA template.** Because base editing corrects DNA directly, there is no requirement for delivering an additional DNA template with the correct sequence, as is the case in HDR-based methods, which we believe may simplify delivery.

- **Avoidance of unwanted DNA modifications associated with double-stranded breaks.** Base editors do not create double-stranded breaks in DNA, thereby avoiding many of the concerns associated with double-stranded breaks, including unwanted gene disruptions, translocations, or deletions. With base editing, we are also able to make multiple simultaneous edits, called multiplexing, without any detectable chromosomal rearrangements.

- **Permanent editing of genes.** Base editing is permanent once the edit is made, creating the potential for a life-long therapeutic outcome. The durability of base editing extends to tissues with high cell turnover, as occurs in young children, since the edit will be passed on as cells divide. Furthermore, because the edits persist after the editor is gone, the expression of the base editor can be transient, thus significantly lowering delivery hurdles compared to gene therapies.

- **Preservation of natural regulation.** Base editing modifies genes in their native genomic setting, allowing the modified gene to benefit from its natural regulatory circuitry and ensuring a normal number of copies of the gene are present in the cell.

- **Versatile and modular product engine.** The same base editor can be repurposed to target different gene sequences by merely replacing the guide RNA, creating significant leverage from our initial platform investments and with the potential to drive high levels of efficiency throughout the drug discovery, development, and manufacturing processes.

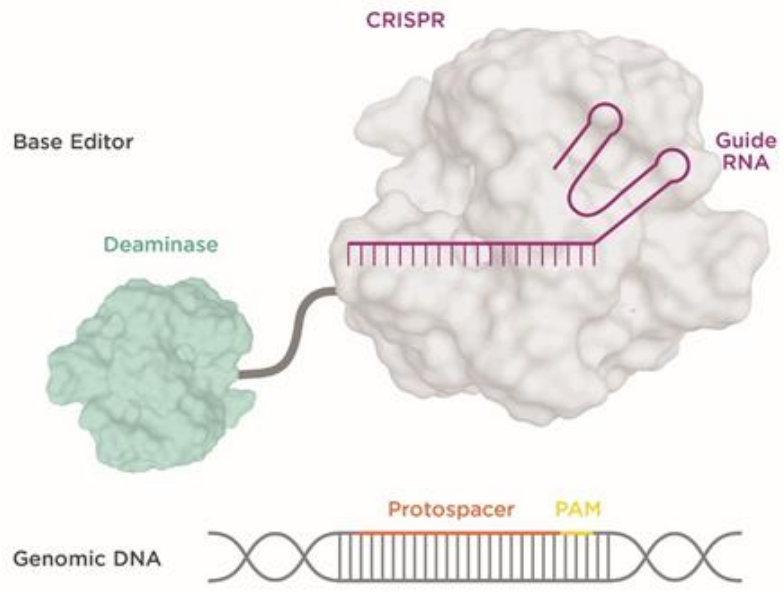
Our base editing platform

Our novel DNA base editors have two principal components that are fused together to form a single protein: (i) a CRISPR protein, bound to a guide RNA, that leverages the established DNA-targeting ability of CRISPR, but modified to not cause a double-stranded break, and (ii) a base editing enzyme, such as a deaminase, which carries out the desired chemical modification of the target DNA base. This proprietary combination enables the precise and targeted editing of a single base pair of DNA, which has not been previously possible.

CRISPR proteins enable precise targeting of genomic DNA sequences. They have been adapted and engineered over the years to target specific genomic locations with high specificity in human cells. CRISPR proteins incorporate a programmable component called a guide RNA. The guide RNA includes a region of approximately 20 bases, which allows the CRISPR protein to recognize any DNA sequence that is complementary to the guide RNA.

This complementary sequence on DNA, also approximately 20 bases, is known as a protospacer. The short sequence of about three bases immediately following the protospacer on the genomic DNA is referred to as the protospacer adjacent motif, or PAM. The presence of the PAM is necessary for RNA-DNA pairing to occur when a matching protospacer sequence is present.

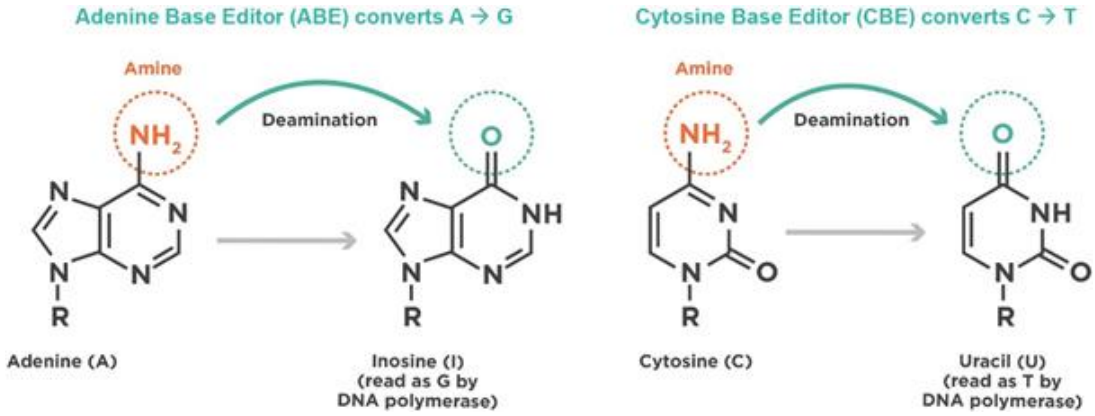
The figure below is a graphical representation of the base editor and its components, including the guide RNA with the single-stranded portion that is complementary to the protospacer in the genomic DNA.



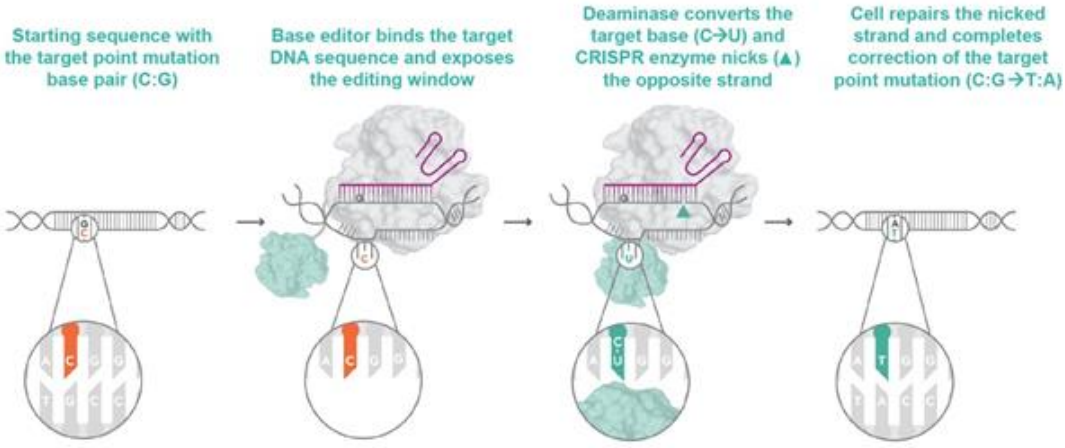
In our base editors, the first component is the CRISPR protein. We are currently using a Cas9 protein for our DNA base editors. We also have ongoing efforts to create base editors with other Cas proteins, including Cas12b. The targeting ability of the CRISPR protein has been preserved, but the cutting ability has been modified such that the CRISPR protein does not make a double-stranded break in the DNA. Our base editors benefit from an additional feature of the CRISPR protein, which, upon binding to its double-stranded DNA target, opens a four to five base single-stranded segment, known as the editing window.

The second component of our base editors is a deaminase, a class of naturally occurring enzymes. For our Cytosine Base Editors, referred to as “CBEs,” we use a deaminase that acts only on single-stranded DNA. This helps to minimize edits in other parts of the genome, where DNA is predominantly double-stranded. Similarly, for our Adenine Base Editors, referred to as “ABEs,” we use a different, engineered deaminase that also acts only on single-stranded DNA.

The deaminase makes a predictable chemical modification, called deamination, of the amine group on either adenine or cytosine. As shown in the figure below, the conversion of an amine group of A results in the formation of inosine, which is read by the DNA polymerase as a G, which subsequently leads to an A-to-G change. The deaminase in a CBE will convert an amine group of C, resulting in the formation of uracil, which is read by the DNA polymerase as a T, which subsequently leads to a C-to-T change.



As shown in the figure below, the two components of our base editors, the CRISPR protein and the deaminase, are fused together to form a single protein. When introduced into a cell, the CRISPR targets the desired genomic location by recognizing a complementary section on the DNA to the section encoded in the guide RNA. The deaminase then makes the desired edit to a target base in the editing window.



In the example shown, a C is edited to a U on one strand of the DNA, which is read as a T. Once this strand has been edited, the intermediate DNA consists of an edited strand, containing a U at the target locus, and an unedited strand with a G. The U:G is a mismatch, which the cell will normally attempt to repair in a process that can potentially lose the edit. In order to preserve the editing, we modify the CRISPR in our base editors to cleave the unedited single strand of the DNA, referred to as nicking, rather than creating double-stranded breaks. Nicking increases the efficiency of editing by inducing the cell to use the newly edited strand, and not the unedited strand, as the template for repair, resulting in a U:A pair without any translocations. Upon DNA repair or replication, the U is read as a T, resulting in a T:A pair. Therefore, the permanent conversion of a C:G base pair to a T:A base pair is completed.

Analogously, when an ABE is used instead of a CBE, an A:T pair is converted to a G:C pair. Because the DNA is double-stranded, by targeting the non-coding strand, we can also convert a T:A pair to a C:G and a G:C pair to a A:T pair in the coding strand. For example, using ABE to install an A-to-G edit on the non-coding strand of the DNA will cause a T-to-C change in the coding sequence of the gene once the base pair has been fully modified.

The modular and individual components of our base editors can be rapidly customized for specific diseases, creating new therapeutic programs with significant efficiencies in development. By changing the guide RNA portions of the CRISPR protein, we can quickly and precisely retarget base editors to different genomic locations based on their gene sequences. By changing the deaminase, we can control which base is edited (e.g., C or A). As a result, we believe our base editing platform is highly versatile, efficient, and scalable for discovery of drug candidates.

Diverse therapeutic applications of base editing

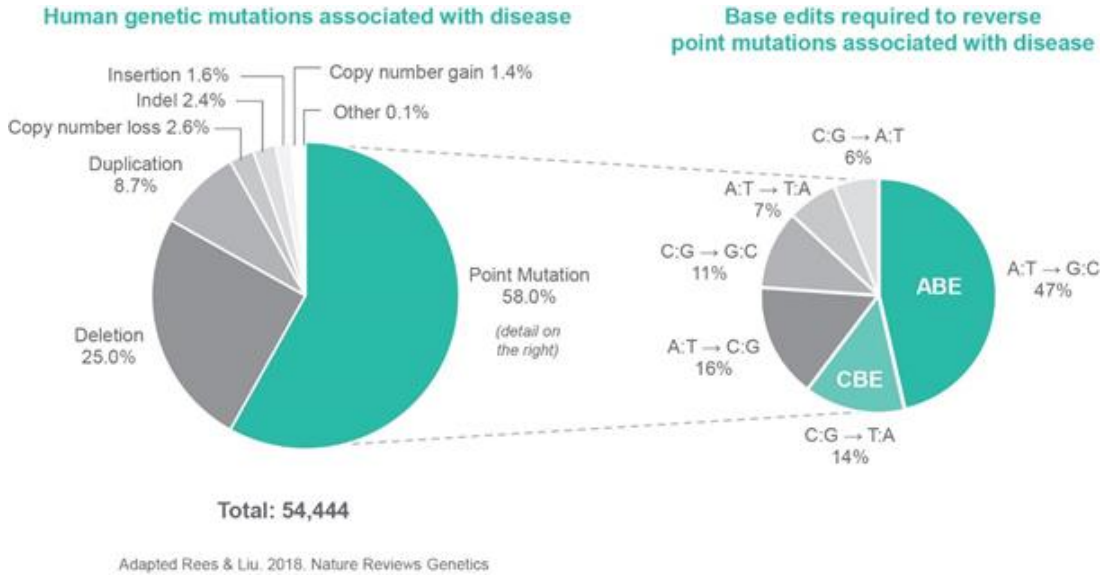
We believe the unique advantages of our base editing platform – single base editing precision, predictable editing outcome, high editing efficiency, and the avoidance of double-stranded breaks – make base editing a compelling approach for a wide range of

therapeutic applications. This includes gene correction, gene modification, gene silencing and gene activation, as well as multiplex editing of several genes simultaneously.

Gene Correction

Errors of a single base, known as point mutations, are the most common form of genetic mutations, representing approximately 58% of all the known genetic errors associated with disease, as shown in the figure below. For example, sickle cell disease is caused by a single point mutation at position 6 in the adult hemoglobin gene, while alpha-1 antitrypsin deficiency is caused by a single point mutation at position 342 in the SERPINA1 gene.

We believe base editors may be an ideal tool for repairing point mutations. Also shown in the figure below, our base editors are capable of correcting approximately 61% of the known point mutations that cause human disease. Our ABEs can address approximately 47% of point mutations, while our CBEs can address approximately 14%, making these editors potentially powerful tools for the treatment of a wide range of diseases. These changes (A to G, G to A, C to T, or T to C) are known as transition mutations. To address the remaining point mutations within the genome, we have an active research effort to develop editors that can make different chemical modifications, such as changing C to G or A to T.

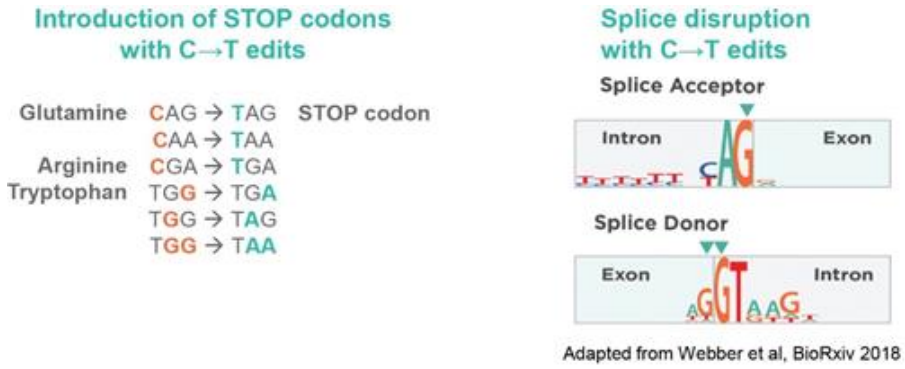


Gene Modification

In addition to repairing point mutations, base editors are also capable of making other kinds of precise modifications to genes that could be used to treat disease. Natural genetic variations of a single base among human populations, revealed by population-level genomic studies, are now known to protect against or modify risk for a disease. For example, the risk of Alzheimer's disease is significantly higher in patients with the apolipoprotein E4 genotype (APOE4), reflecting a variation of just one base in the apolipoprotein gene (APP), whereas it is significantly lower in patients with the "Icelandic" variant of the amylolid precursor protein gene, reflecting a single base change variant (A673T). Several genes, including proprotein convertase subtilisin/kexin type 9 (PCSK9), have also been associated with an increased risk of coronary artery diseases. Therefore, base editors could also potentially prevent or modify risk of disease by making these kinds of precise single-base modifications to genes, informed by human clinical genetics.

Gene Silencing or Activation

Upregulation or downregulation, including silencing and activation, of gene expression is a desirable therapeutic approach to cure many diseases. The high level of precision of base editors is ideally suited to alter regulatory regions of genes, ensuring that only a few bases at precise locations are altered to achieve the desired effect without causing broader disruptions to adjacent regions that may still have important regulatory functions. For example, we have demonstrated re-activation of expression of fetal hemoglobin by precisely changing the regulatory region of the relevant genes to which one or more repressor proteins can bind, including B-cell lymphoma/leukemia 11A, or BCL11A. Both our C and A base editors can also be used to silence the expression of genes, with editing rates that are highly comparable to those achieved with nuclease-based editors but without requiring a double-stranded break. Gene silencing, such as targeting surface proteins in a CAR-T cell, can be achieved either by the conversion of certain short gene sequences, called codons, into STOP codons or by the disruption of splice donor-acceptor sites, in each case with a single base conversion, as shown in the figure below.



Multiplex base editing

Because they avoid creating double-stranded breaks, base editors are particularly advantageous for situations in which multiple sequences in the genome must be simultaneously targeted. This could include targeting duplicated or repetitive sequences in the genome, as is the case with the identical regulatory regions of the two neighboring genes for fetal hemoglobin, or targeting several genes at once, such as in the creation of advanced cell therapies like CAR-T cells with a combination of features that could dramatically enhance their therapeutic potential.

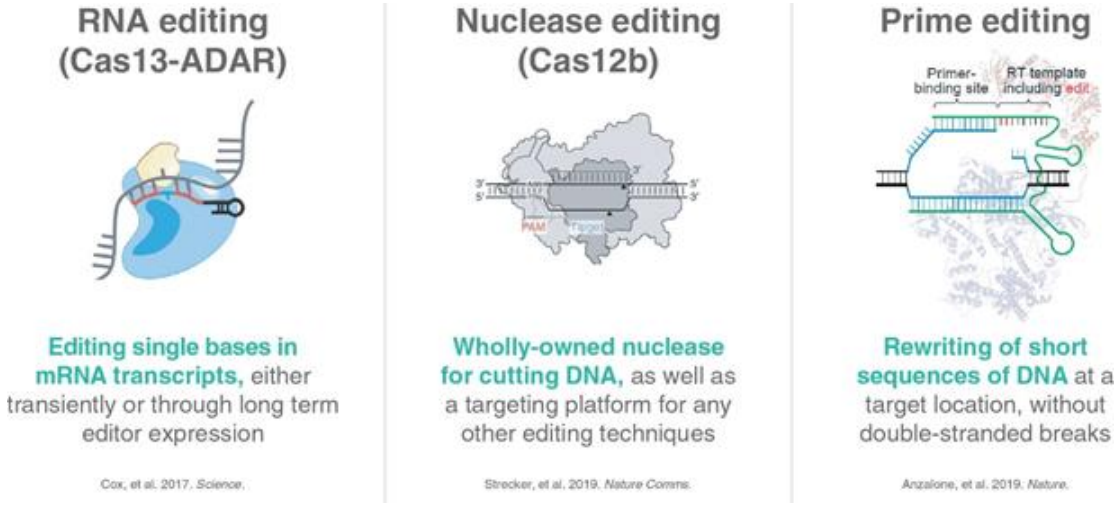
The simultaneous creation of multiple double-stranded breaks by nucleases can cause unwanted large-scale genomic rearrangements, such as translocations and deletions. These genomic rearrangements occur more frequently as the number of double-stranded breaks increases. Conversely, base editors do not create double-stranded breaks, and we have demonstrated in cell lines that they can edit multiple locations simultaneously without causing any detectable chromosomal rearrangements.

Additionally, there are manufacturing benefits as cells that have three or more nuclease edits appear to have a significant growth deficit compared to cells that have been edited the same number of times with a base editor.

We believe that our base editors can provide a significant and meaningful advancement in therapies where more complex genome editing is required, such as targeting multiple sequences across the genome or creating highly engineered cellular therapies.

Our portfolio of precision gene editing technologies

Building on the expertise of our academic founders and our innovative research culture, we plan to explore new and complementary technologies in base editing, gene editing, and genetic medicine over the long term to advance a broad portfolio across multiple delivery pipelines. As part of this strategy, we have licensed a portfolio of three additional complementary technologies – RNA base editing, Cas12b nuclease editing, and prime editing. Combined with base editing, we have assembled a broad and versatile portfolio of next generation gene editing technologies for the treatment of severe diseases.



Our license agreement with the Broad Institute gives us access to RNA base editing technology, a two-part modular system using an RNA-directed CRISPR protein for targeting RNA strands and a deaminase for editing. This CRISPR protein, known as Cas13, is modified so that it cannot break the RNA strand, and is fused to a deaminase capable of making a single base edit at a specific target location within the RNA strand. This enables us to change protein expression, potentially correcting or altering the function of the resulting protein and correcting disease. Our RNA base editing technologies include the REPAIR™ system for A-to-I editing, as well as the RESCUE™ system for C-to-U editing. When delivered through a long-lasting viral vector, RNA base editing may provide a complementary approach to DNA base editing for permanent correction of gene expression. Additionally, RNA editing could potentially be beneficial in situations where a transient change is desirable, such as in regenerative medicine.

Our Broad Institute license also gives us access to the Cas12b nuclease family, which provides several potential strategic advantages for our portfolio. First, the distinct PAM sequence and conformation of Cas12b allows us to create DNA base editors that can bind to different target sites in the genome, further expanding the range of sites that we can edit. Second, having a nuclease allows us to make “cut” edits, which may be appropriate for some applications that require a double stranded break, or to use the general gene targeting ability of Cas12b for other genome editing applications.

We also have a license to technology referred to as “prime editing,” that is controlled by Prime Medicine, Inc. Prime editing may be able to achieve the “rewriting” of short sequences of DNA at a target location. Prime editing utilizes a CRISPR protein to target a mutation site in DNA (blue) and to nick a single strand of the target DNA. The guide RNA (green) allows the CRISPR protein to recognize a DNA sequence that is complementary to the guide RNA and also carries a primer for reverse transcription and a replacement template. The reverse transcriptase copies the template sequence in the nicked site, installing the edit (red). As with base editing, prime editing does not cause double-stranded breaks in the target DNA, resulting in lower indel rates than gene editing technologies that rely on double stranded breaks.

Beam has the exclusive right to develop prime editing technology for the creation or correction of any single base transition mutations, as well as for the treatment of sickle cell disease. Transition mutations (i.e., A to G, G to A, C to T, or T to C) are the largest single class of disease-associated genetic mutations and include all of Beam’s current targets for base editing programs.

Leveraging our deep scientific expertise and significant ongoing investment in our platform, we also expect to develop insights into other innovative gene editing and delivery modalities. We believe that our delivery, manufacturing, and development capabilities could position us to effectively evaluate and rapidly develop such novel technologies and further extend our leadership in the field of genetic medicine.

Our base editing portfolio

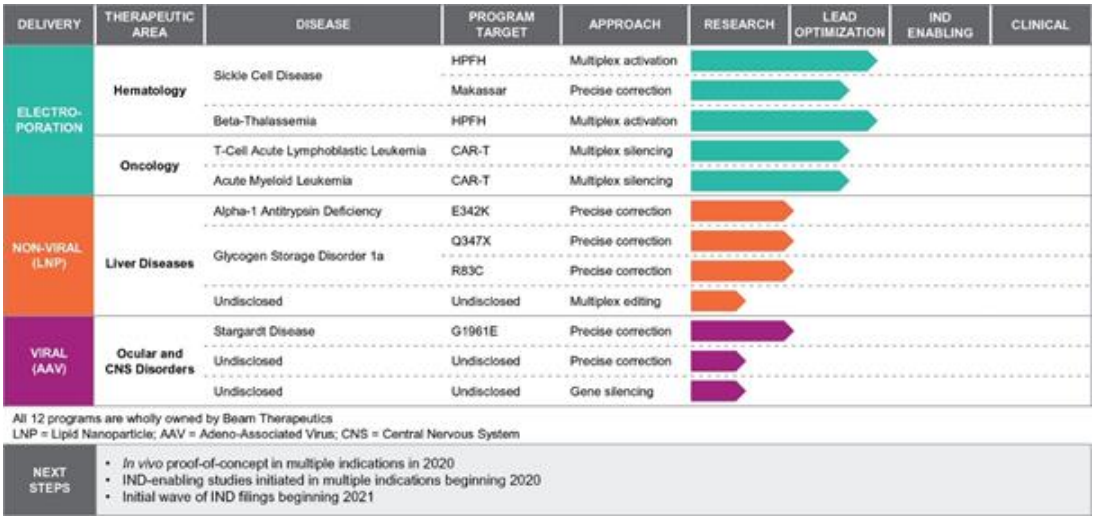
We believe a diversified portfolio across multiple delivery pipelines will maximize our ability to provide life-long therapies to patients over the broadest range of diseases possible. We are currently advancing a portfolio of 12 base editing programs, with each program

progressing along a clearly defined research and development path. We are also evaluating numerous targets that are in earlier stages of research. We plan to advance multiple programs through clinical development in parallel, with each one potentially capable of delivering proof-of-concept in Phase 1 clinical studies in genetically defined patient populations and potentially reaching approval on an accelerated pathway.

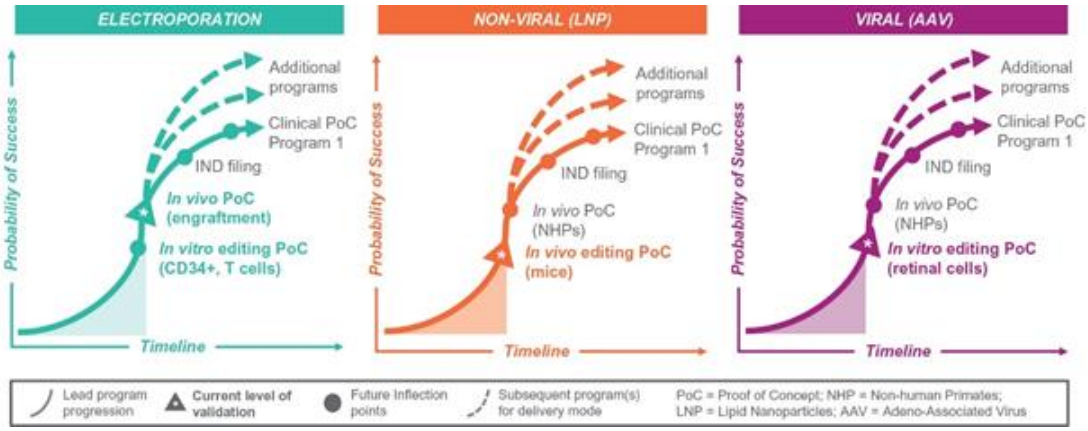
Our portfolio is purposefully built around a mix of strategic and technical profiles, creating significant optionality and risk diversification. We prioritize and advance programs based on a number of criteria, including high unmet medical need, editing feasibility, clinically validated delivery modalities, favorable clinical and regulatory development pathways, and evidence that base editing offers potentially compelling advantages for patients over available standards-of-care and novel therapeutic modalities in development.

Our programs are organized by delivery modality into three distinct pipelines: electroporation for hematology and oncology cell therapy, LNP for the liver, and AAV for the eye and CNS. We have achieved proof-of-concept *in vivo* with long-term engraftment of *ex vivo* base edited human CD34 cells in mice for our HPFH program, and we have demonstrated base editing of cells *in vitro* at therapeutically relevant levels for the majority of our remaining programs. We have also successfully demonstrated feasibility of base editing with each of our three delivery modalities in relevant cell types for electroporation and AAV and *in vivo* in mice for LNP.

We expect to achieve additional preclinical proofs-of-concept *in vivo* for additional programs in 2020, which could include engraftment results for the Makassar precise correction sickle cell program, xenograft models for our CAR-T programs or *in vivo* based editing in our programs using LNP or AAV delivery. If successful, and provided the COVID-19 pandemic does not cause our timelines to slip materially, this will allow us to initiate IND-enabling studies for multiple programs beginning in 2020. We expect to file an initial wave of IND filings beginning in 2021.



The modularity of our platform means that establishing preclinical proof-of-concept of base editing using a particular delivery modality will potentially reduce risk and accelerate the timeline for additional product candidates that we may develop targeting the same tissue. In some cases, a new product candidate may only require changing the guide RNA. Subsequent programs using the same delivery modality can also take advantage of shared capabilities and resources of earlier programs. In this way, we view each delivery modality as its own unique pipeline, where the success of any one program may pave the way for a large number of additional programs to progress quickly to the clinic, as illustrated in the figure below.



Translating base editors into product candidates

We are optimizing specificity and establishing manufacturing capabilities as well as delivery modalities needed to translate these base editors into product candidates.

Specificity in base editing

Characterizing and optimizing the off-target profile of any editing program is a critical need in gene editing. The combination of our experienced scientific team and depth of our platform capabilities, along with our founders' contributions, has allowed us to establish a comprehensive approach to potentially characterize and address off-target editing liabilities of base editing. For example, we have developed and in-licensed sophisticated tools to assess possible off-target base editing, and we continue to make improvements to our base editors in order to increase their specificity. Collectively, these advancements are designed to support our planned IND filings.

Our comprehensive approach to addressing potential off-target effects is supported by proven industry-standard assays to predict and detect off-target editing, with some tailored specifically for base editing. Each base editor and guide RNA construct undergo extensive evaluation to characterize its on- versus off-target editing profile. Guide RNAs that have minimal binding to off-target sites would be chosen for each program, as confirmed through computational and experimental assays. We then assess the potential for the base editor to edit DNA or RNA independently of CRISPR binding, as shown in recent publications. Importantly, our deaminases only edit single-stranded DNA, ensuring that double-stranded DNA outside the editing window remain unedited. Additional proprietary insights, including further optimization of the deaminase domain, are used to potentially minimize residual risk of off-target DNA editing, or transient editing of RNA strands, by the base editor.

Furthermore, in some editing windows, there are more than one C or A base which can be edited, potentially resulting in the modification of an additional base, called a "bystander edit," to the targeted base. For example, a particular editing window may have two A bases, one of which is the intended target. Importantly, potential bystander edits are highly predictable based on analysis of the target gene sequence. As a result, a bystander assessment is a routine part of our early discovery process. When it occurs, bystander editing is often inconsequential, either because of the application (such as when silencing gene function by introducing premature stop codons) or because the genetic code dictates that many codon changes, including almost all third-position transitions (i.e. A-to-G or C-to-T), do not change the amino acid. Infrequently, a bystander edit may lead to an unwanted amino acid change at the target site which could counteract our effort to correct the gene sequence and restore function. In such cases, we employ multiple strategies intended to ensure that any consequence of the bystander edit is mitigated or eliminated. This may include the use of alternative editors that can bind at slightly different positions on the DNA, thus moving the editing window so that the on-target edit is retained while the bystander edit is avoided. In other cases, the bystander edit may be acceptable since the amino acid change leads to a protein with features that are indistinguishable from those of the wild type protein, as determined by biochemical assays or as validated by existing human polymorphisms. Finally, in rare cases where a base editor for a given target site creates a bystander edit which cannot be avoided and leads to a non-functional protein, such a target would no longer be pursued.

Manufacturing base editor product candidates

Many of the general principles and processes used to synthesize, formulate and deliver base editors are similar to those already in development for nuclease-based gene editing technologies. Because of this, we are able to leverage the advances already made in the field of genetic medicine manufacturing.

Our internal process development team is highly experienced across all of our delivery modalities. We have already begun process development initiatives for our most advanced programs, and we intend to transfer optimized protocols to selected contract manufacturing organizations, or CMOs.

For our initial waves of clinical programs, we intend to use CMOs with relevant manufacturing experience in genetic medicines. We have partnered with a CMO that has long-standing experience in manufacturing guide RNAs under GMP standards. We have also identified CMOs for the manufacturing of all other components of the product candidates we may develop.

Over the longer term, due to the importance of high-quality manufacturing and control of production, we may establish our own manufacturing facility. Given our investment in electroporation, viral and non-viral delivery approaches, we anticipate using a facility with the flexibility to manufacture different drug product modalities.

Delivery of base editors

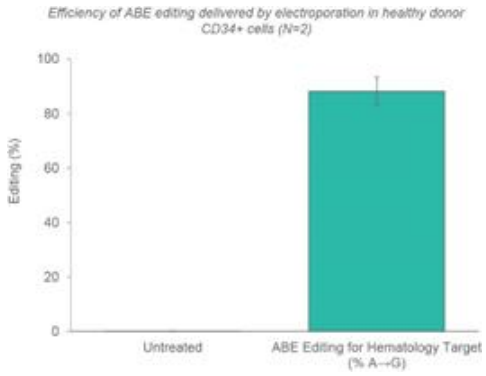
Our delivery strategy is to establish a comprehensive suite of clinically validated technologies in parallel. We believe no single technology has been able to deliver medicines to different target organs with equal efficacy. As a result, for a given tissue type, we use the delivery modality with the most compelling biodistribution. We plan to use electroporation for efficient delivery to blood cells and immune cells *ex vivo*, LNP for *in vivo* delivery to the liver and potentially other organs in the future, and AAV for *in vivo* delivery to the eye and CNS. This strategy utilizes the work of others in the field who have clinically validated each of these approaches for other nucleic acid payloads. This strategy also allows us to benefit from many years of preclinical and clinical industry knowledge, which we intend to capitalize on to rapidly advance our portfolio towards clinical development.

Ex Vivo Delivery via Electroporation

Electroporation is a clinically validated technology for the *ex vivo* delivery of various therapeutic constructs into harvested cells, which are then reintroduced into the body. Electroporation introduces nucleic acid or proteins into cells by discharging an electrical pulse across a cell membrane. With electroporation, we introduce the base editor into the cells as a messenger RNA, or mRNA, encoding the editor, or as a purified protein along with the guide RNA for a given target. When using electroporation for delivery of base editors in hematology, the patient first undergoes a standard myeloablation procedure, which is also used in allogeneic hematopoietic stem cell transplant therapy, to remove all endogenous bone marrow hematopoietic stem cells, or HSCs. The base editors are then introduced in the HSCs using electroporation, and the HSCs are re-infused back into the patient approximately one to two months after initial extraction of the patient's HSCs. Once reinfused, the HSCs begin repopulating a portion of the bone marrow as permanently modified HSCs in a process known as engraftment. The engrafted HSCs give rise to progenitor cell types with the corrected gene sequences.

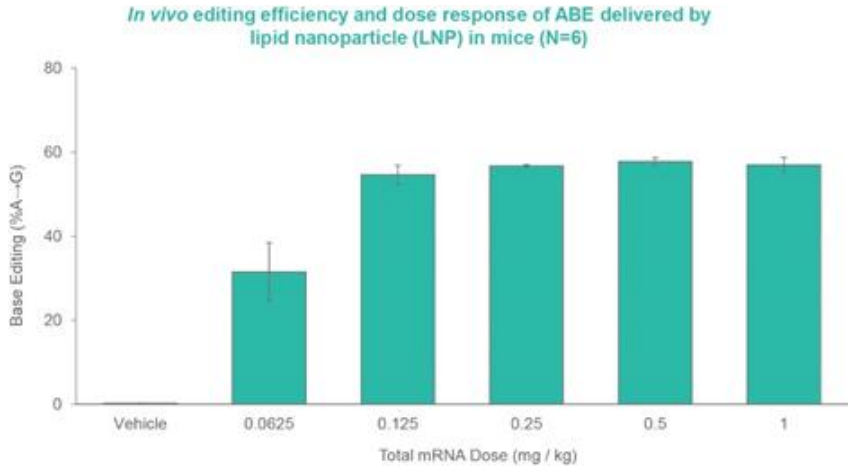
Electroporation has been used extensively preclinically and, more recently, clinically for gene therapy and gene editing applications. The electroporator that we are initially using is referenced in a U.S. Food and Drug Administration, or FDA, Drug Master File and has been used in more than a dozen clinical trials. We are using this technology to advance our *ex vivo* programs in several areas, including for the treatment of diseases in hematology and oncology.

We have shown high levels of editing in CD34 cells after the editor was introduced via electroporation, as shown in the figure below.



Non-Viral Delivery In Vivo with Lipid Nanoparticles

LNPs are a clinically validated technology for delivery of nucleic acid payloads to the liver. LNPs are multi-component particles that encapsulate therapeutic elements and protect them from degradation while in an external environment, enabling the transient delivery of the base editor *in vivo*. Multiple third-party clinical trials have demonstrated the effective delivery of silencing RNA, or siRNAs, to the liver using LNPs. We have developed several proprietary LNP formulations and have shown effective base editing of a surrogate target in mice at low doses, an example of which is shown in the figure below.



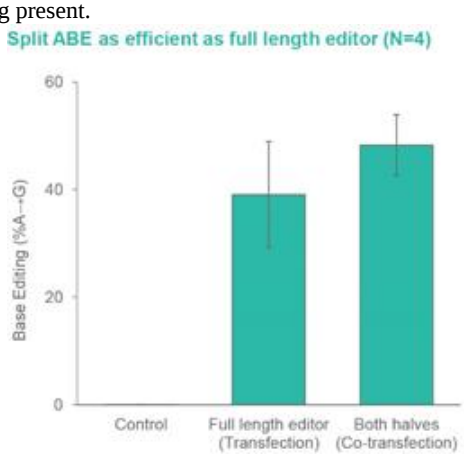
Because only one dose of a base editing therapy may be needed in a course of treatment, LNPs are a suitable delivery modality that we believe is unlikely to face complications seen with chronic use of LNPs, such as when delivering oligonucleotides. All of the components of the LNP, as well as the mRNA encoding the base editor, are well-defined and can be made synthetically, providing the opportunity for scalable manufacturing.

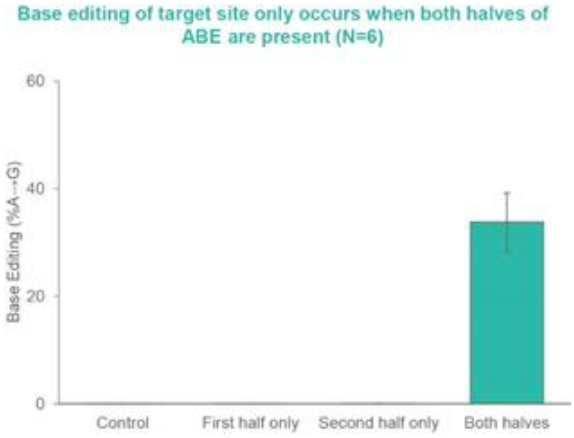
We believe our LNP formulations will be important strategic assets that will facilitate the efficient development of subsequent product candidates in our non-viral delivery pipeline. We are currently using a variety of cationic lipids from various sources to advance our programs for genetic liver diseases. We intend to identify a lead LNP formulation that demonstrates biodistribution to hepatocytes in appropriate non-human primate models, which we would then plan to use in our clinical studies.

Viral Delivery In Vivo with Adeno-Associated Virus Vectors

AAV is a clinically validated technology that has been extensively used for gene delivery to a variety of tissues. AAV is a small, non-pathogenic virus that can be repurposed to carry a therapeutic payload, making it an ideal vector for delivery of gene editing therapies. Several clinical trials have been conducted or are in progress with different AAV variants for multiple diseases, including diseases of the eye, liver, muscle, lung and CNS. We have an option to in-license a variety of AAV variants that could be selected for optimal distribution to multiple organs.

Because our DNA base editors are larger than the approximate 4.5kb packaging limit of AAV vectors, we use a novel split intein technology that is designed to deliver the base editor and guide RNA by co-infection with two viruses, where each virus contains approximately one half of the editor. High levels of base editing efficiency have been demonstrated using split editors, which are comparable to those achieved with full length editors. As shown in the figures below, our novel split editor achieves equivalent levels of editing to the full-length editor, and its activity is strictly dependent upon both halves of the split editor being present.





***Ex vivo* electroporation for hematologic diseases and oncology**

Sickle Cell Disease and Beta-Thalassemia

Opportunity

Sickle cell disease is a severe inherited blood disease caused by a single point mutation in the beta globin gene at the sixth amino acid, also known as Hemoglobin S, or HbS. This mutation makes the protein aggregate into long, rigid molecules that bend red blood cells into a sickle shape under conditions of low oxygen. Sickled cells obstruct blood vessels and die prematurely, ultimately resulting in anemia, severe pain (crises), infections, stroke and early death. Sickle cell disease is the most common inherited blood disorder in the United States, affecting an estimated 100,000 individuals, of which a significant proportion are of African American descent (1:365 births). The only potentially curative therapy currently available for patients with sickle cell disease is allogeneic Hematopoietic Stem Cell Transplant, or HSCT; however, this procedure holds a high level of risk, particularly Graft-versus-Host Disease, or GvHD, resulting in a low number of patients opting for this treatment. Other treatments generally focus on managing patients' symptoms, including pain medicines during vaso-occlusive crises, hydroxyurea to reduce the number of pain episodes, and antibiotics and vaccines to prevent bacterial infections.

Beta-thalassemia is an inherited blood disorder caused by any one of over 200 mutations in the hemoglobin beta gene, or HBB, which results in reduced production of functional hemoglobin. Transfusion-dependent beta-thalassemia, or TDBT, is the most severe form of this disease, often requiring multiple transfusions per year. Patients with TDBT suffer from failure to thrive, persistent infections, and life-threatening anemia. As a consequence of the frequent transfusions, patients with TDBT require iron chelation therapy, which is associated with significant toxicities, resulting in low levels of adherence. The incidence of symptomatic beta-thalassemia is estimated to be 1:100,000 worldwide, including 1:10,000 in Europe. In the United States, based on affected birth incidence of 0.7 in 100,000 births, and increasing survival rates, we expect the population of individuals affected by this disease to be more than 1,400 and rising. As with sickle cell disease, the only potentially curative treatment available today is allogeneic HSCT, which holds a high level of risk, particularly GvHD, resulting in a low number of patients opting for this treatment.

Limitations to current therapeutic approaches

Current efforts to treat these diseases include gene therapy and a variety of approaches to elevate a compensatory form of hemoglobin called fetal hemoglobin, or HbF. A lentiviral gene therapy for one form of beta-thalassemia has been approved in Europe; however, significant unmet medical need remains in these diseases. Lentiviral gene therapy approaches rely on random genomic insertion, which introduces the risk of disrupting important genes or activating cancer-causing genes.

Efforts by others to elevate fetal hemoglobin include knock out of a repressor protein with RNA interference, or RNAi, nuclease editing, or small molecules, with the potential drawback that other biological functions of the repressor protein will also be disrupted. Furthermore, since the two copies of the HbF gene, HBG1 and HBG2, have identical regulatory regions, use of a nuclease to directly re-activate the fetal hemoglobin genes may lead to deletions as a result of simultaneous double-stranded breaks in the neighboring genes. Reported levels of HbF upregulation for these nuclease-based approaches are approximately 30-40%, potentially reaching the threshold of therapeutic efficacy, but data suggest that higher upregulation would be beneficial if achieved.

In sickle cell disease, attempts to directly edit the sickle cell gene with nucleases, leveraging HDR, have been limited by low efficiency, with reported *in vivo* correction rates of 10%. Small molecule therapies, such as voxelotor and rivipansel, and antibodies, such as crizanlizumab, are in clinical development for these diseases. However, these approaches manage, rather than cure, the disease and do not address all of its symptoms.

Our approaches

We are using base editing to pursue two complementary approaches to treating sickle cell disease and one to treat beta-thalassemia:

- A differentiated approach to elevating fetal hemoglobin which could be used in treatments for both sickle cell disease and beta-thalassemia
- A novel approach to directly correcting the sickle mutation

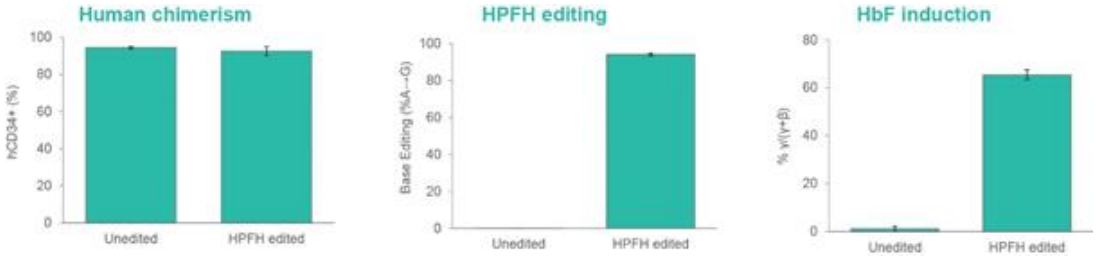
Approach 1: Recreate naturally occurring protective HPFH mutations to elevate HbF

The beneficial effects of HbF to compensate for mutations in adult hemoglobin were first identified in individuals with a condition known as Hereditary Persistence of Fetal Hemoglobin, or HPFH. Beta-thalassemia or sickle cell disease patients who also have HPFH are asymptomatic or experience a much milder form of their disease. HPFH is caused by single base changes in the regulatory region of the HbF genes (HBG1 and HBG2), which increases the expression of the fetal form of hemoglobin by preventing the binding of one or more repressor proteins.

Using base editing, we reproduce these specific, naturally occurring base changes in the regulatory elements of the HbF genes, preventing binding of repressor proteins and leading to re-activation of HbF expression. We believe this approach offers several potential advantages over others:

- **Higher levels of HbF.** Our most effective base editors deliver a higher level of HbF than other editing approaches, such as nuclease editing, which are likely to correlate with further reductions in disease symptoms and improved health.
- **High precision in editing.** Our base editor alters only a few bases at targeted locations in the regulatory regions of the HbF genes, the minimal change required to re-activate HbF.
- **Informed by human genetics.** Our base editor program uses a precise, direct editing strategy that is informed by human genetics and aims to reproduce naturally occurring mutations in the promotion of the HBG1 and HBG2 genes that lead to upregulation of HbF and prevent sickle cell disease or beta-thalassemias.
- **Specific re-activation of HbF genes.** HbF re-activation occurs without impacting the expression or function of the repressor protein itself, avoiding any interference with other biological activities in which the repressor is involved.
- **No deletions or translocations.** Our base editors can precisely and directly edit both fetal hemoglobin genes simultaneously without any genomic or chromosomal alterations, unlike nucleases.
- **Non-viral delivery.** Unlike lentiviral gene therapies, base editors are simple to manufacture, delivered via electroporation, and edit the genome at a predictable location without integration.

We demonstrated that edited CD34+ cells from a healthy donor engraft with high chimerism and maintain >90% editing after 16 weeks in immunocompromised mice, as show in the figure below. We also showed that editing followed by in vitro erythroid differentiation of CD34+ cells from both healthy donors and sickle trait donors led to HbF levels of greater than 60%, which is expected to be clinically relevant.



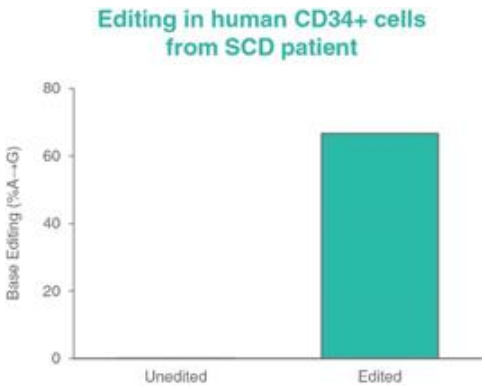
Next Steps

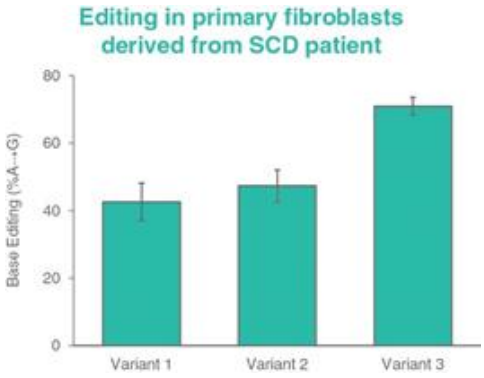
We are progressing our HPFH program towards clinical studies by conducting long-term studies to support our process development efforts prior to filing an IND. This will involve IND-enabling studies to fully characterize the edited cells and confirm the long-term persistence of editing. We have engaged with reputable CMOs to develop the manufacturing process for the guide RNA, the base editor, and the final clinical drug candidate to support our IND. We intend to have a pre-IND meeting with the FDA to confirm that our approach is suitable for progression to an IND filing.

Approach 2: Direct correction of the sickle cell point mutation

Our second base editing approach for sickle cell disease is a direct correction of the causative HbS point mutation at position 6 of the beta globin gene. By making a single A-to-G edit, although our clinical trials may produce different results, we have demonstrated in cell lines the ability to create the naturally occurring “Makassar” variant of hemoglobin. This variant, which was originally identified in humans in 1970, has the same function as the wild-type variant and does not cause sickle cell disease. Distinct from other approaches, cells that are successfully edited in this way are fully corrected, no longer containing the sickle protein.

We have identified base editors that have demonstrated 40% to 70% correction of the sickle cell point mutation into the functional Makassar variant in primary fibroblasts isolated from patients with sickle cell disease, as shown in the figure below. Published studies suggest that 20% correction of HbS may be sufficient to cure the disease. We also show greater than 65% correction of the mutation in CD34+ cells from a SCD patient, as shown in the figure below.





Next Steps

We are advancing this program by testing levels of direct correction of the beta globin gene in CD34+ cells derived from patients with sickle cell disease. Similar to our HPFH approach, we plan to optimize our editing process and will conduct engraftment studies in mice as well as other IND-enabling studies to monitor the efficacy and safety of this editing approach, followed by human clinical trials in patients with sickle cell disease.

Expansion opportunities in hematology pipeline

Once we have established the ability to deliver base editors into CD34+ cells in a transplant setting for beta-thalassemia and sickle cell disease, we believe we will be able to rapidly accelerate other CD34+ programs. We expect that developing new programs may require only minimal incremental investment, selecting different guide RNAs, and making minor changes to the base editor. This could potentially create entirely new product candidates for different gene targets.

***Ex vivo* electroporation for multiplex editing of advanced cell therapies**

CAR-T Cell Therapies in Immunology/Oncology

Opportunity

CAR-T cell therapy is a form of immunotherapy that harness the power of T cells to recognize and kill tumors. Using a protein on their surface called a T cell receptor, or TCR, T cells can distinguish between tumor cells and healthy cells to selectively kill tumors. However, tumors have evolved numerous ways of evading TCR-mediated killing. In CAR-T cell therapy, T cells are engineered to express a protein called a chimeric antigen receptor, or CAR, that recognizes specific proteins on the surface of tumor cells and allows the T cells to kill independently of the TCR, thus circumventing the tumor cells' evasion of the TCR.

There are currently two FDA-approved CAR-T products that are "autologous," or generated using cells taken directly from the patient. Following the initial isolation, these cells are engineered *ex vivo* to express the CAR and are then reintroduced into the patient. These products have demonstrated dramatic efficacy in certain patients with relapsed or refractory hematologic cancers.

Limitations of current approaches

Despite their promising potential, autologous CAR-T therapies have several limitations, including lack of patient eligibility, delays in treatment, and unscalable and costly manufacturing processes. The ability to generate "off-the-shelf" CAR-T products that can be manufactured using standardized processes from a single healthy donor for use in multiple patients can address the above limitations. These products are known as allogeneic, and several approaches are being explored in clinical trials. However, because allogeneic CAR-T cells are isolated from a donor, these approaches introduce new complications:

- **Graft-versus-Host disease.** For allogeneic CAR-T approaches, the original targeting element of the TCR must be removed to prevent the CAR-T from targeting other tissues in the patient's body.

- **Host-versus-Graft rejection.** To prevent recognition and subsequent rejection by the patient's immune system, the proteins of the donor that the immune system recognizes on the surface of the CAR-T cells must be removed.

Additional obstacles for CAR-T therapies include: limited persistence and proliferation within the host; heterogeneity of antigen expression within the tumor that promotes resistance; poor trafficking to the tumor site; and functional suppression by the hostile tumor microenvironment. These collective hurdles require T cell engineering strategies, such as multiplex editing, that target a large and growing list of candidate genes in the same cell.

We believe that multiple factors need to be engineered in CAR-T cells to augment their efficacy to treat a broader range of hematological malignancies and solid tumors. While it is possible to use nucleases to knock out multiple genes at the same time, multiplex editing with nucleases creates simultaneous double-stranded breaks across the genome. We believe that the high probability of unwanted genomic rearrangements, which increases dramatically with the number of double-stranded breaks made, limits the number of simultaneous edits that can be made in a CAR-T product. In addition, the numerous double-stranded breaks impact cell viability and cell yield, which leads to an inefficient manufacturing process. Overall, this may limit the ability to use nuclease-based technologies to develop highly engineered cell therapies that can overcome the obstacles described above.

Our approach: Multiplex base editing for allogeneic cell therapies

We believe that base editing is an ideal tool to simultaneously multiplex edit a large number of genes, without chromosomal rearrangements, to endow allogeneic CAR-T cells with a combination of features that may dramatically enhance their therapeutic potential. We aim to generate CAR-T product candidates with several potential advantages, which include:

- **An efficient manufacturing process.** We intend to introduce the editor and several guide RNAs for the different edits simultaneously. This single electroporation step and the lack of double-stranded breaks maximize cell yield, making the process rapid and efficient. Furthermore, by enabling an allogeneic cell source for the product candidates we may develop, we can potentially create a more scalable and cost-effective manufacturing process.

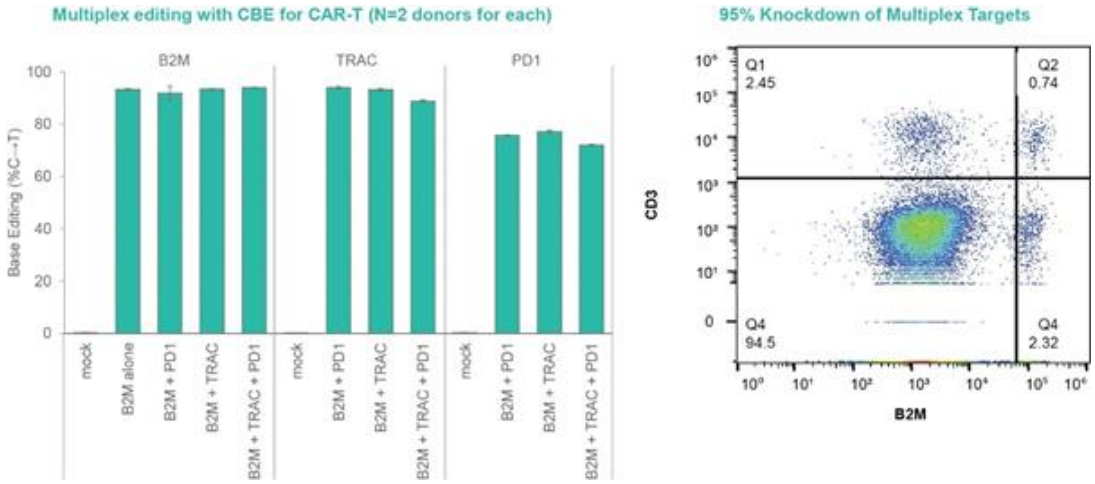
- **The potential to mitigate tumor resistance by developing multi-CAR product candidates.** Variable expression or downregulation of the targeted tumor antigen can lead to resistance or relapse. By targeting more than one antigen at the same time, we can potentially reduce the ability of the tumor to escape killing.

- **Prevention of CAR-T cell fratricide.** When targeting hematological tumors, the shared antigens that are expressed on both the malignant blood cells and the CAR-T cells leads to fratricide, or cell-to-cell killing of CAR-T cells. We can use base editing to eliminate the antigens from the CAR-T cells, preventing fratricide.

- **Broader availability to patients.** Our allogeneic approach opens up the potential to treat more patients, including those who might not be eligible for autologous CAR-T due to inadequate T cell yield or function or those who require rapid treatment and cannot wait for an autologous process.

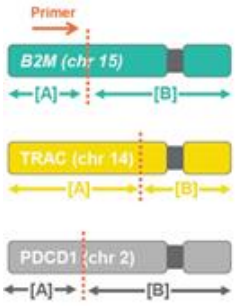
- **The potential for reduced susceptibility to the immunosuppressive tumor microenvironment.** By editing one or more genes on the CAR-T cells, such as PD-1 or LAG-3, we prevent the tumor microenvironment from dampening T cell response, potentially preventing premature exhaustion of the CAR-T cells.

The figure below shows the results of proof-of-concept experiments that demonstrate the ability of base editing to make simultaneous multiplex edits with very high efficiencies and without the generation of chromosomal rearrangements. The panel on the left of the figure below shows the editing of three genes (ß2M, PD1 and TRAC) with very high efficiencies (85% to 95%). In these experiments, we saw no significant loss of efficiency between the editing of a single gene and the simultaneous editing of three genes. The high level of genetic editing resulted in the expected loss of expression of the corresponding proteins on the surface of the cells, as shown by the panel in the middle of the figure below, which demonstrates that 95% of cells achieved complete loss of CD3 (TRAC gene) and of ß2M proteins.



Importantly, the table in the figure below shows no chromosomal rearrangements, as detected by a sensitive method (UDiTaS™) following editing with the C base editor. By contrast, in Cas9 nuclease-treated cells, chromosomal rearrangements were readily detected.

No detectable translocations in triple-edited cells for CBE as compared to Cas9 (N = 3 donors)*

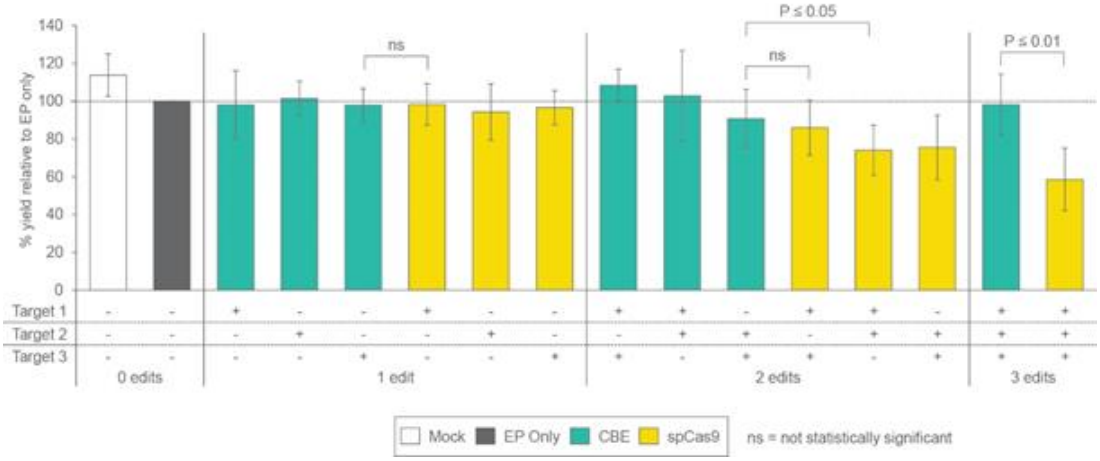


Type	Gene [Fragment]	Control (%)	CBE-treated (%)	Cas9-treated (%)
On target modification (% C→T or indels)	B2M	0	89.9%	53.0%
	TRAC	0	97.9%	77.2%
	PDCD1	0	89.1%	55.2%
Genomic rearrangement products (% rearranged)	B2M [A] / TRAC [A]	0	**0**	**0.9%**
	B2M [A] / TRAC [B]	0	**0**	**0.4%**
	B2M [A] / PDCD1 [A]	0	**0**	**1.6%**
	B2M [A] / PDCD1 [B]	0	**0**	**0.5%**
	B2M [B] / TRAC [A]**	0	**0**	**0.5%**

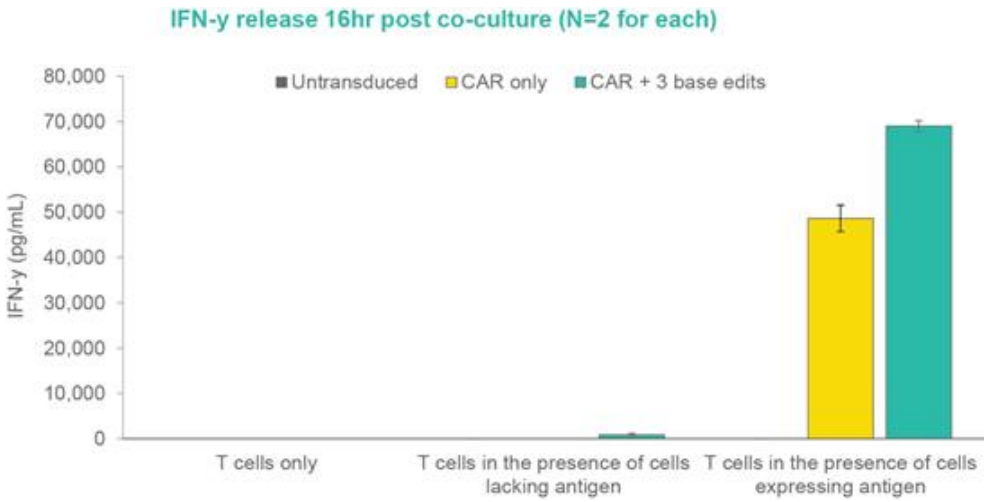
* Lower limit of detection for rearrangements of 0.1%; ** B2M-B only measurable if translocation includes local rearrangement in B2M; B2M = beta 2 macroglobulin gene; TRAC = T-cell receptor alpha constant chain gene; PDCD1 = programmed cell death protein 1 gene

Notably, as shown in the figure below, nuclease-treated cells also demonstrated a growth deficit compared to controls, as the number of simultaneous edits rises. By contrast, base edited cells grew normally, consistent with a potentially more efficient manufacturing process for base edited cells.

Cell yield relative to electroporation (EP) control (N=6)



Finally, as shown in the figure below, the triple-edited cells were highly functional in *in vitro* assays that measured secreted interferon gamma, a biomarker of T cell activity. High levels of interferon were only released after the CAR-T cells interacted with cells expressing the targeted antigen and not with cells lacking the antigen, demonstrating the functional recognition of the antigen by the CAR.



Our initial CAR-T therapeutic programs

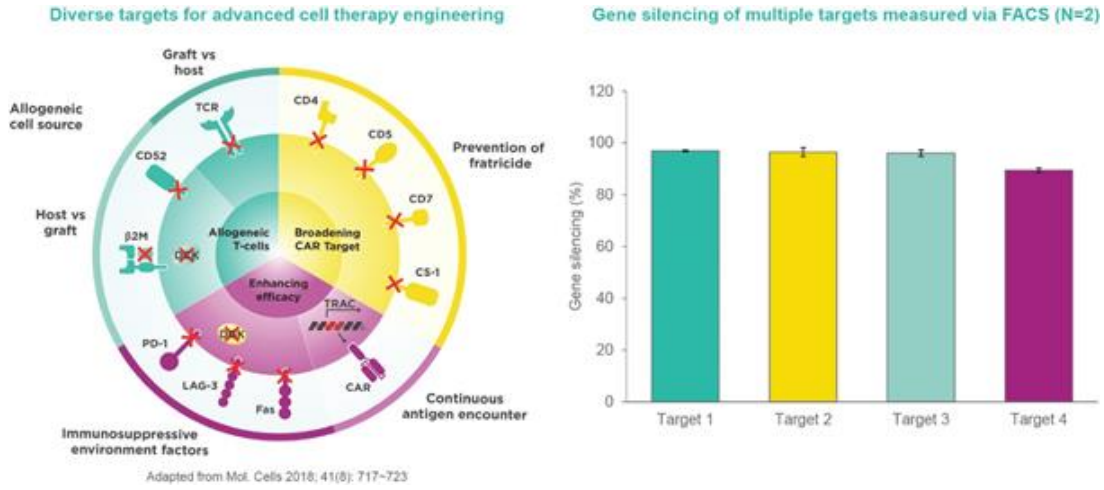
We are leveraging our highly efficient multiplex base editor technology to generate advanced allogeneic CAR-T cells with four to five simultaneous base edits in addition to the insertion of the CAR. Our initial focus will be on hematologic malignancies, and we are developing allogeneic CAR-T product candidates that have four edits each, enabling a high degree of engineering and functionality. We intend to leverage collaborations with one or more academic institutions experienced in CAR-T therapy to advance these programs.

The initial indications that we plan to target with these product candidates are relapsed, refractory, pediatric T-cell Acute Lymphoblastic Leukemia, or T-ALL, and pediatric Acute Myeloid Leukemia, or AML. While several trials are ongoing with CAR-T or bispecific antibody product candidates for T-ALL and AML, we do not believe that any of the approaches have all of the attributes of product candidates that are enabled by our multiplex editing. We believe that our approach has the potential to produce higher response rates and deeper remissions than existing approaches. Longer term, expansion from pediatric into adult populations with either T-cell malignancies or AML may represent additional opportunities for these product candidates.

The highly engineered CAR-T product candidates we are developing for T-ALL and AML include the following simultaneous edits:

- **Prevent graft-vs-host.** Editing out the TCR to ensure that the CAR-T cell only attacks the CAR antigen on the tumor and not the patient's healthy cells.
- **Enable allogeneic cell source.** Another edit to enable the use of healthy donor cells.
- **Minimize interference by the tumor microenvironment.** An additional edit to minimize exhaustion by the T cell and prolong efficacy for attacking the tumor.
- **Prevent fratricide.** Additional edits to eliminate antigens that are shared between malignant cells and CAR-T cells, to prevent fratricide for T-ALL.

In the below figure, the image on the left shows some of the potential targets that may be edited to produce advanced product attributes, and the chart on the right shows the efficiency of silencing various target genes using multiplex editing.



Next Steps

We are in the process of finalizing the selection and evaluation of the CAR antigens for the product candidates we are developing in T-ALL and AML, testing cell killing and T cell activation in the presence of tumor cells. We then plan to conduct *in vivo* studies of our CAR-T product candidates in animal models of these diseases. We have engaged with reputable CMOs to develop the manufacturing process for the guide RNA, the base editor, and the final clinical drug candidate to support our IND-enabling studies and, eventually, the filing of the IND. We plan to conduct clinical studies at sites both in the United States and Europe and to have pre-IND, or equivalent, engagements with the relevant authorities to ensure that our plans can successfully support IND filings or equivalent.

Expansion opportunities in advanced cell therapy pipeline beyond our initial product candidates

We believe the versatility of our base editing platform positions us to rapidly expand our portfolio of advanced cell therapies beyond the initial product candidates we may develop. Applying the same multiplex editing principles to other validated and emerging hematologic targets potentially will allow us to directly benefit from the learnings of our two initial programs. Furthermore, the ability to create CAR-T products with numerous edits to checkpoints and other immune signaling/microenvironment receptors could also unlock solid tumors, a much larger opportunity that has been difficult to target with existing CAR-T therapies.

Beyond CAR-T in hematology and solid tumors, other kinds of cell therapies could also benefit from these same approaches. In oncology, CAR-NK cells, TCR-modified T cells, and induced pluripotent stem cells are likely to expand the therapeutic landscape of engineered cell therapies; each could also benefit from the multiplex editing strategies described above. Beyond oncology, engineered immune cells may be useful for autoimmune, neurological, and other disorders.

Non-Viral delivery for liver diseases

Alpha-1 Antitrypsin Deficiency

Opportunity

Alpha-1 Antitrypsin Deficiency, or AATD, is a severe inherited genetic disorder that can cause progressive lung and liver disease. AATD is the result of a mutation in the SERPINA1 gene that normally produces secreted alpha-1 antitrypsin, or AAT. AAT modulates various proteases such as neutrophil elastase, an enzyme that normally fights infections but that can also attack normal lung tissue if not adequately controlled by AAT. The most severe form of AATD arises when a patient has a point mutation in both copies of the SERPINA1 gene at amino acid 342 position (E342K, also known as the “Z” allele). This point mutation causes AAT to misfold, accumulating inside liver cells rather than being secreted, resulting in very low levels (10%-15%) of circulating AAT. As a consequence, the lung is left unprotected from neutrophil elastase, resulting in progressive, destructive changes in the lung, such as emphysema, which can result in the need for lung transplants. The mutant AAT protein also accumulates in the liver, causing liver inflammation and cirrhosis, which can ultimately cause liver failure or cancer and require patients to undergo a liver transplant. It is estimated that approximately 60,000 individuals in the United States have two copies of the Z allele.

Limitations of current approaches

There are currently no curative treatments for patients with AATD. The most common treatment is intravenous protein replacement therapy, where purified human AAT is infused weekly to increase circulating AAT levels. While this treatment may slow the progression of the lung component of the disease, it will not cure the disease and has no protective effect on the liver component caused by the accumulation of the mutant protein.

Recent efforts to use genetic tools to address AATD have included gene therapy, AAT protein knock out, and SERPINA1 gene editing. The high volume of systemic AAT circulation required presents a challenge for gene therapy, particularly given recent data have shown that expression of AAV gene therapies in the liver can wane over time. AAV gene therapies can also be diluted by cell growth over time. AAT knock out with RNAi or gene editing in the liver may ameliorate liver toxicity but is likely to lower circulating AAT levels and exacerbate the progression of the lung component of the disease. Finally, the use of nuclease-based technology to directly correct the AATD gene is severely limited by the low efficiency of HDR.

Small molecule drugs are also entering development which can bind the Z form of AAT, assisting in partial restoration of AAT secretion and folding. However, the functional effects of the Z protein bound to a small molecule have not yet been characterized, and such therapies would require chronic dosing.

Our approach: Direct correction of the AATD point mutation

With the high efficiency and precision of our base editors, we aim to directly correct the E342K point mutation back to the wild type sequence, an approach that has numerous potential advantages:

- **Ameliorating both lung and liver components of the disease.** Direct correction of SERPINA1 simultaneously addresses both the lung component, by restoring AAT secretion and production, and the liver component, by removing the buildup of toxic AAT protein.

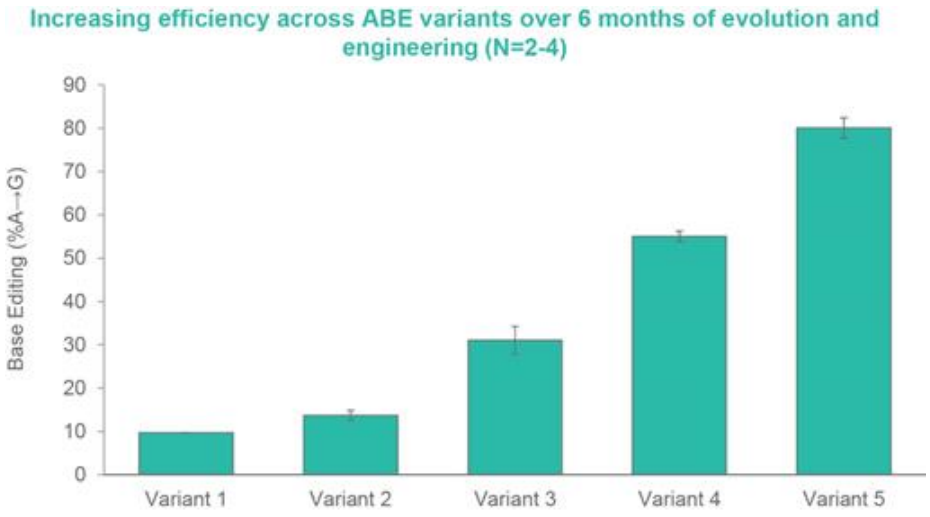
- **One-time treatment.** Unlike chronic therapies such as small molecules or RNAi, our base editor therapy could represent a one-time correction of the disease after transient expression of the base editor in hepatocytes.

- **Permanent editing for life-long effect.** Unlike AAV gene therapies which may decline over time or be diluted by cell growth, the correction of the SERPINA1 gene would represent a permanent life-long genetic modification. It would also be passed on through cell divisions during normal growth, thereby enabling treatment of young children.

- **Natural regulation.** Direct correction of the SERPINA1 gene would also benefit from normal endogenous regulation, restoring normal production and levels of AAT over time.

- **Survival advantage of edited cells.** Because of the toxicity of mutant AAT proteins, liver cells that are successfully corrected in this way may have a survival advantage in the liver and, over time, make up an increasing proportion of total liver cells.

Using molecular evolution techniques and structural biology insights, two of the core strengths of our platform discovery efforts, in six months, we have developed a novel base editor capable of correcting the E342K mutation in human cells, increasing the editing efficiency from 10% to 80% *in vitro*, as shown in the figure below.



Next Steps

We are currently conducting preclinical studies to confirm the ability to correct the E342K sequence in existing and enhanced mouse models of AATD. We are also optimizing LNP formulations in mice and in NHPs. These LNPs will encapsulate an mRNA coding for the base editor and the guide RNA targeting the specific SERPINA1 mutation for clinical delivery. The final selected formulation for clinical delivery will then be tested in IND-enabling studies before initiating clinical development in patients with AATD.

Glycogen Storage Disease 1a

Opportunity

Glycogen Storage Disease Type 1a, also known as Von Gierke disease, is an inborn disorder of glucose metabolism caused by mutations in the G6PC gene, which codes for the glucose-6-phosphatase protein, or G6Pase. Deficiencies in G6Pase activity result in hypoglycemia, or low blood glucose levels, which can be fatal if patients do not adhere to a strict regimen of slow-release forms of glucose, administered every one to four hours (including overnight). The inability to release glucose from the liver also leads to the accumulation of a multi-branched form of glucose, known as glycogen, in the liver and kidneys, resulting in functional impairment of these organs. Hepatocellular adenomas are a common sequaele in patients with GSD1a. Research has shown that approximately 10% of individuals with GSD1a, affected by hepatocellular adenomas, are at risk of progressing to malignant hepatocellular carcinomas. GSD1a occurs in approximately 1:100,000 births worldwide.

Limitations of current approaches

There are no disease-modifying therapies available for patients with GSD1a. Current approaches to treatment in development include AAV gene therapy and mRNA therapy to add back functional G6PC at the DNA and RNA level, respectively. In addition, gene editing approaches are being developed to correct the G6PC gene. AAV gene therapy to the liver can wane over time leading to uncertain durability of expression, a key concern in a disease for which life-long expression of G6PC in a high proportion of liver cells is needed to control systemic glucose metabolism during fasting periods. In addition, AAV gene therapies lack the endogenous regulation of this critical metabolic enzyme. Furthermore, the ability to treat young children may be limited by the dilution of the transgene as the patients grow. mRNA replacement therapy is being explored but would also require chronic treatment. Lastly, gene editing to correct the G6PC gene has been limited by the low efficiency of HDR.

Our approach: Direct correction of prevalent GSD1a point mutations

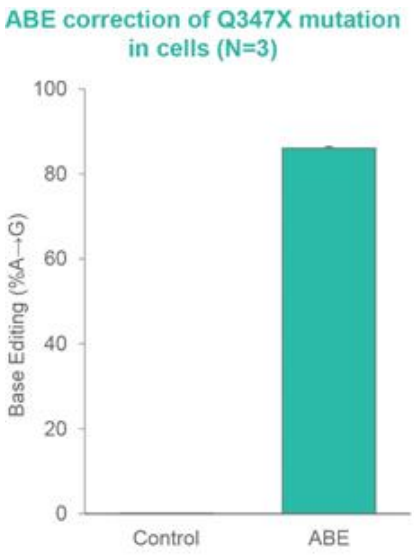
Our approach to treating patients with GSD1a is to apply base editing via LNP delivery to repair the two most prevalent mutations that cause the disease, R83C and Q347X. It is estimated that these two-point mutations account for 900 and 500 patients, respectively, in the United States, representing approximately 59% of all GSD1a patients. Animal studies have shown that as little as 11% of normal G6Pase activity in liver cells is sufficient to restore fasting glucose; however, this level must be maintained in order to preserve glucose control and alleviate other serious, and potentially fatal, GSD1a sequelae. Our approach to directly correcting these point mutations with base editors has several potential advantages:

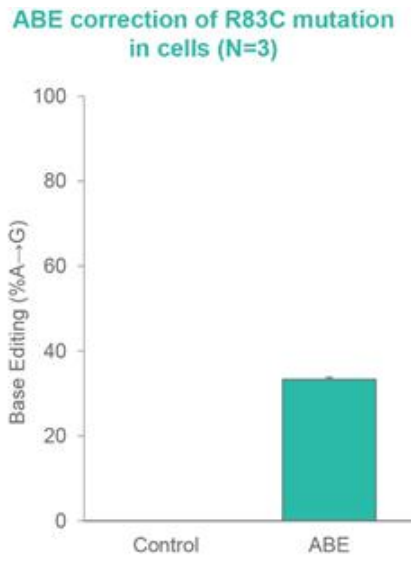
- **One-time treatment.** We believe that base editing has the potential to provide a one-time correction of the disease after transient expression of the base editor in hepatocytes.

- **Permanent editing for life-long effect.** We believe the correction of the G6PC gene by base editing would be permanent, creating a persistent, life-long genetic modification that would be passed on through cell division during normal growth, enabling treatment of young children.

- **Natural regulation.** Direct correction of the G6PC gene at its locus would restore the natural control of expression of the G6Pase protein, which needs to be tightly coordinated to maintain effective glucose control during fast and fed cycles.

We have identified product candidates that can correct up to 80% of the alleles in cells harboring the Q347X point mutation and approximately 60% of the alleles in cells harboring the R83C mutation as shown in the figures below. Correction of at least 11% is expected to be clinically relevant and potentially disease modifying for GSD1a patients.





Next Steps

Our current efforts are aimed at confirming the precise correction of the R83C and the Q347X mutations in transgenic mice harboring the specific mutations. In addition, we are optimizing LNP formulations, which will encapsulate an mRNA coding for the base editor and the guide RNA targeting the specific G6PC mutations, for clinical delivery. The final formulation for clinical delivery will be selected and tested in IND-enabling studies before initiating clinical development for GSD1a patients with these specific mutations.

Expansion opportunities in non-viral delivery pipeline

Once we have established the ability to deliver base editors via LNPs to hepatocytes, we could potentially advance other base editing liver programs to the clinic quickly. This highlights the versatility and modularity of our platform that potentially enables the creation of new product candidates by merely changing the guide RNA. The development of additional LNP formulations may also unlock tissues beyond the liver.

Finally, we have entered into a strategic collaboration with Verve Therapeutics to investigate gene editing strategies to modify genes associated with an increased risk of coronary artery diseases, initially focusing on the highest risk patient populations.

Viral delivery for ocular and CNS disorders

Stargardt Disease

Opportunity

Stargardt disease is an inherited disorder of the central region of the retina, called the macula, which is responsible for sharp, central vision. The disease causes progressive degeneration of the macula, typically resulting in vision loss typically beginning in adolescence, and ultimately leading to central and night vision blindness.

The most common form of Stargardt disease is caused by autosomal recessive mutations in the ABCA4 gene, leading to abnormal accumulation of lipofuscin, a fatty yellow pigment, in retinal cells. This biochemical defect eventually leads to the death of photoreceptors, which are the cells that convert light into the electrical signals that are transmitted to the brain.

The most prevalent mutation in the ABCA4 gene that leads to Stargardt disease is the G1961E point mutation. Approximately 5,500 individuals in the United States are affected by this mutation.

Limitations of current approaches

There are currently no approved therapies for Stargardt disease. Although AAV gene therapy has been shown to be effective in other retinal disorders, the ABCA4 gene cannot be packaged into a single AAV vector due to its large size.

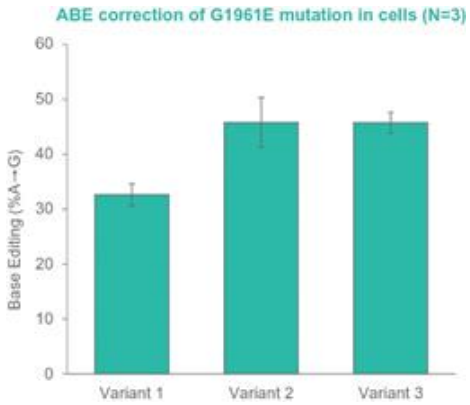
Approach: Direct correction of the most prevalent Stargardt mutation

Our base editing approach is to repair the G1961E point mutation in the ABCA4 gene. Disease modeling using tiny spot stimuli, or light stimuli through holes that are equivalent in size to a single photoreceptor cell, suggests that only 12%-20% of these cells are sufficient to preserve vision. We anticipate, therefore, that editing percentages in the range of 12%-20% of these cells would be

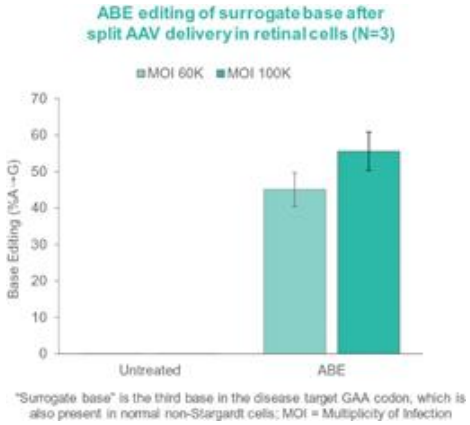
disease-modifying, since each edited cell will be fully corrected and protected from the biochemical defect. Our base editing approach has several key potential advantages:

- **No limitation of gene size.** Because we are editing the gene in its natural environment, we only need to deliver the editor to correct the point mutation. It may be challenging to deliver this large, membrane-bound protein using existing gene therapy approaches.
- **One-time treatment.** Our base editor therapy could represent a one-time correction of the disease.
- **Natural regulation.** Direct correction of the ABCA4 gene would benefit from normal endogenous regulation, restoring normal production and levels of the ABCA4 protein, which is critical for eliminating a key toxic metabolic byproduct in photoreceptor cells.

We have identified a base editor that is able to edit approximately 45% of the alleles in recombinant cells carrying the human mutated sequence, as shown in the figure below.



Given that the base editor is larger than the packaging capacity of a single AAV, we use a split AAV system that delivers the base editor via two AAV vectors. Once inside the cell, the two halves of the editor are recombined to create a functional base editor. As shown in the figure below, in human retinal pigment epithelial cells, or ARPE-19 cells, we have demonstrated approximately 50% editing of a surrogate base positioned immediately adjacent to the target base, which would be present in a diseased cell. If edited, this surrogate base would result in a synonymous change (i.e., no change to the amino acid).



Next Steps

We will progress towards clinical studies by testing the AAV split editors in non-human primate studies, where the editors will be delivered via sub-retinal injection to mimic the anticipated route of administration in the clinic. A retinal-specific protomer is also being tested to express the editor in the retina and minimize expression in other organs, in case of leakage. We also plan to test the editor for editing efficiency in human retinal organoids. We will subsequently conduct IND-enabling studies before initiating clinical development in Stargardt patients carrying the G1961E mutation. Finally, we are exploring the development of base editing of additional commonly occurring point mutations in Stargardt to expand the addressable patient population.

Expansion opportunities in viral delivery pipeline

Once we have established delivery to the eye of a base editor in an AAV, there are several other diseases of the eye where our editing technologies could be applied. By merely changing the guide RNA, we may be able to rapidly create new product candidates using the same AAV production and delivery approaches pioneered in the Stargardt program.

The ability to deliver base editors with AAV may also open up therapeutic opportunities in other tissues where AAV has been a clinically validated delivery approach. Beyond the eye, we are investigating the opportunity to edit numerous genes responsible for certain diseases of the CNS.

Competition

The pharmaceutical and biotechnology industries, including the gene therapy and gene editing fields, are characterized by rapidly advancing technologies, intense competition, and a strong emphasis on intellectual property. While we believe that our differentiated technology, scientific expertise, and intellectual property position provide us with competitive advantages, we face potential competition from a variety of companies in these fields. There are several other companies utilizing CRISPR/Cas9 nuclease technology, including Caribou Biosciences, Editas Medicine, CRISPR Therapeutics, and Intellia Therapeutics. Several additional companies utilize other nuclease-based genome editing technologies, including Zinc Fingers, Arcuses, and TAL Nucleases, including Sangamo Biosciences, Precision BioSciences, and bluebird bio. In addition, we face competition from companies utilizing gene therapy, oligonucleotides, and CAR-T therapeutic approaches.

Any product candidates that we successfully develop and commercialize will compete with existing therapies and new therapies that may become available in the future that are approved to treat the same diseases for which we may obtain approval for our product candidates. This may include other types of therapies, such as small molecule, antibody, and/or protein therapies.

In addition, many of our current or potential competitors, either alone or with their collaboration partners, have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials and approved products than we do today. Mergers and acquisitions in the pharmaceutical, biotechnology and gene therapy industries may result in even more resources being concentrated among a smaller number of our competitors. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. We also compete with these companies in recruiting, hiring and retaining qualified scientific and management talent, establishing clinical trial sites and patient registration for clinical trials, obtaining manufacturing slots at contract manufacturing organizations, and in acquiring technologies complementary to, or necessary for, our programs. Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize products that are safer, more effective, particularly if they represent cures, have fewer or less severe side effects, are more convenient, or are less expensive than any products that we may develop. Our competitors also may obtain FDA or other regulatory approval for their products more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the market. The key competitive factors affecting the success of all of our programs are likely to be their efficacy, safety, convenience, and availability of reimbursement.

Intellectual property

Our success depends in part on our ability to obtain and maintain proprietary protection for our platform technology, our programs, and know-how related to our business, defend and enforce our intellectual property rights, in particular, our patent rights, preserve the confidentiality of our trade secrets, and operate without infringing, misappropriating or otherwise violating any valid and enforceable intellectual property rights of others. We seek to protect our proprietary position by, among other things, exclusively licensing and filing U.S. and certain foreign patent applications related to our platform technology, existing and planned programs, and improvements that are important to the development of our business, where patent protection is available. Notwithstanding these efforts, we cannot be sure that patents will be granted with respect to any patent applications we have licensed or filed or may license or file in the future, and we cannot be sure that any patents we have licensed or patents that may be licensed or granted to us in the future will not be challenged, invalidated, or circumvented or that such patents will be commercially useful in protecting our technology. For more information regarding the risks related to our intellectual property, please see Item 1A., *Risk factors—Risks related to our intellectual property*, in this Annual Report on Form 10-K.

Our wholly owned and our in-licensed patents and patent applications cover various aspects of our base editing platform and our programs, including:

- C-to-T DNA base editors
- A-to-G DNA base editors
- A-to-I RNA base editors, or REPAIR
- C-to-U RNA base editors, or RESCUE
- CRISPR/Cas12b systems for nuclease editing

- Novel guide RNA sequences
- Systems and methods for increasing the specificity of base editing
- Multiplex base editing in immune cells *ex vivo*
- Methods for evaluating base editing specificity
- Therapeutic methods
- Delivery modality

We also have an option to license patents and patent applications relating to CRISPR/Cas9 systems. We intend to continue to pursue, when possible, additional patent protection, including composition of matter, method of use, and process claims, directed to each component of our platform technology and the programs in our portfolio. We also intend to obtain rights to delivery modalities through one or more licenses from third parties and to protect our own intellectual property to delivery modalities.

As of December 31, 2019, we owned approximately 31 pending U.S. provisional patent applications and approximately eight pending international patent applications, or PCT applications. Our owned patent applications are related to our DNA base editing technology, including claims to base editor variants with enhanced activities (e.g., nucleobase deaminating activity) or novel properties (e.g., PAM recognition), methods of using such base editors, methods of using such base editors for therapeutic indications, multiplex base editing in immune cells *ex vivo*, guide RNAs that target base editors to therapeutically relevant DNA sequences, and methods for evaluating base editing specificity. One of these PCT applications is co-owned with Broad Institute and President and Fellows of Harvard College, or Harvard. If issued as U.S. patents, and if the appropriate maintenance fees are paid, the U.S. patents would be expected to expire between 2039 and 2040, excluding any additional term for patent term adjustments or patent term extensions.

DNA base editing

As of December 31, 2019, we in-licensed approximately 17 U.S. patents, approximately 26 pending U.S. patent applications, three pending PCT applications, nine ex-U.S. patents, and 126 pending ex-U.S. patent applications, related to DNA base editing from Broad Institute, Harvard, Editas Medicine Inc., or Editas, and Bio Palette Co., Ltd., or Bio Palette. The patents and patent applications outside of the United States were filed primarily in Europe, Japan, and China, although some of our in-licensed patent families were filed in a larger number of countries. The patents and applications from our in-licensed portfolio for DNA base editing include claims to novel base editors, claims to engineered deaminase enzymes (e.g., evolved TadA) used in the base editors, compositions including the base editor or engineered deaminase as a component, methods of using such base editors, including methods of using such base editors for therapeutic indications, guide RNAs that target base editors to therapeutically relevant DNA sequences. The in-licensed patents and applications also cover various aspects related to the platform technology, including base editing systems that employ *S. pyogenes* Cas9, *S. aureus* Cas9, Cas9 PAM variants, inactive forms of Cas9, and/or Cas9 nickases, and systems for delivery of base editors. Our current in-licensed patents and patent applications on DNA base editing, if the appropriate maintenance fees are paid, are expected to expire between 2034 and 2038, excluding any additional term for patent term adjustments or patent term extensions (or the corresponding foreign equivalent).

RNA Base Editing

As of December 31, 2019, we in-licensed approximately nine pending U.S. patent applications, five pending PCT applications, and 25 pending ex-U.S. patent applications, related to RNA base editing from Broad Institute. The patents and patent applications outside of the United States were filed in Australia, Canada, Europe, and Russia. The patents and applications from our in-licensed portfolio for RNA base editing include claims to novel base editors, compositions including the base editor as a component, guide RNAs that target base editors to therapeutically relevant RNA sequences, and methods of using such base editors, including methods of using such base editors for therapeutic indications. Our current in-licensed patents and patent applications on RNA base editing, if the appropriate maintenance fees are paid, are expected to expire between 2036 and 2038, excluding any additional term for patent term adjustments or patent term extensions (or the corresponding foreign equivalent).

CRISPR/Cas12b

As of December 31, 2019, we in-licensed approximately one pending U.S. patent applications, four pending PCT applications, and four pending ex-U.S. patent applications, related to editing using Cas12b from Broad Institute. The patents and patent applications outside of the United States were filed in Australia, Canada, Europe, and Russia. The patents and applications from our in-licensed portfolio for Cas12b editing include claims to methods of using Cas12b to modify DNA (e.g., nuclease cleavage of DNA) and engineered and/or non-naturally occurring compositions including Cas12b as a component. Our current in-licensed patents and patent applications on Cas12b base editing, if the appropriate maintenance fees are paid, are expected to expire between 2036 and 2039, excluding any additional term for patent term adjustments or patent term extensions (or the corresponding foreign equivalent).

Rest of platform

As of December 31, 2019, we in-licensed approximately ten U.S. patents, approximately 12 pending U.S. patent applications, one pending PCT application, four ex-U.S. patents, and 60 pending ex-U.S. patent applications, related to the balance of our platform from universities and institutions. The patents and patent applications outside of the United States were filed primarily in Europe, Japan, and China, although some of our in-licensed patent families were filed in a larger number of countries. The patents and applications from our in-licensed portfolio for the balance of our platform include claims to compositions and methods for delivery of charged base editor proteins into cells, modification and improvements to the base editing systems including improvements to the nucleotide binding protein component, guide RNA component and base editing enzyme component of the base editing complex, methods for evaluating gene targeting and base editing efficiency and compositions and methods for prime editing. Our current in-licensed patents and patent applications on the balance of our platform, if the appropriate maintenance fees are paid, are expected to expire between 2034 and 2039, excluding any additional term for patent term adjustments or patent term extensions (or the corresponding foreign equivalent).

CRISPR/Cas9 and CRISPR/Cas12a

We have a nonexclusive license to conduct research activities and an option to exclusively license certain patents and patent applications directed to Cas9 and Cas12a from Editas, who in turn has licensed such patents from various academic institutions. In the case of Cas9, a number of the U.S. patents are subject to an interference declared by the Patent and Trademark office, and a number of the European patents are the subject of one or more oppositions. For more information regarding the risks related to our intellectual property, please see Item 1., *Business—Intellectual property—Intellectual property licenses* and Item 1A., *Risk factors—Risks related to our intellectual property*, in this Annual Report on Form 10-K.

The term of individual patents depends upon the legal term for patents in the countries in which they are granted. In most countries, including the United States, the patent term is 20 years from the earliest claimed filing date of a non-provisional patent application in the applicable country. However, the actual protection afforded by a patent varies from country to country, and depends upon many factors, including the type of patent, the scope of its coverage, the availability of regulatory-related extensions, the availability of legal remedies in a particular country and the validity and enforceability of the patent. In the United States, a patent's term may, in certain cases, be lengthened by patent term adjustment, or PTA, which compensates a patentee for administrative delays by the USPTO in examining and granting a patent, or may be shortened (e.g., if a patent is terminally disclaimed over a commonly owned patent having an earlier expiration date). In some instances, such a PTA may result in a U.S. patent term extending beyond 20 years from the earliest date of filing a non-provisional patent application related to the U.S. patent. Patent term extensions, or PTE, under the Drug Price Competition and Patent Term Restoration Act of 1984, commonly known as the Hatch-Waxman Act, are also possible for patents that cover an FDA-approved drug as compensation for the patent term lost during the FDA regulatory review process. The Hatch-Waxman Act permits a PTE of up to five years beyond the expiration of the patent. The length of the PTE is related to the length of time the drug is under regulatory review. PTE cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval and only one patent applicable to an approved drug, a method for using it, or a method of manufacturing it, may be extended. Similar provisions are available in Europe and certain other jurisdictions to extend the term of a patent that covers an approved drug. In the future, if our products receive regulatory approval, we may be eligible to apply for PTEs on patents covering such products, however there is no guarantee that the applicable authorities, including the FDA in the United States, will agree with our assessment of whether such PTE should be granted, and if granted, the length of such PTE. For more information regarding the risks related to our intellectual property, please see Item 1A., *Risk factors—Risks related to our Intellectual property*, in this Annual Report on Form 10-K.

We also rely on trade secrets, know-how, continuing technological innovation, and confidential information to develop and maintain our proprietary position and protect aspects of our business that are not amenable to, or that we do not consider appropriate for, patent protection. We seek to protect our proprietary technology and processes, in part, by confidentiality agreements with our employees, consultants, scientific advisors, and contractors. We also seek to preserve the integrity and confidentiality of our data and trade secrets by maintaining physical security of our premises and physical and electronic security of our information technology systems. While we have implemented measures to protect and preserve our trade secrets, such measures can be breached, and we may not have adequate remedies for any such breach. In addition, our trade secrets may otherwise become known or be independently discovered by competitors. For more information regarding the risks related to our intellectual property, please see Item 1A., *Risk factors—Risks related to our intellectual property*, in this Annual Report on Form 10-K.

Trademarks

As of December 31, 2019, we owned two trademark applications for BEAM THERAPEUTICS with the Patent and Trademark Office.

As of December 31, 2019, we in-licensed five registered ex-U.S. trademarks, 18 trademark applications, including approximately two pending U.S. trademark applications and 16 pending ex-U.S. trademark applications, for the use of REPAIR™ and RESCUE™ from Broad Institute.

Intellectual property licenses

We are a party to a number of license agreements under which we license patents, patent applications, and other intellectual property from third parties. The licensed intellectual property covers, in part, CRISPR-related compositions of matter and their use for base editing. These licenses impose various diligence and financial payment obligations on us. We expect to continue to enter into these types of license agreements in the future. We consider the following license agreements to be material to our business.

License Agreement with The President and Fellows of Harvard College

In June 2017, we entered into a license agreement with Harvard, and, in December 2017, we entered into an amendment to such license agreement, pursuant to which we received an exclusive, worldwide, royalty-bearing, sublicensable license under certain patent rights owned or controlled by Harvard to make, have made, offer for sale, sell, have sold and import products in the field of the prevention or treatment of any and all human diseases and conditions, excluding human germline modification and products for non-human animal and plant applications. We refer to this license agreement as the Harvard License Agreement.

The licensed patents are directed, among other things, to C-to-T, A-to-G, and C-to-G base editors, for the treatment of certain diseases and conditions and to base editing, more generally.

Under the Harvard License Agreement, we are required to use commercially reasonable efforts to develop products incorporating the base editing technology covered in the licensed patents, in accordance with a development plan that we prepared and submitted to Harvard. The development plan includes certain development milestones that we are required to meet, as well as the timelines for the completion thereof, and we may update the development plan from time to time in our discretion to better position us to meet such milestones. If we are successfully able to gain regulatory approval in any country to introduce a licensed product into the commercial market in such country, then we are also required to use commercially reasonable efforts to commercialize such licensed product and make such licensed product reasonably available to the public. If we fail to meet any of the deadlines for the development milestones, then Harvard may terminate the Harvard License Agreement, subject to certain exceptions and opportunities for us to cure such failure. Additionally, we are required to initiate a discovery program in accordance with the development plan and development milestones for the development of a licensed product covered by certain sub-categories of licensed patents.

The licenses granted to us under the Harvard License Agreement are expressly subject to certain preexisting rights held by Harvard and certain third parties. For example, certain of the licensed patents were developed by employees of the Howard Hughes Medical Institute and were subsequently assigned to Harvard but remain subject to a non-exclusive license between Harvard and Howard Hughes, pursuant to which Howard Hughes received a license from Harvard under certain of the licensed patents for research purposes with the right to sublicense to non-profit and governmental entities. In addition, certain of the licensed patents claim or cover inventions resulting from research that was sponsored by the U.S. government, and the U.S. government retains certain rights with respect to such licensed patents under applicable U.S. law. Harvard additionally retains limited rights for itself and for other non-profit research organizations to practice the licensed patents for research, educational, and scholarly purposes. Furthermore, Harvard retains the right, beginning a certain period of time after regulatory approval of any licensed product in the U.S. or certain European countries, to grant third parties the non-exclusive right to develop, manufacture, have manufactured, import, have imported, offer for sale, sell, have sold or otherwise distribute or have distributed such licensed product or an equivalent thereof solely for sale on a locally-affordable basis in certain specified developing countries in which the we do not have plans to seek regulatory approval.

Although the licenses granted to us under the Harvard License Agreement are exclusive, Harvard may grant a license to a third party under the licensed patents to research, develop, and commercialize a product directed to a particular target, or a proposed product, in the field under limited circumstances. If a third party that is not a specified competitor of ours inquires with Harvard for such a license, attempts to enter into a sublicense agreement with us and fails to do so after a certain period of time and presents to Harvard a proposal including certain information describing the proposed development and commercialization of such a proposed product, then Harvard may notify us of such proposal. If we are not researching, developing or commercializing such a proposed product, then we can notify Harvard as to whether we are interested in developing such proposed product, entering into a sublicense agreement with such third party to develop such proposed product, or entering into a sublicense with another third party to develop the same proposed product. If we inform Harvard that we are interested in developing such proposed product, then we will prepare a development plan, similar in scope to the development plan under the Harvard License Agreement, to develop such proposed product. If we inform Harvard that we are interested in entering into a sublicense agreement pursuant to which a third party would receive a sublicense from us under the licensed patents to develop such proposed product, then we will have a specified period of time to enter into such a sublicense agreement and provide reasonable evidence thereof. If we are not researching, developing, or commercializing such a proposed product, fail to provide a development plan, or fail to enter into a sublicense agreement with respect to such proposed product, in each case, within specified time periods, then Harvard may grant a license to the applicable third party under the licensed patents to research, develop, and commercialize such proposed product.

We are permitted to further sublicense our rights under the Harvard License Agreement to third parties, provided that any such sublicense agreement with a third party must remain in compliance with and be consistent with the terms of the Harvard License Agreement, and certain rights granted to us under the Harvard License Agreement can only be sublicensed to *bona fide* collaboration partners who are working with us to develop one or more licensed products. In addition, any such sublicense agreement must include

certain customary provisions to ensure our ability to comply with the Harvard License Agreement. We are also responsible for any breaches of a sublicense agreement by the applicable sublicensee, if such breach results in a material breach of the Harvard License Agreement.

In exchange for the licenses granted to us under the Harvard License Agreement, we initially issued to Harvard 101,363 shares of our common stock and subsequently issued 765,549 shares of our common stock pursuant to anti-dilution rights in the Harvard License Agreement. We are also required to pay to Harvard an annual license maintenance fee ranging from low-to-mid five figures to low six figures, depending on the particular calendar year. Harvard is also entitled to receive potential clinical and regulatory milestones in the mid-to-high eight figure range, subject to our receipt of regulatory approval in the United States, Japan and the European Union, or EU. If we undergo a change of control during the term of the Harvard License Agreement, then certain of the milestone payments would be increased. We paid Harvard a total of $9.0 million upon the completion of our Series A and Series B financings. We may additionally owe Harvard success payments ranging from $5.0 million to a maximum total of $105.0 million.

With respect to the sale of licensed products by us, our affiliates or our sublicensees, Harvard is entitled to receive low single digit royalties on net sales of licensed products until, on a country-by-country basis, the latest of the expiration of (i) the last to expire licensed patent covering the applicable licensed product, (ii) the period of exclusivity associated with such licensed product in such country or (iii) a certain number of years after the first commercial sale of such licensed product in such country. We are entitled to certain reductions and offsets on these royalties with respect to a licensed product in a given country and certain increases in the event we, our affiliates or sublicensees bring patent challenges relating to any licensed patents (subject to a cure period for us to terminate the sublicense that has taken the applicable action). If we sublicense our rights to develop or commercialize a licensed product under the Harvard License Agreement to a third party and we receive non-royalty sublicense income, then Harvard is entitled to a percentage of such consideration, ranging from the high single digits to an amount between 10% and 20% depending on the date in which such sublicense agreement is executed and the stage of development our licensed products at such time.

Harvard is responsible for the prosecution and maintenance of all licensed patents, provided that we have customary consultation, comment, and review rights with respect to such prosecution and maintenance activities. We are responsible for Harvard's documented out-of-pocket expenses with respect to such prosecution and maintenance, but if Harvard enters into a license agreement with a third party pursuant to which it grants such third party a license under the licensed patents outside of our field, then Harvard must use reasonable efforts to include a provision in such agreement that provides for an apportionment of prosecution and maintenance costs between us and such third party with respect to such licensed patents. If we choose to no longer pay for the prosecution and maintenance costs of a given licensed patent, then we will be relieved of such payment obligation, but our license with respect to such licensed patent will also terminate.

Unless earlier terminated, the Harvard License Agreement will remain in effect until the later of the last-to-expire valid claim of a licensed patent covering our licensed products or the end of the last to expire royalty term. We may terminate the Harvard License Agreement at our convenience following written notice to Harvard. Either party may terminate the Harvard License Agreement for a material breach of the other party, subject to a notice and cure period. Harvard may also terminate the Harvard License Agreement in the event of our bankruptcy or insolvency or if we fail to procure and maintain insurance. Upon expiration or termination of the Harvard License Agreement, the licenses granted to us will terminate and all rights under the licensed patent rights will revert to Harvard.

License Agreement with Editas Medicine, Inc.

In May 2018, we entered into a license agreement with Editas pursuant to which we received an exclusive (even as to Editas), royalty-bearing, sublicenseable, worldwide license under certain patent rights owned or controlled by Editas related to certain base editing technologies and CRISPR technology to develop, commercialize, make, have made, use, offer for sale, sell and import base editing products for the treatment of human diseases or conditions. We refer to this license agreement as the Editas License Agreement. The license we received is non-exclusive with respect to certain specified targets. Our licensed field excludes the treatment of certain diseases and certain fields of use that have already been licensed to other partners of Editas, provided that our licensed field may expand if the fields licensed to other Editas partners are reduced or are otherwise modified as a result of any termination, expiration, or amendment to Editas' agreements with such partners. In addition, we received a royalty-free, non-sublicenseable, non-exclusive license under a separate set of patent rights owned or controlled by Editas to conduct research activities in our licensed field and for which we have an option to obtain an exclusive license from Editas.

Certain of the patents licensed to us under the Editas License Agreement were licensed to Editas from Broad Institute and Harvard and certain of the patents for which we have an option to obtain a license were licensed to Editas from the Massachusetts General Hospital, or MGH. Accordingly, the licenses granted to us under the Editas License Agreement are subject to the terms and conditions set forth in each of the license agreements concerning the licensed patents between Broad Institute, Harvard and Editas, or the Broad/Harvard Head Licenses, and each of the license agreements concerning the patents for which we have an option to obtain a license between MGH and Editas, or the MGH Head Licenses.

As described above, Editas granted us an exclusive option to obtain an exclusive license under certain patents on a patent family-by-patent family basis. If we so exercise the option with respect to a patent family of such optioned patents, then we would receive an

exclusive license to such patent family of the same scope as the other patents exclusively licensed to us under the Editas License Agreement. In order to exercise an option with respect to a patent family of these optioned patents we would pay an eight-figure option exercise fee, depending on the date in which particular option is exercised.

Under the Editas License Agreement, we are required to use commercially reasonable efforts to develop a licensed product in our licensed field in each of the United States, Japan, the United Kingdom, or U.K., Germany, France, Italy and Spain, including filing the first IND for a licensed product within a certain period of time following the execution of the Editas License Agreement. If we are successfully able to gain regulatory approval in any country for a licensed product, then we are also required to use commercially reasonable efforts to commercialize such licensed product in such country. We also have sole control and responsibility over all regulatory activities with respect to the development of licensed products.

We are permitted to further sublicense certain of our rights under the Editas License Agreement to third parties, provided that any such sublicense agreement with a third party must remain in compliance with and be consistent with the terms of the Editas License Agreement and the Broad/Harvard Head Licenses and MGH Head Licenses, as applicable. We are also responsible for any breaches of a sublicense agreement by the applicable sublicensee and are responsible for all payments due under the Editas License Agreement by operation of any such sublicense. Following the signing of the Editas License Agreement, we obtained the right to further sublicense our rights the licensed patents from Broad Institute and Harvard to third parties, provided that we comply with certain sublicensing requirements under each of the Broad/Harvard Head Licenses as if we were Editas, as well as certain other customary conditions. We have not obtained any such right from MGH allowing us to further sublicense our rights under the licensed patents from MGH to third parties and will require written consent in the event we wish to further sublicense such rights to a third party.

Upon the execution of the Editas License Agreement, we paid Editas an upfront fee of $180,000. We also issued to Editas 1,833,333 shares of our Series A-1 Preferred Stock and 1,222,222 shares of our Series A-2 Preferred Stock. In addition, if any of our commercial, regulatory, development or sales activities with respect to the licensed products triggers a milestone payment or sublicense income that Editas owes under the Broad/Harvard Head Licenses or the MGH Head Licenses, then we are required to pay Editas the full amount of such milestone payment or sublicense income, as applicable; provided that we will not pay Editas for any sublicense income due as a result of the upfront fee we paid to Editas, our issuance of Series A-1 Preferred Stock and Series A-2 Preferred Stock to Editas, or our payment of any option exercise fee to Editas. Aggregate milestone amounts under the Editas License Agreement could equal up to $68.8 million for each product developed and commercialized using rights related to certain base editing technologies and CRISPR technology; in the event we develop and commercialize products covered by claims from the additional patent families licensed or optioned to us under the Editas License Agreement, aggregate milestone payments could equal up to $74.0 million per product. The percentage of sublicense income we would owe under the Editas License Agreement ranges from none to amounts between 10% and 20%. In addition, we agreed to pay for a portion of the annual license maintenance fees and prosecution and maintenance costs that Editas incurs itself or owes under the Broad /Harvard Head Licenses and the MGH Head Licenses with respect to the licensed patents. The upfront fee, equity issuance, and option exercise payments we make to Editas under the Editas License Agreement constitute both consideration for the licenses granted to us under the Editas License Agreement and reimbursement for prosecution and maintenance costs for the licensed patents.

With respect to the sale of licensed products by us, our affiliates or our sublicensees, we are required to pay to Editas an amount equal to the royalty rates that it owes to Broad Institute, Harvard, or MGH under its applicable in-licenses, plus an additional low- to mid-single digit royalty on net sales of licensed products, depending on whether such licensed product is covered by an Editas-owned patent and based on the aggregate worldwide net sales of licensed products in a given calendar year. We are entitled to certain reductions and offsets on these royalties with respect to a licensed product in a given country and if Editas is entitled to receive any reductions or offsets in respect to its royalty payment obligations under the relevant Broad/Harvard Head Licenses or MGH Head Licenses, then Editas will use reasonable efforts to avail itself of such reductions, which in turn would reduce our royalty payment obligations under the Editas License Agreement. The royalty term expires on licensed product-by-licensed product and country-by-country basis upon the later of (i) the last-to-expire royalty term in such country under any applicable Broad/Harvard Head License or MGH Head License, and, if such product is covered by a licensed Editas-owned patent, (ii) the date at which such product is no longer covered by a valid claim of a licensed Editas-owned patent in such country.

Editas is responsible for the prosecution and maintenance of all licensed patents, provided that we have certain information, comment, and review rights for certain of the licensed patents.

Unless earlier terminated, the Editas License Agreement will expire on a licensed product-by-licensed product and country-by-country basis on the expiration of the applicable royalty term with respect to such licensed product in such country. We may terminate the Editas License Agreement following written notice to Editas. Either party may terminate the Editas License Agreement for a material breach of the other party, subject to a notice and cure period. Editas may also terminate the Editas License Agreement if we challenge the validity of any of the licensed patents, subject to customary carveouts. Upon expiration or termination of the Editas License Agreement in its entirety or with respect to a family of patents, the licenses granted to us will immediately terminate in its entirety or solely with respect to the expired or terminated patent family, as the case may be; however, if we have the right to terminate the Editas License Agreement due to Editas' material breach of the Editas License Agreement, then in lieu of so terminating the Editas License

Agreement, we can elect to reduce our royalty payment obligations under the Editas License Agreement by certain specified percentages.

License Agreement with The Broad Institute, Inc.

In May 2018, our affiliate, Blink Therapeutics Inc., or Blink, entered into a license agreement with Broad Institute and, in September 2018, Blink and Broad Institute entered into an amendment to such License Agreement. Under the Broad License Agreement, Blink is granted certain rights to RNA base editing technology, including the RNA editor platforms RESCUE™ and REPAIR™, which use Cas13 linked to a deaminase to deliver single base A-to-I or C-to-U editing of RNA transcripts, respectively, as well as the Cas12b nuclease family of gene editing enzymes.

More specifically, under the Broad License Agreement, Broad Institute granted Blink an exclusive license under certain patent rights to the extent owned or controlled by Broad Institute (including via an interinstitutional agreement with the Massachusetts Institute of Technology, or MIT, and Harvard) comprising of (i) an exclusive license under certain patent rights claiming or disclosing novel CRISPR enzymes and systems (including those related to DNA cleaving) or systems, methods and compositions for targeted nucleic acid editing, in each case to exploit products covered by such patents, (ii) an exclusive license under certain product-specific patent rights claiming or disclosing novel CRISPR enzymes and systems, methods and compositions for targeted nucleic acid editing, in each case to exploit base editor products covered by such patents and (iii) an exclusive license under certain patent rights generally related to gene targeting to exploit base editor products covered by such patents.

Under the Broad License Agreement, Blink has also been granted (i) a non-exclusive license under all patents exclusively licensed to Blink under the Broad License Agreement to exploit certain products in our field that were made, discovered, developed or determined to have utility through the use of such patents in a research or discovery program commencing before May 2021 or through the use of transferred materials from Broad Institute but that are not covered by the licensed patents and (ii) a non-exclusive internal research license under all patents exclusively licensed to Blink. All licenses granted to Blink by Broad Institute exclude human germline modification, the stimulation of biased inheritance of particular genes or, with certain exceptions, traits within a plant or animal population and certain modifications of the tobacco plant and are subject to certain retained rights of Broad Institute, Harvard and MIT and the U.S. federal government. Broad Institute additionally retains limited rights for itself, Harvard and MIT and for other non-profit research organizations to practice the licensed patents for research, educational, and scholarly purposes.

Under the Broad License Agreement, Blink is required to use commercially reasonable efforts to develop licensed products in accordance with a development plan that Blink prepared and submitted to Broad Institute. The development plan includes certain development milestones that Blink is required to meet, as well as the timelines for the completion thereof, and Blink may update the development plan from time to time if Blink believes, in its good faith judgment, that such update is needed in order to improve Blink's ability to meet such development milestones. Blink will not be able to delay such development milestone timelines without providing a reasonable explanation and plan to Broad Institute and provided further that Broad Institute's approval of the explanation and plan in its reasonable discretion is required for any milestone timeline extension of more than a specified number of years. If Blink is successfully able to gain regulatory approval in any country to introduce a licensed product into the commercial market in such country, then Blink is also required to use commercially reasonable efforts to commercialize such licensed product and make such licensed product reasonably available to the public.

Additionally, Blink is required to use commercially reasonable efforts to pursue the viability of the technology covered, claimed or disclosed in certain sub-categories of licensed patents and must initiate a discovery program for the development of a licensed product covered by a valid claim, or otherwise generally enabled, by the use of such sub-category of the licensed patents during a certain period of time following the execution of the Broad License Agreement and submit an updated development plan and development milestones reasonably acceptable to Broad Institute for such sub-category of the licensed patents within such period of time. If Blink fails to use commercially reasonable efforts to pursue the viability of such technology or to initiate a discovery program or to submit an updated development plan in the specified time period then the license under such sub-category of the licensed patents will terminate and, if such sub-category of the licensed patents consists of base editor patent rights, Blink's rights with respect to gene targeting licensed patents shall convert to non-exclusive so that such rights may be licensed for use to such terminated base editor licensed patents.

Broad Institute, MIT, and Harvard also retain the right to grant further licenses under specified circumstances to third parties, other than specified entities, that wish to research, develop, and commercialize a product that would otherwise fall within the scope of our exclusive license grant from Broad Institute and Harvard pursuant to Broad Institute, Harvard and MIT's inclusive innovation model. If, after a specified period of time, such a third party inquires with Broad Institute for such a license and presents to Broad Institute a proposal including information describing the proposed development and commercialization of such a proposed product, then Broad Institute may notify Blink of the request and requester, and the nature of the specific proposed product. Broad Institute is not required to share any other information provided by the requester to Blink in connection with the inclusive innovation model. If Blink is not researching, developing or commercializing such a proposed product, then Blink can notify Broad Institute as to whether in good faith it is interested in developing such proposed product, entering into a sublicense agreement with such requesting third party to develop such proposed product, or entering into a sublicense with another third party to develop such proposed product. If Blink informs Broad

Institute that it is interested in developing such proposed product, then Blink will prepare a development plan, similar in scope to the development plan under the Broad License Agreement, to develop such proposed product and must commence the development program for such proposed product within a specified period. If Blink informs Broad Institute that it is interested in entering into a sublicense agreement pursuant to which the inquiring third party or another third party would receive a sublicense from Blink under the licensed patents to develop such proposed product, then Blink may enter into such a sublicense agreement and provide reasonable evidence thereof during the period. If Blink declines to conduct the foregoing activities or does not complete such activities within the specified period, which period is reduced by the period of time the requesting third party has previously negotiated with Blink, then Broad Institute may grant a license to the applicable third party under the licensed patents to research, develop, and commercialize such proposed product.

Blink is permitted to sublicense the licensed patents to affiliates and third parties, provided that any such sublicense agreement must remain in compliance with and be consistent with the terms of the Broad License Agreement. In addition, any such sublicense agreement must include certain customary provisions to ensure Blink's ability to comply with the Broad License Agreement. Blink is also responsible for any breaches of a sublicense agreement by the applicable sublicensee and is responsible for all payments due under the Broad License Agreement by operation of any such sublicense.

As partial consideration for the rights granted under the Broad License Agreement, Broad Institute received 1,940,000 shares of Blink's common stock. The shares issued to Broad Institute were exchanged into 865,240 shares of our common stock in connection with our acquisition of Blink on September 25, 2018.

Under the Broad License Agreement, Blink is also required to pay Broad Institute an annual license maintenance fee ranging from the low- to mid-five figures to the low-six figures, depending on the particular calendar year. Broad Institute is also entitled to receive clinical and regulatory milestones totaling in the mid-to-high eight figure range. We paid Broad Institute a total of $9.0 million upon the completion of our Series A and Series B financings. Blink may additionally owe Broad Institute success payments ranging from $5.0 million to a maximum total of $105.0 million.

Blink is also required to pay royalties in the low single digits for products covered by the licensed patents with such royalty reduced by a certain percentage for products enabled by the licensed patents, but not covered by the licensed patents. The royalty rate payable by Blink is subject to customary reductions and offsets on these royalties with respect to a product in a given country. The royalty term for a product in a country will terminate on the later of the expiration of (i) the last to expire licensed patent covering the applicable product, (ii) the period of exclusivity associated with such product in such country or (iii) a certain period of time after the first commercial sale of such product in such country. If Blink sublicenses its rights to develop or commercialize a licensed product under the Broad License Agreement to a third party and receives non-royalty sublicense income, then Broad Institute is entitled to a percentage of such consideration, ranging from the high single digits to an amount between 10% and 20%, dependent on the development stage of products under the Broad License Agreement at the time of sublicense execution.

Broad Institute is responsible for the prosecution and maintenance of all licensed patents, provided that Blink has certain consultation, comment, and review rights with respect to such prosecution and maintenance activities of exclusively licensed patent rights.

Unless earlier terminated, the Broad License Agreement will remain in effect until the later of the last-to-expire valid claim of a licensed patent covering our licensed products or the end of the last to expire royalty term. Blink may terminate the Broad License Agreement for its convenience following written notice to Broad Institute. Either party may terminate the Broad License Agreement for a material breach of the other party, subject to a notice and cure period. Broad Institute may also terminate the Broad License Agreement in the event of Blink's bankruptcy or insolvency, if Blink fails to procure and maintain insurance or if Blink, its affiliates or sublicensees bringing patent challenges relating to any licensed patents (subject to a cure period for Blink to terminate the sublicensee that has taken the applicable action).

License Agreement with Bio Palette Co., Ltd.

On March 27, 2019, we entered into a license agreement with Bio Palette Co., Ltd., or Bio Palette, pursuant to which we received an exclusive (even as to Bio Palette), sublicensable license under certain patent rights related to base editing owned or controlled by Bio Palette to exploit products for the treatment of human disease throughout the world, but excluding products in the microbiome field in Asia. We refer to this agreement as the Bio Palette License Agreement. In addition, we granted Bio Palette an exclusive (even as to Beam) license under certain patent rights related to base editing and gene editing owned or controlled by Beam to exploit products in the microbiome field in Asia. Each party to the agreement retains non-exclusive rights to develop and manufacture products in the microbiome field worldwide for the sole purpose of exploiting those products in its own territory. Each party agrees to certain coordination obligations in the microbiome field in the event that either party determines not to exploit their rights in such field.

If Bio Palette comes into the control of any other patent right that is useful within a certain defined field and intends to grant a license under that patent right in certain defined fields in certain defined territories, we have the exclusive right of first negotiation for an exclusive license under that patent right in those fields and territories. If we come into the control of any other patent right that is useful in certain defined fields and intend to grant a license under that patent right in those fields in certain defined territories, Bio Palette has the exclusive right of first negotiation for an exclusive license under that patent right in those fields and territories.

As part of the agreement, if we form a Scientific Advisory Board, then Bio Palette will have the right to appoint two representatives to such board for a period of five years. Additionally, we and Bio Palette agree to communicate with each other regarding potential base editing collaborations in Japan.

We are required to use commercially reasonable efforts to develop a licensed product in the United States, Japan, the U.K., France, Germany, Italy and Spain. For any licensed product in our licensed field and territory that receives regulatory approval, we are required to use commercially reasonable efforts to commercialize that licensed product in the relevant country. Bio Palette is required to use commercially reasonable efforts to develop a licensed product in Japan. For any licensed product in the microbiome field in Asia that receives regulatory approval, Bio Palette is required to use commercially reasonable efforts to commercialize such licensed product in the relevant country.

Certain of the patents licensed to us under the Bio Palette License Agreement were licensed to Bio Palette from Kobe University under a license agreement we refer to as the Kobe Head License. Accordingly, the licenses granted to us under the Bio Palette License Agreement are subject to the terms and conditions set forth in the Kobe Head License, which include provisions providing for certain rights to be retained by third parties including governmental authorities.

We and Bio Palette are both permitted to sublicense the licensed patents to affiliates and third parties, provided that the applicable terms of the Bio Palette License Agreement and the applicable head licenses would apply to such affiliates and third parties. The sublicensing party is also responsible for any breaches of such terms by the applicable sublicensee and is responsible for all payments due under the Bio Palette License Agreement by operation of any such sublicense.

Upon the execution of the Bio Palette License Agreement, we paid Bio Palette an upfront fee of $500,000. If a certain Bio Palette patent issues in the United States, we will pay an additional amount in the low seven figures and will issue to Bio Palette an additional number of shares of the Company's common stock in the five figures. In connection with the execution of the Bio Palette License Agreement, we issued to Bio Palette 16,725 shares of our common stock, with an agreement to issue additional shares of our common stock in the low six figures in the event that the referenced Bio Palette patent issues in the United States. We also agreed to pay a royalty at a fraction of a percent on net sales of products that are covered by the patents licensed by Bio Palette to us, and Bio Palette agreed to pay a royalty at a fraction of a percent on net sales of products that are covered by the patents licensed by us to Bio Palette. The royalty term for a product in a country will terminate on the later of the expiration of (i) patent-based exclusivity with respect to such licensed product in such country or (ii) regulatory exclusivity with respect to such licensed product in such country.

Any intellectual property arising out of activities under the Bio Palette License Agreement will be owned by the party inventing such intellectual property. Bio Palette is responsible for the prosecution and maintenance of all patents licensed by Bio Palette to us, provided that we have customary consultation, comment and review rights with respect to such prosecution and maintenance activities solely with respect to national entries of a certain specified PCT application. We are responsible for the prosecution and maintenance of patents licensed by us to Bio Palette.

Unless earlier terminated, the Bio Palette License Agreement will expire on a licensed product-by-licensed product and country-by-country basis upon the expiration of the applicable royalty term for each such licensed product and country. Each party has the right to terminate the Bio Palette License Agreement for convenience with respect to the license granted to such party subject to a specified notice period. Either party may terminate the Bio Palette License Agreement with respect to the license granted to the other party for a material breach by the other party, subject to a specified notice and cure period. Additionally, either party may also terminate the Bio Palette License Agreement in the event of the other party's bankruptcy or insolvency or if the other party, its affiliates or sublicensees brings a patent challenge relating to any licensed patents (but, in the case of such a patent challenge by a sublicensee, subject to a cure period for such party to terminate its agreement with the sublicensee that has taken the applicable action).

Manufacturing

We currently have no manufacturing capabilities. For our initial wave of clinical programs, we intend to use CMOs with relevant manufacturing experience in genetic medicines. We partnered with a CMO that has long-standing experience in manufacturing guide RNAs under GMP standards. We have also identified CMOs for manufacturing of all other components of our product candidates.

Government regulation

Government authorities in the United States, at the federal, state and local level, and in other countries and jurisdictions, including the EU, extensively regulate, among other things, the research, development, testing, manufacturing, packaging, labeling, storage, record keeping, reimbursement, advertising, promotion, distribution, post-approval monitoring and reporting and import and export, pricing and reimbursement of pharmaceutical products, including biological products. Failure to comply with the applicable regulatory requirements at any time during the product development process or post-approval may subject an applicant for marketing approval to delays in development or approval, as well as administrative and judicial sanctions.

The processes for obtaining marketing approvals in the United States and in foreign countries and jurisdictions and compliance with applicable statutes and regulatory requirements, both pre- and post-approval, and obtaining reimbursement status will continue to require the expenditure of substantial time and financial resources. The regulatory requirements applicable to drug and biological

product development, approval, and marketing are subject to change, and regulations and administrative guidance often are revised or reinterpreted by the agencies in ways that may have a significant impact on our business. Ethical, social and legal concerns about gene therapy, genetic testing and genetic research could result in additional regulations restricting or prohibiting the processes we may use. We cannot predict whether legislative changes will be enacted or if regulatory authorities' guidance or interpretations will change.

Licensure and regulation of biologics in the United States

In the United States, our candidate products are regulated as biological products, or biologics, under the Public Health Service Act, or the PHSA, and the Federal Food, Drug and Cosmetic Act, or the FDCA, the implementing regulations of the FDA and other federal, state and local statutes and regulations.

An applicant seeking approval to market and distribute a new biologic in the United States generally must satisfactorily complete each of the following steps:

- preclinical laboratory tests, animal studies and formulation studies all performed in accordance with the FDA's Good Laboratory Practice regulations;
- submission to the FDA of an IND application for human clinical testing, which must become effective before human clinical trials may begin;
- approval by an independent institutional review board, or IRB, representing each clinical site before each clinical trial may be initiated;
- performance of adequate and well-controlled human clinical trials to establish the safety, potency, and purity of the product candidate for each proposed indication, in accordance with current Good Clinical Practices, or GCP;
- preparation and submission to the FDA of a Biologics License Application, or BLA, requesting marketing of the biological product for one or more proposed indications, including submission of detailed information on the manufacture and composition of the product and proposed labelling;
- review of the BLA by an FDA advisory committee, where applicable;
- satisfactory completion of one or more FDA inspections of the manufacturing facility or facilities, including those of third parties, at which the product, or components thereof, are produced to assess compliance with current Good Manufacturing Practices, or cGMP, requirements; to assure that the facilities, methods, and controls are adequate to preserve the product's identity, strength, quality, and purity; and, if applicable, the FDA's current good tissue practice, or cGTP, requirements for the use of human cellular and tissue products;
- satisfactory completion of any FDA audits of the non-clinical and clinical trial sites to assure compliance with GCPs and the integrity of clinical data in support of the BLA;
- payment of the application fee under the Prescription Drug User Free Act, or PDUFA, unless exempted; and
- FDA review and approval of the BLA, which may be subject to additional post-approval requirements, including the potential requirement to implement a Risk Evaluation and Mitigation Strategy, or REMS, and any post-approval studies required by the FDA.

Preclinical studies and investigational new drug application

Before testing any investigational biological product in humans, including a gene editing product candidate, the product candidate must undergo preclinical testing. Preclinical tests include laboratory evaluations of product chemistry, formulation and stability, as well as studies to evaluate the potential for efficacy and toxicity in animal studies. The conduct of the preclinical tests and formulation of the compounds for testing must comply with federal regulations and requirements, including applicable Good Laboratory Practices requirements. The results of the preclinical tests, together with manufacturing information and analytical data, are submitted to the FDA as part of an IND application.

An IND is an exemption from the FDCA that allows an unapproved drug or biological product to be shipped in interstate commerce for use in an investigational clinical trial. The IND seeks FDA authorization to test the drug or biological product candidate in humans and automatically becomes effective 30 days after receipt by the FDA, unless before that time the FDA raises concerns or questions about the product or conduct of the proposed clinical trial, including concerns that human research subjects will be exposed to unreasonable health risks. In that case, the IND sponsor and the FDA must resolve any outstanding FDA concerns before the clinical trials can begin. Preclinical or nonclinical testing typically continues even after the IND is submitted.

FDA may, at any time during the initial 30-day IND review period or while clinical trials are ongoing under the IND, impose a partial or complete clinical hold based on concerns for patient safety and/or noncompliance with regulatory requirements. This order issued by the FDA would delay a proposed clinical study or cause suspension of an ongoing study until all outstanding concerns have been

adequately addressed, and the FDA has notified the company that investigations may proceed. Imposition of a clinical hold could cause significant delays or difficulties in completing planned clinical studies in a timely manner.

Expanded access to an investigational drug for treatment use

Expanded access, sometimes called “compassionate use,” is the use of investigational products outside of clinical trials to treat patients with serious or immediately life-threatening diseases or conditions when there are no comparable or satisfactory alternative treatment options. FDA regulations allow access to investigational products under an IND by the company or the treating physician for treatment purposes on a case-by-case basis for: individual patients (single-patient IND applications for treatment in emergency settings and non-emergency settings); intermediate-size patient populations; and larger populations for use of the investigational product under a treatment protocol or treatment IND application.

There is no requirement for a manufacturer to provide expanded access to an investigational product. However, if a manufacturer decides to make its investigational product available for expanded access, FDA reviews requests for expanded access and determines if treatment may proceed. Expanded access may be appropriate when all of the following criteria apply: patient(s) have a serious or immediately life-threatening disease or condition, and there is no comparable or satisfactory alternative therapy to diagnose, monitor, or treat the disease or condition; the potential patient benefit justifies the potential risks of the treatment and the potential risks are not unreasonable in the context or condition to be treated; and the expanded use of the investigational drug for the requested treatment will not interfere with initiation, conduct, or completion of clinical investigations that could support marketing approval of the product or otherwise compromise the potential development of the product.

Under the FDCA, sponsors of one or more investigational products for the treatment of a serious disease(s) or condition(s) must make publicly available their policy for evaluating and responding to requests for expanded access for individual patients. Sponsors are required to make such policies publicly available upon the earlier of initiation of a Phase 2 or Phase 3 study; or 15 days after the investigational drug or biologic receives designation as a breakthrough therapy, fast track product, or regenerative medicine advanced therapy.

In addition, on May 30, 2018, the Right to Try Act was signed into law. The law, among other things, provides an additional mechanism for patients with a life-threatening condition who have exhausted approved treatments and are unable to participate in clinical trials to access certain investigational products that have completed a Phase I clinical trial, are the subject of an active IND, and are undergoing investigation for FDA approval. Unlike the expanded access framework described above, the Right to Try Pathway does not require FDA to review or approve requests for use of the investigational product. There is no obligation for a manufacturer to make its investigational products available to eligible patients under the Right to Try Act.

Human clinical trials in support of a BLA

Clinical trials involve the administration of the investigational product candidate to healthy volunteers or patients with the disease to be treated under the supervision of qualified principal investigators, generally physicians not employed by or under the trial sponsor’s control, in accordance with GCP requirements, which include the requirement that all research subjects provide their informed consent for their participation. Clinical trials are conducted under study protocols detailing, among other things, the objectives of the study, inclusion and exclusion criteria, the parameters to be used in monitoring safety, and the effectiveness criteria to be evaluated. A protocol for each clinical trial and any subsequent protocol amendments must be submitted to the FDA as part of the IND.

A sponsor who wishes to conduct a clinical trial outside the United States may, but need not, obtain FDA authorization to conduct the clinical trial under an IND. When a foreign clinical trial is conducted under an IND, all FDA IND requirements must be met unless waived. When a foreign clinical trial is not conducted under an IND, the sponsor must ensure that the trial complies with certain FDA regulatory requirements in order to use the trial as support for an IND or application for marketing approval in the U.S. Specifically, the FDA requires that such trials be conducted in accordance with GCP requirements intended to ensure the protection of human subjects and the quality and integrity of the study data, including requirements for review and approval by an independent ethics committee and obtaining subjects’ informed consent.

For clinical trials conducted in the United States, an IND is required, and each clinical trial must be reviewed and approved by an IRB either centrally or individually at each institution at which the clinical trial will be conducted. The IRB will consider, among other things, clinical trial design, patient informed consent, ethical factors, the safety of human subjects, and the possible liability of the institution. An IRB must operate in compliance with FDA regulations. Clinical trials must also comply with extensive GCP rules and the requirements for obtaining subjects’ informed consent. The FDA, IRB, or the clinical trial sponsor may suspend or discontinue a clinical trial at any time for various reasons, including a finding that the clinical trial is not being conducted in accordance with FDA requirements, including GCP, or the subjects or patients are being exposed to an unacceptable health risk.

Additionally, some clinical trials are overseen by an independent group of qualified experts organized by the clinical trial sponsor, known as a data safety monitoring board or committee. This group may recommend continuation of the study as planned, changes in study conduct, or cessation of the study at designated checkpoints based on access to certain data from the study. Finally, research activities involving infectious agents, hazardous chemicals, recombinant DNA, and genetically altered organisms and agents may be

subject to review and approval of an Institutional Biosafety Committee, or IBC, in accordance with NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules.

Clinical trials typically are conducted in three sequential phases, but the phases may overlap or be combined. Additional studies may be required after approval.

- *Phase 1* clinical trials are initially conducted in a limited population to test the product candidate for safety, including adverse effects, dose tolerance, absorption, metabolism, distribution, excretion, and pharmacodynamics in healthy humans or, on occasion, in the case of some products for severe or life-threatening diseases, especially when the product may be too inherently toxic to ethically administer to healthy volunteers, in patients, such as cancer patients.

- *Phase 2* clinical trials are generally conducted in a limited patient population to identify possible adverse effects and safety risks, evaluate the efficacy of the product candidate for specific targeted indications and determine dose tolerance and optimal dosage. Multiple Phase 2 clinical trials may be conducted by the sponsor to obtain information prior to beginning larger and more costly Phase 3 clinical trials.

- *Phase 3* clinical trials proceed if the Phase 2 clinical trials demonstrate that a dose range of the product candidate is potentially effective and has an acceptable safety profile. Clinical trials are undertaken within an expanded patient population at multiple geographically dispersed clinical study sites to further evaluate dosage, provide substantial evidence of clinical efficacy, and further test for safety. A well-controlled, statistically robust Phase 3 trial may be designed to deliver the data that regulatory authorities will use to decide whether or not to approve, and, if approved, how to appropriately label a biologic; such Phase 3 studies are referred to as “pivotal.”

In some cases, the FDA may approve a BLA for a product candidate but require the sponsor to conduct additional clinical trials to further assess the product candidate’s safety or effectiveness after approval. Such post-approval trials are typically referred to as Phase 4 clinical trials. These studies are used to gain additional experience from the treatment of patients in the intended therapeutic indication and to document a clinical benefit in the case of biologics approved under accelerated approval regulations. Failure to exhibit due diligence with regard to conducting Phase 4 clinical trials could result in withdrawal of approval for products. The FDA generally recommends that sponsors observe subjects for potential gene-therapy related delayed adverse events in a long-term follow-up study of fifteen years for integrating vectors, up to fifteen years for herpes virus vectors capable of establishing latency, up to fifteen years for microbial vectors known to establish persistent infection, up to fifteen years for genome editing products, and up to five years for AAV vectors. FDA recommends that these long-term follow-up studies include, at a minimum, five years of annual physical examinations followed by annual queries, either in-person or by phone or written questionnaire, for the remaining observation period.

Under the Pediatric Research Equity Act of 2003, or PREA, a BLA or supplement thereto must contain data that are adequate to assess the safety and effectiveness of the product for the claimed indications in all relevant pediatric subpopulations, and to support dosing and administration for each pediatric subpopulation for which the product is safe and effective. Sponsors must submit a pediatric study plan to FDA outlining the proposed pediatric study or studies they plan to conduct, including study objectives and design, any deferral or waiver requests, and other information required by regulation. The FDA must then review the information submitted, consult with the sponsor, and agree upon a final plan. The FDA or the applicant may request an amendment to the plan at any time.

For products intended to treat a serious or life-threatening disease or condition, the FDA must, upon the request of an applicant, meet to discuss preparation of the initial pediatric study plan or to discuss deferral or waiver of pediatric assessments. In addition, FDA will meet early in the development process to discuss pediatric study plans with sponsors and FDA must meet with sponsors by no later than the end-of-phase 1 meeting for serious or life-threatening diseases and by no later than 90 days after FDA’s receipt of the study plan. The FDA may, on its own initiative or at the request of the applicant, grant deferrals for submission of some or all pediatric data until after approval of the product for use in adults, or full or partial waivers from the pediatric data requirements, under specified circumstances. Unless otherwise required by regulation, the pediatric data requirements do not apply to products with orphan designation.

Information about certain clinical trials must be submitted within specific timeframes to the NIH for public dissemination on its ClinicalTrials.gov website. Similar requirements for posting clinical trial information in clinical trial registries exist in the EU and in other countries outside the United States.

Special regulations and guidance governing gene therapy products

It is possible that the procedures and standards applied to gene therapy products and cell therapy products may be applied to any CRISPR/Cas9 product candidates we may develop, but that remains uncertain at this point. The FDA has defined a gene therapy product as one that mediates its effects by transcription and/or translation of transferred genetic material and/or by integrating into the host genome and which are administered as nucleic acids, viruses, or genetically engineered microorganisms. The products may be used to modify cells *in vivo* or be transferred to cells *ex vivo* prior to administration to the recipient. The Center for Biologics Evaluation and Research, or CBER, at FDA regulates gene therapy products. Within CBER, the review of gene therapy and related

products is consolidated in the Office of Tissues and Advanced Therapies, and the FDA has established the Cellular, Tissue and Gene Therapies Advisory Committee to advise CBER on its reviews. CBER works closely with the NIH, and the FDA and the NIH have published a number of guidance documents with respect to the development of gene therapy products.

Although the FDA's guidance documents are not legally binding, we believe that our compliance with certain aspects of them is likely necessary to gain approval for any product candidate we may develop. The guidance documents provide recommendations and additional clarity as to factors that the FDA will consider at each stage of gene therapy development and relate to, among other things, the proper preclinical assessment of gene therapies; the chemistry, manufacturing, and controls, or CMC, information that should be included in an IND application; the proper design of tests to measure product potency in support of an IND or BLA application; measures to observe delayed adverse effects in subjects who have been exposed to investigational gene therapies; and gene therapy products for the treatment of rare diseases.

If a gene therapy trial is conducted at, or sponsored by, institutions receiving any NIH funding for research involving recombinant or synthetic nucleic acid molecules, the trial must be conducted in accordance with the NIH Guidelines for Research Involving Recombinant DNA Molecules. Research conducted at such institutions that involves the transfer of recombinant or synthetic nucleic acid molecules, or DNA or RNA derived from recombinant or synthetic nucleic acid molecules, into human subjects must undergo review and approval by an IBC before it commences. Many companies and other institutions not otherwise subject to the NIH Guidelines voluntarily follow them.

Compliance with cGMP and cGTP requirements

Before approving a BLA, the FDA typically will inspect the facility or facilities where the product is manufactured. The FDA will not approve an application unless it determines that the manufacturing processes and facilities are in full compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. The PHSA emphasizes the importance of manufacturing control for products like biologics whose attributes cannot be precisely defined. Material changes in manufacturing equipment, location, or process post-approval, may result in additional regulatory review and approval.

For a gene therapy product, the FDA also will not approve the product if the manufacturer is not in compliance with cGTP. These standards are found in FDA regulations and guidance documents that govern the methods used in, and the facilities and controls used for, the manufacture of human cells, tissues, and cellular and tissue based products, or HCT/Ps, which are human cells or tissue intended for implantation, transplant, infusion, or transfer into a human recipient. The primary intent of the GTP requirements is to ensure that cell and tissue-based products are manufactured in a manner designed to prevent the introduction, transmission, and spread of communicable disease. FDA regulations also require tissue establishments to register and list their HCT/Ps with the FDA and, when applicable, to evaluate donors through screening and testing.

Manufacturers and others involved in the manufacture and distribution of products must also register their establishments with the FDA and certain state agencies. Both domestic and foreign manufacturing establishments must register and provide additional information to the FDA upon their initial participation in the manufacturing process. Any product manufactured by or imported from a facility that has not registered, whether foreign or domestic, is deemed misbranded under the FDCA. The manufacturing facilities may be subject to periodic unannounced inspections by government authorities to ensure compliance with cGMPs and other laws. If a manufacturing facility is not in substantial compliance with the applicable regulations and requirements imposed when the product was approved, regulatory enforcement action may be taken, which may include a warning letter or an injunction against shipment of products from the facility and/or recall of products previously shipped.

Review and approval of a BLA

The results of product candidate development, preclinical testing, and clinical trials, along with descriptions of the manufacturing process, information on the chemistry and composition of the biological product candidate, proposed labeling, and other relevant information are submitted to the FDA as part of a BLA requesting license to market the product. Under federal law, the submission of most BLAs is subject to an application user fee, which for federal fiscal year 2020 is $2,942,965 for an application requiring clinical data. The sponsor of an approved BLA is also subject to an annual program fee, which for fiscal year 2020 is $325,424. Certain exceptions and waivers are available for some of these fees, such as an exception from the application fee for products with orphan designation and a waiver for certain small businesses.

The FDA has 60 days after submission of the application to conduct an initial review to determine whether it is sufficient to accept for filing based on the agency's threshold determination that it is sufficiently complete to permit substantive review. Once the submission has been accepted for filing, the FDA begins an in-depth review of the application. Under the goals and policies agreed to by the FDA under PDUFA, the FDA has ten months from filing in which to complete its initial review of a standard application and respond to the applicant, and six months for a priority review application. A major amendment to a BLA submitted at any time during the review cycle, including in response to a request from the FDA, may extend the goal date by three months. The FDA does not always meet its PDUFA goal dates for standard and priority BLAs.

During its review of a BLA, the FDA may refer the application to an advisory committee for review, evaluation, and recommendation as to whether the application should be approved and under what conditions. In particular, the FDA may refer applications for novel

biological products or biological products that present difficult questions of safety or efficacy to an advisory committee. Typically, an advisory committee is a panel of independent experts, including clinicians and other scientific experts. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions about a BLA.

Under the PHSA, the FDA may approve a BLA if it determines that the product is safe, pure, and potent and that the facility where the product will be manufactured meets standards designed to ensure that it continues to be safe, pure, and potent.

On the basis of the FDA's evaluation of the application and accompanying information, including the results of the inspection of the manufacturing facilities and any FDA audits of non-clinical and clinical trial sites to assure compliance with GCP, the FDA may issue an approval letter or a complete response letter. An approval letter authorizes commercial marketing of the product with specific labeling for specific indications. If the application is not approved, the FDA will issue a complete response letter, which will contain the conditions that must be met in order to secure approval of the application, and when possible will outline recommended actions the sponsor might take to obtain approval of the application. Sponsors that receive a complete response letter may submit to the FDA information that represents a complete response to the issues identified by the FDA. Such resubmissions are classified under PDUFA as either Class 1 or Class 2. The classification of a resubmission is based on the information submitted by an applicant in response to an action letter. Under the goals and policies agreed to by the FDA under PDUFA, the FDA has two months to review a Class 1 resubmission and six months to review a Class 2 resubmission. The FDA will not approve an application until issues identified in the complete response letter have been addressed.

If the FDA approves a new product, it may limit the approved indications for use of the product. It may also require that contraindications, warnings or precautions be included in the product labeling. In addition, the FDA may require post-approval studies, including Phase 4 clinical trials, to further assess the product's safety or efficacy after approval. The agency may also require testing and surveillance programs to monitor the product after commercialization, or impose other conditions, including distribution restrictions or other risk management mechanisms, including REMS, to help ensure that the benefits of the product outweigh the potential risks. REMS can include medication guides, communication plans for healthcare professionals, and elements to assure safe use, or ETASU. ETASU can include, but are not limited to, special training or certification for prescribing or dispensing, dispensing only under certain circumstances, special monitoring, and the use of patent registries. The FDA may prevent or limit further marketing of a product based on the results of post-market studies or surveillance programs. After approval, many types of changes to the approved product, such as adding new indications, manufacturing changes and additional labeling claims, are subject to further testing requirements and FDA review and approval.

Fast track, breakthrough therapy, priority review and regenerative advanced therapy designations

The FDA has several programs designed to expedite the development and approval of drugs and biological products intended to treat serious or life-threatening diseases or conditions. These programs include fast track designation, breakthrough therapy designation, priority review designation, and regenerative medicine advanced therapy (RMAT) designation. These designations are not mutually exclusive, and a product candidate may qualify for one or more of these programs. While these programs are intended to expedite product development and approval, they do not alter the standards for FDA approval.

The FDA may grant a product fast track designation if it is intended for the treatment of a serious or life-threatening disease or condition, and nonclinical or clinical data demonstrate the potential to address an unmet medical need for such disease or condition. For fast track products, sponsors may have greater interactions with the FDA, and the FDA may initiate review of sections of a fast track product's application before the application is complete in some circumstances. Fast track designation may be rescinded if FDA believes that the product no longer meets the qualifying criteria.

A product may be designated as a breakthrough therapy if it is intended to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the product may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints. The FDA may take certain actions with respect to breakthrough therapies, including holding meetings with the sponsor throughout the development process; providing timely advice to the product sponsor regarding development and approval; involving more senior staff in the review process; assigning a cross-disciplinary project lead for the review team; and taking other steps to aid sponsors in designing the clinical trials in an efficient manner. Breakthrough designation may be rescinded if a product no longer meets the qualifying criteria.

With passage of the 21st Century Cures Act in December 2016, Congress authorized an additional expedited program for regenerative medicine advanced therapies. A product is eligible for RMAT designation if it is a regenerative medicine therapy that is intended to treat, modify, reverse or cure a serious or life-threatening disease or condition, and preliminary clinical evidence indicates that the product has the potential to address unmet medical needs for such disease or condition. The benefits of RMAT designation include the benefits available to breakthrough therapies, including potential eligibility for priority review and accelerated approval based on surrogate or intermediate endpoints. RMAT designation may be rescinded if a product no longer meets the qualifying criteria.

FDA may designate a product for priority review if it is a product that treats a serious condition and, if approved, would provide a significant improvement in safety or effectiveness of the treatment, prevention, or diagnosis of such condition. A priority designation

is intended to direct overall attention and resources to the evaluation of such applications, and it shortens the FDA's goal for taking action on a marketing application from ten months to six months from filing.

Accelerated approval pathway

The FDA may grant accelerated approval to a product for a serious or life-threatening condition that provides meaningful therapeutic advantage to patients over existing treatments based upon a determination that the product has an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit. The FDA may also grant accelerated approval for such a condition when the product has an effect on an intermediate clinical endpoint that can be measured earlier than an effect on irreversible morbidity or mortality, or IMM, and that is reasonably likely to predict an effect on IMM or other clinical benefit, taking into account the severity, rarity, or prevalence of the condition and the availability or lack of alternative treatments.

The accelerated approval pathway is most often used in settings in which the course of a disease is long, and an extended period of time is required to measure the intended clinical benefit of a product, even if the effect on the surrogate or intermediate clinical endpoint occurs rapidly. Thus, accelerated approval has been used extensively in the development and approval of products for treatment of a variety of cancers in which the goal of therapy is generally to improve survival or decrease morbidity and the duration of the typical disease course requires lengthy and sometimes large trials to demonstrate a clinical or survival benefit.

For drugs granted accelerated approval, FDA generally requires sponsors to conduct, in a diligent manner, additional post-approval confirmatory studies to verify and describe the product's clinical benefit. Failure to conduct required post-approval studies with due diligence, failure to confirm a clinical benefit during the post-approval studies, or dissemination of false or misleading promotional materials would allow the FDA to withdraw the product approval on an expedited basis. All promotional materials for product candidates approved under accelerated approval are subject to prior review by the FDA unless FDA informs the applicant otherwise.

Post-approval regulation

Upon FDA approval of a BLA, the sponsor must comply with extensive post-approval regulatory requirements applicable to biological products, including any additional post-approval requirements that the FDA may impose as part of the approval process. These post-approval requirements include, among other things:

- record keeping requirements;
- reporting of certain adverse experiences with the product and production problems to the FDA;
- submission of updated safety and efficacy information to the FDA;
- drug sampling and distribution requirements;
- notifying FDA and gaining its approval of specified manufacturing and labeling changes; and
- compliance with requirements concerning advertising, promotional labeling, industry-sponsored scientific and educational activities and other promotional activities.

Additionally, the sponsor and its third-party manufacturers are subject to periodic unannounced regulatory inspections for compliance with ongoing regulatory requirements, including cGMP and pharmacovigilance regulations. Accordingly, the sponsor and its third-party manufacturers must continue to expend time, money, and effort in the areas of production and quality control to maintain compliance with cGMP regulations and other regulatory requirements.

The FDA strictly regulates the advertising and labeling of prescription drug products, including biological products. Promotional claims about a drug's safety or effectiveness are prohibited before the drug is approved. In addition, the sponsor of an approved drug in the United States may not promote that drug for unapproved, or off-label, uses, although a physician may prescribe a drug for an off-label use in accordance with the practice of medicine. If a company is found to have promoted off-label uses, it may become subject to administrative and judicial enforcement by the FDA, the DOJ, or the Office of the Inspector General of the Department of Health and Human Services, as well as state authorities. This could subject a company to a range of penalties that could have a significant commercial impact, including civil and criminal fines and agreements that materially restrict the manner in which a company promotes or distributes drug products. The federal government has levied large civil and criminal fines against companies for alleged improper promotion and has also requested that companies enter into consent decrees or permanent injunctions under which specified promotional conduct is changed or curtailed.

After approval, some types of changes to the approved product, such as adding new indications or dosing regimens, manufacturing changes, or additional labeling claims, are subject to further FDA review and approval. In addition, the FDA may require testing and surveillance programs to monitor the effect of approved products that have been commercialized, and the FDA has the power to prevent or limit further marketing of a product based on the results of these post-marketing programs.

The FDA may withdraw product approval if compliance with regulatory requirements and standards is not maintained or if problems occur after the product reaches the market. Later discovery of previously unknown problems with a product, including adverse events

of unanticipated severity or frequency or issues with manufacturing processes, may result in revisions to the approved labeling to add new safety information; imposition of post-market studies or clinical trials to assess new safety signals; or imposition of distribution or other restrictions under a REMS program. Other potential consequences include, among other things:

- restrictions on the marketing or manufacturing of the product;
- fines, warning letters or holds on post-approval clinical trials;
- refusal of the FDA to approve pending applications or supplements to approved applications, or suspension or revocation of product license approvals;
- product recall, seizure, or detention, or refusal to permit the import or export of products; or
- injunctions or the imposition of civil or criminal penalties.

Orphan drug designation

Orphan drug designation in the United States is designed to encourage sponsors to develop products intended for the treatment of rare diseases or conditions. In the United States, a rare disease or condition is statutorily defined as a condition that affects fewer than 200,000 individuals in the United States or that affects more than 200,000 individuals in the United States and for which there is no reasonable expectation that the cost of developing and making the product available for the disease or condition will be recovered from sales of the product in the United States.

Orphan drug designation qualifies a company for certain tax credits. In addition, if a drug candidate that has orphan drug designation subsequently receives the first FDA approval for that drug for the disease for which it has such designation, the product is entitled to orphan drug exclusivity, which means that the FDA may not approve any other applications to market the same drug for the same indication for seven years following product approval unless the subsequent product candidate is demonstrated to be clinically superior. Absent a showing of clinical superiority, FDA cannot approve the same product made by another manufacturer for the same indication during the market exclusivity period unless it has the consent of the sponsor or the sponsor is unable to provide sufficient quantities.

A sponsor may request orphan drug designation of a previously unapproved product or new orphan indication for an already marketed product. In addition, a sponsor of a product that is otherwise the same product as an already approved orphan drug may seek and obtain orphan drug designation for the subsequent product for the same rare disease or condition if it can present a plausible hypothesis that its product may be clinically superior to the first drug. More than one sponsor may receive orphan drug designation for the same product for the same rare disease or condition, but each sponsor seeking orphan drug designation must file a complete request for designation. To qualify for orphan exclusivity, however, the drug must be clinically superior to the previously approved product that is the same drug for the same condition.

Gene therapy products present novel issues for assessing when two products are the “same” for orphan exclusivity purposes. On January 28. 2020, the FDA issued a non-binding draft guidance document describing its current thinking on when a gene therapy product is the “same” as another product for purposes of orphan exclusivity. Under the draft guidance, if either the transgene or vector differs between two gene therapy products in a manner that does not reflect “minor” differences, the two products would be considered different drugs for orphan drug exclusivity purposes. FDA will determine whether two vectors from the same viral class are the same on a case-by-case basis and may consider additional key features in assessing sameness. While the guidance provides some additional clarity on FDA’s approach to assessing “sameness,” significant ambiguity and uncertainty remain as to how FDA will assess viral vectors in the same class, what differences in vector or transgene are considered minor, and what additional features may be considered.

Pediatric exclusivity

Pediatric exclusivity is another type of non-patent regulatory exclusivity in the United States. Specifically, the Best Pharmaceuticals for Children Act provides for the attachment of an additional six months of exclusivity, which is added on to the term of any remaining regulatory exclusivity or patent periods at the time the pediatric exclusivity is granted. This six-month exclusivity may be granted if a BLA sponsor submits pediatric data that fairly respond to a written request from the FDA for such data, even if the data do not show the product to be effective in the pediatric population studied.

Biosimilars and exclusivity

The 2010 Patient Protection and Affordable Care Act, or PPACA, which was signed into law in March 2010, included a subtitle called the Biologics Price Competition and Innovation Act of 2009, or BPCIA. The BPCIA established a regulatory scheme authorizing the FDA to approve biosimilars and interchangeable biosimilars. FDA has approved over 25 biosimilar products for use in the United States to date. No interchangeable biosimilars, however, have been approved.

Under the BPCIA, a manufacturer may submit an application for licensure of a biological product that is “biosimilar to” or “interchangeable with” a previously approved biological product or “reference product.” In order for the FDA to approve a biosimilar

product, it must find that there are no clinically meaningful differences between the reference product and proposed biosimilar product in terms of safety, purity, and potency. For the FDA to approve a biosimilar product as interchangeable with a reference product, the agency must find that the biosimilar product can be expected to produce the same clinical results as the reference product, and (for products administered multiple times) that the biologic and the reference biologic may be switched after one has been previously administered without increasing safety risks or risks of diminished efficacy relative to exclusive use of the reference biologic.

Under the BPCIA, an application for a biosimilar product may not be submitted to the FDA until four years following the date of approval of the reference product. The FDA may not approve a biosimilar product until 12 years from the date on which the reference product was first licensed. This 12-year exclusivity period is referred to as the reference product exclusivity period and bars approval of a biosimilar but notably does not prevent approval of a competing product pursuant to a full BLA (i.e., containing the sponsor's own preclinical data and data from adequate and well-controlled clinical trials to demonstrate the safety, purity, and potency of the product). The BPCIA also created certain exclusivity periods for biosimilars approved as interchangeable products. The law also includes an extensive process for the innovator biologic and biosimilar manufacturer to litigate patent infringement, validity, and enforceability prior to the approval of the biosimilar.

There have been ongoing federal legislative and administrative efforts as well as judicial challenges seeking to repeal, modify or invalidate some or all of the provisions of the PPACA. While none of those efforts have focused on changes to the provisions of the ACA related to the biosimilar regulatory framework, if those efforts continue and if the ACA is repealed, substantially modified, or invalidated, it is unclear what, if any, impact such action would have on biosimilar regulation.

Patent term restoration and extension

A patent claiming a new biological product may be eligible for a limited patent term extension under the Hatch-Waxman Act, which permits a patent restoration of up to five years for a single patent for an approved product as compensation for patent term lost during product development and FDA regulatory review. The restoration period granted on a patent covering a product is typically one-half the time between the effective date a clinical investigation involving human beings is begun and the submission date of a marketing application less any dime during which the applicant failed to exercise due diligence, plus the time between the submission date of an application and the ultimate approval date less any dime during which the applicant failed to exercise due diligence. Patent term restoration cannot be used to extend the remaining term of a patent past a total of 14 years from the product's approval date. Only one patent applicable to an approved product is eligible for the extension, only those claims covering the approved drug, a method for using it, or a method for manufacturing it may be extended and the application for the extension must be submitted prior to the expiration of the patent in question. A patent that covers multiple products for which approval is sought can only be extended in connection with one of the approvals. The USPTO reviews and approves the application for any patent term extension or restoration in consultation with the FDA.

FDA approval of companion diagnostics

In August 2014, the FDA issued final guidance clarifying the requirements that will apply to approval of therapeutic products and *in vitro* companion diagnostics. According to the guidance, for novel drugs, a companion diagnostic device and its corresponding therapeutic should be approved or cleared contemporaneously by the FDA for the use indicated in the therapeutic product's labeling. Approval or clearance of the companion diagnostic device will ensure that the device has been adequately evaluated and has adequate performance characteristics in the intended population. In July 2016, the FDA issued a draft guidance intended to assist sponsors of the drug therapeutic and *in vitro* companion diagnostic device on issues related to co-development of the products.

Under the FDCA, *in vitro* diagnostics, including companion diagnostics, are regulated as medical devices. In the United States, the FDCA and its implementing regulations, and other federal and state statutes and regulations govern, among other things, medical device design and development, preclinical and clinical testing, premarket clearance or approval, registration and listing, manufacturing, labeling, storage, advertising and promotion, sales and distribution, export and import, and post-market surveillance. Unless an exemption applies, diagnostic tests require marketing clearance or approval from the FDA prior to commercial distribution.

The FDA previously has required *in vitro* companion diagnostics intended to select the patients who will respond to the product candidate to obtain pre-market approval, or PMA, simultaneously with approval of the therapeutic product candidate. The PMA process, including the gathering of clinical and preclinical data and the submission to and review by the FDA, can take several years or longer. It involves a rigorous premarket review during which the applicant must prepare and provide the FDA with reasonable assurance of the device's safety and effectiveness and information about the device and its components regarding, among other things, device design, manufacturing and labeling. PMA applications are subject to an application fee, which exceeds $250,000 for most PMAs; for federal fiscal year 2020, the standard fee for review of a PMA is $340,995 and the small business fee is $85,249.

A clinical trial is typically required for a PMA application and, in a small percentage of cases, the FDA may require a clinical study in support of a 510(k) submission. A manufacturer that wishes to conduct a clinical study involving the device is subject to the FDA's IDE regulation. The IDE regulation distinguishes between significant and non-significant risk device studies and the procedures for obtaining approval to begin the study differ accordingly. Also, some types of studies are exempt from the IDE regulations. A significant risk device presents a potential for serious risk to the health, safety, or welfare of a subject. Significant risk devices are

devices that are substantially important in diagnosing, curing, mitigating, or treating disease or in preventing impairment to human health. Studies of devices that pose a significant risk require both FDA and an IRB approval prior to initiation of a clinical study. Many companion diagnostics are considered significant risk devices due to their role in diagnosing a disease or condition. Non-significant risk devices are devices that do not pose a significant risk to the human subjects. A non-significant risk device study requires only IRB approval prior to initiation of a clinical study.

After a device is placed on the market, it remains subject to significant regulatory requirements. Medical devices may be marketed only for the uses and indications for which they are cleared or approved. Device manufacturers must also establish registration and device listings with the FDA. A medical device manufacturer's manufacturing processes and those of its suppliers are required to comply with the applicable portions of the Quality System Regulation, which covers the methods and documentation of the design, testing, production, processes, controls, quality assurance, labeling, packaging and shipping of medical devices. Domestic facility records and manufacturing processes are subject to periodic unscheduled inspections by the FDA. The FDA also may inspect foreign facilities that export products to the United States.

Regulation and procedures governing approval of medicinal products in the EU

In order to market any product outside of the United States, a company must also comply with numerous and varying regulatory requirements of other countries and jurisdictions regarding quality, safety and efficacy and governing, among other things, clinical trials, marketing authorization, commercial sales and distribution of products. Whether or not it obtains FDA approval for a product, an applicant will need to obtain the necessary approvals by the comparable foreign regulatory authorities before it can commence clinical trials or marketing of the product in those countries or jurisdictions. Specifically, the process governing approval of medicinal products in the EU generally follows the same lines as in the United States. It entails satisfactory completion of preclinical studies and adequate and well-controlled clinical trials to establish the safety and efficacy of the product for each proposed indication. It also requires the submission to the relevant competent authorities of a marketing authorization application, or MAA, and granting of a marketing authorization by these authorities before the product can be marketed and sold in the EU.

Marketing authorization

To obtain a marketing authorization for a gene therapy product under the EU regulatory system, an applicant must submit an application via the centralized procedure administered by the European Medicines Agency (EMA). Specifically, the grant of marketing authorization in the EU for products containing viable human tissues or cells such as gene therapy medicinal products is governed by Regulation 1394/2007/EC on advanced therapy medicinal products, read in combination with Directive 2001/83/EC of the European Parliament and of the Council, commonly known as the Community code on medicinal products. Regulation 1394/2007/EC lays down specific rules concerning the authorization, supervision, and pharmacovigilance of gene therapy medicinal products, somatic cell therapy medicinal products, and tissue engineered products. Manufacturers of advanced therapy medicinal products must demonstrate the quality, safety, and efficacy of their products to the EMA's Committee for Advance Therapies which provides a draft opinion regarding the application for marketing authorization and which is subject to final approval by the EMA's Committee for Medicinal Products for Human Use. The European Commission grants or refuses marketing authorization in light of that final approval.

Under the centralized procedure in the EU, the maximum timeframe for the evaluation of an MAA is 210 days, excluding clock stops when additional information or written or oral explanation is to be provided by the applicant in response to questions of the CHMP. Accelerated evaluation may be granted by the CHMP in exceptional cases, when a medicinal product is of major interest from the point of view of public health and, in particular, from the viewpoint of therapeutic innovation. If the CHMP accepts such a request, the time limit of 210 days will be reduced to 150 days, but it is possible that the CHMP may revert to the standard time limit for the centralized procedure if it determines that it is no longer appropriate to conduct an accelerated assessment.

Regulatory data protection in the EU

In the EU, new chemical entities approved on the basis of a complete independent data package qualify for eight years of data exclusivity upon marketing authorization and an additional two years of market exclusivity pursuant to Regulation (EC) No 726/2004, as amended, and Directive 2001/83/EC, as amended. Data exclusivity prevents regulatory authorities in the EU from referencing the innovator's data to assess a generic (abbreviated) application for a period of eight years. This also applies to biosimilars. During the additional two-year period of market exclusivity, a generic marketing authorization application can be submitted, and the innovator's data may be referenced, but no generic medicinal product can be marketed until the expiration of the market exclusivity. The overall ten-year period will be extended to a maximum of eleven years if, during the first eight years of those ten years, the marketing authorization holder obtains an authorization for one or more new therapeutic indications which, during the scientific evaluation prior to authorization, is held to bring a significant clinical benefit in comparison with existing therapies. In addition, if a pediatric investigation plan is accepted, then a further year of market exclusivity might be obtained (or in the alternative a patent extension (SPC) of a further 6 months). For orphan medicinal products, the periods are separate and different in that there is a total of 10-year data exclusivity and if they have a PIP, there is a further two-year extension to that 10-year period. Even if a compound is considered to be a new chemical or biological entity so that the innovator gains the prescribed period of data exclusivity, another company may

market another version of the product if such company obtained marketing authorization based on an MAA with a complete independent data package of pharmaceutical tests, preclinical tests and clinical trials.

Periods of authorization and renewals

A marketing authorization is valid for five years, in principle, and it may be renewed after five years on the basis of a reevaluation of the risk-benefit balance by the EMA or by the competent authority of the authorizing member state. To that end, the marketing authorization holder must provide the EMA or the competent authority with a consolidated version of the file in respect of quality, safety and efficacy, including all variations introduced since the marketing authorization was granted, at least six months before the marketing authorization ceases to be valid. Once renewed, the marketing authorization is valid for an unlimited period, unless the European Commission or the competent authority decides, on justified grounds relating to pharmacovigilance, to proceed with one additional five-year renewal period. Any authorization that is not followed by the placement of the drug on the EU market (in the case of the centralized procedure) or on the market of the authorizing member state within three years after authorization ceases to be valid.

Regulatory requirements after marketing authorization

Following approval, the holder of the marketing authorization is required to comply with a range of requirements applicable to the manufacturing, marketing, promotion and sale of the medicinal product. These include compliance with the EU's stringent pharmacovigilance or safety reporting rules, pursuant to which post-authorization studies and additional monitoring obligations can be imposed. In addition, the manufacturing of authorized products, must also be conducted in strict compliance with the EMA's GMP requirements and comparable requirements of other regulatory bodies in the EU, which mandate the methods, facilities, and controls used in manufacturing, processing and packing of drugs to assure their safety and identity. The marketing and promotion of authorized products, including industry-sponsored continuing medical education and advertising directed toward the prescribers of drugs and/or the general public, are strictly regulated in the EU under Directive 2001/83EC, as amended.

Clinical trial approval

Pursuant to the currently applicable Clinical Trials Directive 2001/20/EC and the Directive 2005/28/EC on GCP, a system for the approval of clinical trials in the EU has been implemented through national legislation of the member states. Under this system, an applicant must obtain approval from the competent national authority of each EU member state in which the clinical trial is to be conducted. Furthermore, the applicant may only start a clinical trial at a specific study site after the local competent ethics committee has issued a favorable opinion. In April 2014, the EU adopted a new Clinical Trials Regulation (EU) No 536/2014, which is set to replace the current Clinical Trials Directive 2001/20/EC six months after the clinical trial portal is announced by the European Commission to be ready for use. This new legislation, which will be directly applicable in all member states, aims at simplifying and streamlining the approval of clinical trials in the EU by allowing for a streamlined application procedure via a single-entry point and strictly defined deadlines for the assessment of clinical trial applications.

Conditional marketing authorization

For medicinal products where the benefit of immediate availability outweighs the risk of less comprehensive data than normally required, based on the scope and criteria defined in legislation and guidelines, it is possible to obtain from the EMA a conditional marketing authorization with a 12 month validity period and annual renewal pursuant to Regulation No 507/2006. These are granted only if the CHMP finds that all four requirements are met: (i) the benefit-risk balance of the product is positive; (ii) it is likely that the applicant will be able to provide comprehensive data; (iii) unmet medical needs will be fulfilled; and (iv) the benefit to public health of the medicinal product's immediate availability on the market outweighs the risks due to need for further data.

PRIME designation in the EU

The EU has a Priority Medicines, or PRIME, scheme that is intended to encourage drug development in areas of unmet medical need and provides accelerated assessment of products representing substantial innovation reviewed under the centralized procedure. Products from small- and medium-sized enterprises may qualify for earlier entry into the PRIME scheme than larger companies. Many benefits accrue to sponsors of product candidates with PRIME designation, including but not limited to, early and proactive regulatory dialogue with the EMA, frequent discussions on clinical trial designs and other development program elements, and accelerated marketing authorization application assessment once a dossier has been submitted.

Orphan drug designation and exclusivity

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

Brexit and the regulatory framework in the U.K

The withdrawal of the U.K. from the EU occurred on January 31, 2020, which is commonly known as "Brexit." A "transition period" through December 31, 2020 has been established to allow the U.K. and EU to negotiate the terms of the U.K.'s withdrawal.

Since the regulatory framework for pharmaceutical products in the U.K. relating to quality, safety and efficacy of pharmaceutical products, clinical trials, marketing authorization, commercial sales and distribution of pharmaceutical products is derived from EU directives and regulations, Brexit will materially impact the future regulatory regime which applies to products and the approval of product candidates in the U.K.. In the first instance, a separate U.K. authorization from any centralized authorization for the EU would need to be applied before the end of any agreed transition period. In the immediately foreseeable future, the process is likely to remain very similar to that applicable in the EU, albeit that the processes for applications will be separate. Longer term, the U.K. is likely to develop its own legislation that diverges from that in the EU.

General data protection regulation

The collection, use, disclosure, transfer, or other processing of personal data, including personal health data, regarding individuals who are located in the European Economic Area (EEA), and the processing of personal data that takes place in the EEA, is subject to the EU's General Data Protection Regulation, or 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, and it imposes heightened requirements on companies that process health and other sensitive data, such as requiring in many situations that a company obtain the consent of the individuals to whom the sensitive personal data relate before processing such data. Examples of obligations imposed by the GDPR on companies processing personal data that fall within the scope of the GDPR include providing information to individuals regarding data processing activities, implementing safeguards to protect the security and confidentiality of personal data, appointing a data protection officer, 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 EEA, 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 is a rigorous and time-intensive process that may increase the cost of doing business or require companies to change their business practices to ensure full compliance.

California Consumer Privacy Act

In 2018, California passed into law the California Consumer Privacy Act (CCPA), which took effect on January 1, 2020 and imposed many requirements on businesses that process the personal information of California residents. Many of the CCPA's requirements are similar to those found in the GDPR, including requiring businesses to provide notice to data subjects regarding the information collected about them and how such information is used and shared, and providing data subjects the right to request access to such personal information and, in certain cases, request the erasure of such personal information. The CCPA also affords California residents the right to opt-out of "sales" of their personal information. The CCPA contains significant penalties for companies that violate its requirements. It also provides California residents a private right of action, including the ability to seek statutory damages, in the event of a breach involving their personal information. Compliance with the CCPA is a rigorous and time-intensive process that may increase the cost of doing business or require companies to change their business practices to ensure full compliance.

Coverage, pricing, and reimbursement

Significant uncertainty exists as to the coverage and reimbursement status of any product candidates for which we may seek regulatory approval by the FDA or other government authorities. In the United States and markets in other countries, patients who are prescribed treatments for their conditions and providers performing the prescribed services generally rely on third-party payors to reimburse all or part of the associated healthcare costs. Patients are unlikely to use any product candidates we may develop unless coverage is provided and reimbursement is adequate to cover a significant portion of the cost of such product candidates. Sales of our products will depend, in part, on the availability of coverage and the adequacy of reimbursement from third-party payors.

Within the United States, third-party payors include government authorities or government healthcare programs, such as Medicare and Medicaid, and private entities, such as managed care organizations, private health insurers and other organizations. The process for determining whether a third-party payor will provide coverage for a product may be separate from the process for setting the reimbursement rate that the payor will pay for the drug product. Third-party payors may limit coverage to specific products on an approved list, or formulary, which might not include all of the FDA-approved products for a particular indication. Some third-party payors may manage utilization of a particular product by requiring pre-approval (known as "prior authorization") for coverage of particular prescriptions (to allow the payor to assess medical necessity). Moreover, a third-party payor's decision to provide coverage for a drug product does not imply that an adequate reimbursement rate will be approved. Adequate third-party reimbursement may not be available to enable us to maintain net price levels sufficient to realize an appropriate return on our investment in product development. Additionally, coverage and reimbursement for drug products can differ significantly from payor to payor. One third-

party payor's decision to cover a particular drug product or service does not ensure that other payors will also provide coverage for the drug product or will provide coverage at an adequate reimbursement rate.

Third-party payors are increasingly challenging the price and examining the cost-effectiveness of new products and services in addition to their safety and efficacy. To obtain or maintain coverage and reimbursement for any current or future product, we may need to conduct expensive pharmacoeconomic studies to demonstrate the medical necessity and cost-effectiveness of our product. These studies will be in addition to the studies required to obtain regulatory approvals. If third-party payors do not consider a product to be cost-effective compared to other available therapies, they may not cover the product after approval as a benefit under their plans or, if they do, the level of payment may not be sufficient to allow a company to sell its products at a profit. Thus, obtaining and maintaining reimbursement status is time-consuming and costly.

As noted above, the marketability of any product candidates for which we receive regulatory approval for commercial sale may suffer if the government and third-party payors fail to provide coverage and adequate reimbursement. There is an emphasis on cost containment measures in the United States and we expect will continue to increase the pressure on pharmaceutical pricing. Coverage policies and third-party reimbursement rates may change at any time. Even if favorable coverage and reimbursement status is attained for one or more product candidates for which we receive regulatory approval from one or more third party payors, less favorable coverage policies and reimbursement rates may be implemented in the future.

If we obtain appropriate approval in the future to market any of our current product candidates in the United States, we may be required to provide discounts or rebates under government healthcare programs or to certain government and private purchasers in order to obtain coverage under federal healthcare programs such as Medicaid. Participation in such programs may require us to track and report certain drug prices. We may be subject to fines and other penalties if we fail to report such prices accurately.

Outside the United States, ensuring adequate coverage and payment for any product candidates we may develop will face challenges. Pricing of prescription pharmaceuticals is subject to governmental control in many countries. Pricing negotiations with governmental authorities can extend well beyond the receipt of regulatory marketing approval for a product and may require us to conduct a clinical trial that compares the cost effectiveness of any product candidates we may develop to other available therapies. The conduct of such a clinical trial could be expensive and result in delays in our commercialization efforts.

In the EU, pricing and reimbursement schemes vary widely from country to country because this is not yet the subject of harmonized EU law. Many countries provide that products may be marketed only after a reimbursement price has been agreed. Some countries may require the completion of additional studies that compare the cost-effectiveness of a particular product candidate to currently available therapies (so called health technology assessments) in order to obtain reimbursement or pricing approval and others with "peg" their pricing to a basket of other countries. EU member states may approve a specific price for a product, or it may instead adopt a system of direct or indirect controls on the profitability of the company placing the product on the market. Some member states, in addition to controlling pricing will monitor and control prescription volumes and issue guidance to physicians to limit prescriptions. Recently, many countries in the EU have increased the amount of discounts required on pharmaceuticals and these efforts could continue as countries attempt to manage healthcare expenditures, especially in light of the severe fiscal and debt crises experienced by many countries in the EU. The downward pressure on health care costs in general, particularly prescription products, has become intense. As a result, increasingly high barriers are being erected to the entry of new products. 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 EU member states, and parallel trade (arbitrage between low-priced and high-priced member states), can further reduce prices. 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, if approved in those countries.

Healthcare law and regulation

Healthcare providers and third-party payors play a primary role in the recommendation and prescription of pharmaceutical products that are granted marketing approval. Arrangements with providers, consultants, third-party payors, and customers are subject to broadly applicable fraud and abuse, anti-kickback, false claims laws, reporting of payments to physicians and teaching physicians and patient privacy laws and regulations and other healthcare laws and regulations that may constrain our business and/or financial arrangements. Restrictions under applicable federal and state healthcare laws and regulations, including certain laws and regulations applicable only if we have marketed products, include the following:

- federal false claims, false statements and civil monetary penalties laws prohibiting, among other things, any person from knowingly presenting, or causing to be presented, a false claim for payment of government funds or knowingly making, or causing to be made, a false statement to get a false claim paid;

- federal healthcare program anti-kickback law, which prohibits, among other things, persons from soliciting, receiving or providing remuneration, directly or indirectly, to induce either the referral of an individual, for an item or service or the purchasing or ordering of a good or service, for which payment may be made under federal healthcare programs such as Medicare and Medicaid;

- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which, in addition to privacy protections applicable to healthcare providers and other entities, prohibits executing a scheme to defraud any healthcare benefit program or making false statements relating to healthcare matters;

- the federal Food, Drug, and Cosmetic Act, or the FDCA, which among other things, strictly regulates drug marketing, prohibits manufacturers from marketing such products for off-label use and regulates the distribution of samples;

- 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 under the Patient Protection and Affordable Care Act, which requires pharmaceutical and medical device companies to monitor and report certain financial interactions with certain healthcare providers to the Center for Medicare & Medicaid Services within the U.S. Department of Health and Human Services for re-disclosure to the public, as well as ownership and investment interests held by physicians and their immediate family members; and

- analogous state and foreign laws and regulations, such as state anti-bribery, anti-kickback and false claims laws, which may apply to healthcare items or services that are reimbursed by non-governmental third-party payors, including private insurers.

Some state laws require pharmaceutical companies to comply with specific compliance standards, restrict financial interactions between pharmaceutical companies and healthcare providers or require pharmaceutical companies to report information related to payments to health care providers or marketing expenditures.

Health care and other reform

In the United States, there have been and continue to be a number of significant legislative initiatives to contain healthcare costs. Federal 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, or the Healthcare Reform Act, which expanded health care coverage through Medicaid expansion and the implementation of the individual mandate for health insurance coverage and which included changes to the coverage and reimbursement of drug products under government healthcare programs. Under the Trump administration, there have been ongoing efforts to modify or repeal all or certain provisions of the Healthcare Reform Act. For example, tax reform legislation was enacted at the end of 2017 that eliminates the tax penalty established under Healthcare Reform Act for individuals who do not maintain mandated health insurance coverage beginning in 2019. The Healthcare Reform Act has also been subject to judicial challenge. In December 2018, a federal district court, in a challenge brought by a number of state attorneys general, found the Healthcare Reform Act unconstitutional in its entirety because, once Congress repealed the individual mandate provision, there was no longer a basis to rely on Congressional taxing authority to support enactment of the law. In December 2019, a federal appeals court agreed that the individual mandate was unconstitutional but remanded the case back to the district court to assess more carefully whether any provisions of the Healthcare Reform Act were severable and could survive. In March 2020, the Supreme Court agreed to hear the case. Pending resolution of the litigation, the Healthcare Reform Act is still operational in all respects.

There have also been other reform initiatives under the Trump Administration, including initiatives focused on drug pricing. For example, the Bipartisan Budget Act of 2018 contained various provisions that affect coverage and reimbursement of drugs, including an increase in the discount that manufacturers of Medicare Part D brand name drugs must provide to Medicare Part D beneficiaries during the coverage gap from 50% to 70% that took effect in 2019. As another example, in 2018, President Trump and the Secretary of the Department of Health and Human Services, or HHS, released a "blueprint" to lower prescription drug prices and out-of-pocket costs. Certain proposals in the blueprint, and related drug pricing measures proposed since the blueprint, could cause significant operational and reimbursement changes for the pharmaceutical industry. As another example, legislation passed in 2019 revised how certain prices reported by pharmaceutical manufacturers under the Medicaid drug rebate program are calculated, a revision that the Congressional Budget Office has estimated will save the federal government approximately $3 billion over the next ten years.

There have also been efforts by federal and state government officials or legislators to implement measures to regulate prices or payment for pharmaceutical products, including legislation on drug importation. Recently, there has been considerable public and government scrutiny of pharmaceutical pricing and proposals to address the perceived high cost of pharmaceuticals. There have also been recent state legislative efforts to address drug costs, which generally have focused on increasing transparency around drug costs or limiting drug prices.

General legislative cost control measures may also affect reimbursement for our product candidates. The Budget Control Act, as amended, resulted in the imposition of 2% reductions in Medicare (but not Medicaid) payments to providers in 2013 and will remain in effect through 2029 unless additional Congressional action is taken. Any significant spending reductions affecting Medicare, Medicaid or other publicly funded or subsidized health programs that may be implemented and/or any significant taxes or fees that may be imposed on us could have an adverse impact on our results of operations.

Adoption of new legislation at the federal or state level could affect demand for, or pricing of, our current or future products if approved for sale. We cannot, however, 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.

Employees

As of December 31, 2019, we had 118 full-time employees. Of these full-time employees, 97 are engaged in research and development activities. None of our employees is represented by a labor union or covered by a collective bargaining agreement or represented by a trade or labor union.

Corporate Information

We were incorporated in Delaware in January 2017. Our principal executive offices are located at 26 Landsdowne Street, 2nd Floor, Cambridge, MA 02139, and our telephone number is 857-327-8775.

Available Information

Our website address is www.beamtx.com, and our investor relations website is located at investors.beamtx.com. Information on our website is not incorporated by reference herein. We will make available on our website, free of charge, our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and any amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act, as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC. The SEC maintains an Internet site (http://www.sec.gov) containing reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC.

Item 1A. Risk Factors.

You should carefully consider the risks and uncertainties described below together with all of the other information contained in this Annual Report on Form 10-K, including our consolidated financial statements and related notes appearing at the end of this Annual Report on Form 10-K, in evaluating our company. If any of the events or developments described below were to occur, our business, prospects, operating results and financial condition could suffer materially, the trading price of our common stock could decline. The risks and uncertainties described below are not the only ones we face. Additional risks and uncertainties not presently known to us or that we currently believe to be immaterial may also adversely affect our business.

Risks related to our financial position and need for additional capital

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

Since inception, we have incurred significant operating losses. Our net loss was $78.3 million and $116.7 million for the years ended December 31, 2019 and 2018, respectively. As of December 31, 2019, we had an accumulated deficit of $203.0 million. We have financed our operations primarily through private placements of our preferred stock and proceeds from the sale of common stock in our initial public offering, or IPO. We have devoted all of our efforts to research and development. We expect to continue to incur significant expenses and increasing operating losses for the foreseeable future. The net losses we incur may fluctuate significantly from quarter to quarter. We anticipate that our expenses will increase substantially if and as we:

- continue our current research programs and our preclinical development of product candidates from our current research programs;
- seek to identify additional research programs and additional product candidates;
- initiate preclinical testing and clinical trials for any product candidates we identify and develop;
- maintain, expand, enforce, defend and protect our intellectual property portfolio and provide reimbursement of third-party expenses related to our patent portfolio;
- seek marketing approvals for any of our product candidates that successfully complete clinical trials;
- ultimately establish a sales, marketing, and distribution infrastructure to commercialize any medicines for which we may obtain marketing approval;
- further develop our base editing platform;
- hire additional research and development personnel;
- hire clinical and commercial personnel;
- add operational, financial, and management information systems and personnel, including personnel to support our product development;
- acquire or in-license product candidates, intellectual property and technologies; and
- should we decided to do so, build and maintain a commercial-scale current Good Manufacturing Practices, or cGMP, manufacturing facility.

We have not initiated clinical development of any product candidate and expect that it will be many years, if ever, before we have a product candidate ready for commercialization. To become and remain profitable, we must develop and, either directly or through collaborators, eventually commercialize a medicine or medicines with significant market potential. This will require us to be successful in a range of challenging activities, including identifying product candidates, completing preclinical testing and clinical trials of product candidates, obtaining marketing approval for these product candidates, manufacturing, marketing, and selling those medicines for which we may obtain marketing approval, and satisfying any post-marketing requirements. We may never succeed in these activities and, even if we do, may never generate revenues that are significant or large enough to achieve profitability. We are currently only in the preclinical testing stages for all our research programs. Because of the numerous risks and uncertainties associated with developing base editing product candidates, we are unable to predict the extent of any future losses or when we will become profitable, if at all. If we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable would decrease the value of our company and could impair our ability to raise capital, maintain our research and development efforts, expand our business, or continue our operations.

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

We expect our expenses to increase in connection with our ongoing activities, particularly as we identify, continue the research and development of, initiate clinical trials of, and seek marketing approval for, product candidates. In addition, if we obtain marketing approval for any product candidates we may develop, we expect to incur significant commercialization expenses related to product sales, marketing, manufacturing, and distribution to the extent that such sales, marketing, manufacturing, and distribution are not the responsibility of a collaborator. Furthermore, since the closing of our IPO, we have incurred and expect to continue to incur additional costs associated with operating as a public company. Accordingly, we will need to obtain substantial additional funding in connection with our continuing operations. If we are unable to raise capital when needed or on attractive terms, we would be forced to delay, reduce, or eliminate our research and product development programs or future commercialization efforts.

At December 31, 2019, our cash, cash equivalents, and marketable securities were $91.8 million. We believe that our existing cash, cash equivalents, and marketable securities, together with proceeds from our IPO of $188.3 million, net of underwriting discounts and estimated offering costs, will enable us to fund our operating expenses and capital expenditure requirements for at least the next 12 months. However, our operating plan may change as a result of factors currently unknown to us, and we may need to seek additional funding sooner than planned. Our future capital requirements will depend on many factors, including:

- the costs of continuing to build our base editing platform;
- the costs of acquiring licenses for the delivery modalities that will be used with our product candidates we may develop;
- the scope, progress, results, and costs of discovery, preclinical development, formulation development, and clinical trials for the product candidates we may develop;
- the costs of preparing, filing, and prosecuting patent applications, maintaining and enforcing our intellectual property and proprietary rights, and defending intellectual property-related claims;
- the costs, timing, and outcome of regulatory review of the product candidates we may develop;
- the costs of future activities, including product sales, medical affairs, marketing, manufacturing, distribution, coverage and reimbursement for any product candidates we may develop for which we receive regulatory approval;
- our ability to establish and maintain additional collaborations on favorable terms, if at all;
- the success of any collaborations that we may establish and of our license agreements;
- the achievement of milestones or occurrence of other developments that trigger payments under any additional collaboration agreements we obtain;
- the extent to which we acquire or in-license product candidates, intellectual property and technologies; and
- the costs of operating as a public company.

Identifying potential product candidates and conducting preclinical testing and clinical trials is a time-consuming, expensive, and uncertain process that takes years to complete, and we may never generate the necessary data or results required to obtain marketing approval and achieve product sales. In addition, even if we successfully identify and develop product candidates and those are approved, we may not achieve commercial success. Our commercial revenues, if any, will be derived from sales of medicines that we do not expect to be commercially available for many years, if at all. Accordingly, we will need to continue to rely on additional financing to achieve our business objectives. Adequate additional financing may not be available to us on acceptable terms, or at all.

Any additional fundraising efforts may divert our management from their day-to-day activities, which may adversely affect our ability to develop and commercialize our product candidates. We cannot be certain that additional funding will be available on acceptable terms, or at all. We have no committed source of additional capital and, if we are unable to raise additional capital in sufficient amounts or on terms acceptable to us, we may have to significantly delay, scale back or discontinue the development or commercialization of our product candidates or other research and development initiatives. Our license agreements and any future collaboration agreements may also be terminated if we are unable to meet the payment or other obligations under the agreements. We could be required to seek collaborators for product candidates we may develop at an earlier stage than otherwise would be desirable or on terms that are less favorable than might otherwise be available or relinquish or license on unfavorable terms our rights to product candidates we may develop in markets where we otherwise would seek to pursue development or commercialization ourselves.

If we are unable to obtain funding on a timely basis, we may be required to significantly curtail, delay or discontinue one or more of our research or development programs or the commercialization of any product candidate, or be unable to expand our operations or otherwise capitalize on our business opportunities, as desired, which could materially affect our business, financial condition and results of operations. Any of the above events could significantly harm our business, prospects, financial condition and results of operations and cause the price of our common stock to decline.

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

Until such time, if ever, as we can generate substantial product revenues, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaborations, strategic alliances, and licensing arrangements. We do not have any committed external source of funds. 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 of these securities may include liquidation or other preferences that adversely affect your rights as a common stockholder. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures, declaring dividends, and possibly other restrictions.

If we raise funds through additional collaborations, strategic alliances, or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs, or product candidates we may develop, or we may have to grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce, or terminate our product development or future commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves.

Our short operating history may make it difficult for you to evaluate the success of our business to date and to assess our future viability.

We are an early-stage company. We were founded and commenced operations in January 2017. Our operations to date have been limited to organizing and staffing our company, business planning, raising capital, acquiring and developing our platform and technology, identifying potential product candidates, and undertaking preclinical studies. All of our research programs are still in the preclinical or research stage of development, and their risk of failure is high. We have not yet demonstrated an ability to initiate or successfully complete any clinical trials, including large-scale, pivotal clinical trials, obtain marketing approvals, manufacture a commercial-scale medicine, or arrange for a third party to do so on our behalf, or conduct sales and marketing activities necessary for successful commercialization. Typically, it takes about 10 to 15 years to develop a new medicine from the time it is discovered to when it is available for treating patients. Consequently, any predictions you make about our future success or viability may not be as accurate as they could be if we had a longer operating history.

Our limited operating history, particularly in light of the rapidly evolving base editing and gene editing field, may make it difficult to evaluate our technology and industry and predict our future performance. Our very short history as an operating company makes any assessment of our future success or viability subject to significant uncertainty. We will encounter risks and difficulties frequently experienced by very early stage companies in rapidly evolving fields. If we do not address these risks successfully, our business will suffer.

In addition, as a new business, we may encounter other unforeseen expenses, difficulties, complications, delays, and other known and unknown factors. We will need to transition from a company with a research focus to a company capable of supporting commercial activities. We may not be successful in such a transition.

We have never generated revenue from product sales and may never become profitable.

Our ability to generate revenue from product sales and achieve profitability depends on our ability, alone or with collaborative partners, to successfully complete the development of, and obtain the regulatory approvals necessary to commercialize, product candidates we may identify for development. We do not anticipate generating revenues from product sales for the next several years, if ever. Our ability to generate future revenues from product sales depends heavily on our, or our collaborators', ability to successfully:

- identify product candidates and complete research and preclinical and clinical development of any product candidates we may identify;
- seek and obtain regulatory and marketing approvals for any of our product candidates for which we complete clinical trials;
- launch and commercialize any of our product candidates for which we obtain regulatory and marketing approval by establishing a sales force, marketing, and distribution infrastructure or, alternatively, collaborating with a commercialization partner;
- qualify for adequate coverage and reimbursement by government and third-party payors for any of our product candidates for which we obtain regulatory and marketing approval;
- develop, maintain, and enhance a sustainable, scalable, reproducible, and transferable manufacturing process for the product candidates we may develop;

- establish and maintain supply and manufacturing relationships with third parties that can provide adequate, in both amount and quality, products, and services to support clinical development and the market demand for any of our product candidates for which we obtain regulatory and marketing approval;
- obtain market acceptance of any product candidates we may develop as viable treatment options;
- address competing technological and market developments;
- implement internal systems and infrastructure, as needed;
- negotiate favorable terms in any collaboration, licensing, or other arrangements into which we may enter and performing our obligations in such collaborations;
- maintain, protect, enforce, defend, and expand our portfolio of intellectual property rights, including patents, trade secrets, and know-how;
- avoid and defend against third-party interference, infringement, and other intellectual property claims; and
- attract, hire, and retain qualified personnel.

Even if one or more of the product candidates we may develop are approved for commercial sale, we anticipate incurring significant costs associated with commercializing any approved product candidate. Our expenses could increase beyond expectations if we are required by the U.S. Food and Drug Administration, or the FDA, the European Medicines Agency, or the EMA, or other regulatory authorities to perform clinical and other studies in addition to those that we currently anticipate. Even if we are able to generate revenues from the sale of any approved product candidates, we may not become profitable and may need to obtain additional funding to continue operations.

Even if we do achieve profitability, we may not be able to sustain or increase profitability on a quarterly or annual basis. Our failure to become and remain profitable would decrease the value of our company and could impair our ability to raise capital, maintain our research and development efforts, expand our business or continue our operations.

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

We have incurred substantial losses during our history, and we may never achieve profitability. To the extent that we continue to generate taxable losses, unused losses will carry forward to offset a portion of future taxable income, if any, subject to expiration of such carryforwards in the case of carryforwards generated prior to 2018. Additionally, we continue to generate business tax credits, including research and development tax credits, which generally may be carried forward to offset a portion of future taxable income, if any, subject to expiration of such credit carryforwards. In addition, under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, or the Code, if a corporation undergoes an “ownership change,” generally defined as one or more shareholders or groups of shareholders who own at least 5% of the corporation’s equity increasing their ownership in the aggregate by a greater than 50 percentage point 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 and development tax credits) to offset its post-change income or taxes may be limited. Our prior equity offerings and other changes in our stock ownership may have resulted in such ownership changes. In addition, we may experience ownership changes in the future as a result shifts in our stock ownership, some of which are outside of our control. As a result, if we earn net taxable income, our ability to use our pre-change NOLs or other pre-change tax attributes to offset U.S. federal taxable income may be subject to limitations, which could potentially result in increased future tax liability to us. Additional limitations on our ability to utilize our NOLs to offset future taxable income may arise as a result of our corporate structure whereby NOLs generated by certain of our subsidiaries or controlled entities may not be available to offset taxable income earned by our subsidiaries or other controlled entities. In addition, under legislation commonly referred to as the Tax Cuts and Jobs Act of 2017, or the Tax Act, the amount of post-2017 NOLs that we are permitted to deduct in any taxable year is limited to 80% of our taxable income in such year. The Tax Act generally eliminates the ability to carry back any NOLs to prior taxable years, while allowing post-2017 unused NOLs to be carried forward indefinitely. There is a risk that due to changes under the Tax Act, regulatory changes, or other unforeseen reasons, our existing NOLs or business tax credits could expire or otherwise be unavailable to offset future income tax liabilities. At the state level, there may also be periods during which the use of NOLs or business tax credits is suspended or otherwise limited, which could accelerate or permanently increase state taxes owed. For these reasons, we may not be able to realize a tax benefit from the use of our NOLs or tax credits, even if we attain profitability.

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

On December 22, 2017, the Tax Act was signed into law. The Tax Act, among other things, contains significant changes to corporate taxation, including (i) reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, (ii) limitation of the tax deduction for interest expense to 30% of adjusted earnings (except for certain small businesses), (iii) limitation of the deduction for NOLs to 80% of current year taxable income in respect of NOLs generated during or after 2018 and elimination of NOL carrybacks, (iv) immediate deductions for certain new investments instead of deductions for depreciation expense over time, and (v) modifying or repealing many business deductions and credits. Any federal NOL incurred in 2018 and in future years may now be carried forward

indefinitely pursuant to the Tax Act. It is uncertain if and to what extent various states will conform to the newly enacted federal tax law. We will continue to examine the impact the Tax Act may have on our business.

Risks related to discovery, development, and commercialization

Base editing is a novel technology that is not yet clinically validated for human therapeutic use. The approaches we are taking to discover and develop novel therapeutics are unproven and may never lead to marketable products.

We are focused on developing potentially curative medicines utilizing base editing technology. Although there have been significant advances in the field of gene therapy, which typically involves introducing a copy of a gene into a patient's cell, and gene editing in recent years, base editing technologies are new and largely unproven. The technologies that we have licensed and that we intend to develop and intend to license have not yet been clinically tested, nor are we aware of any clinical trials for safety or efficacy having been completed by third parties using our base editing or similar technologies. The scientific evidence to support the feasibility of developing product candidates based on these technologies is both preliminary and limited, and base editing and delivery modalities for it are novel. Successful development of product candidates by us will require solving a number of issues, including safely delivering a therapeutic into target cells within the human body or in an *ex vivo* setting, optimizing the efficiency and specificity of such product candidates, and ensuring the therapeutic selectivity of such product candidates. There can be no assurance we will be successful in solving any or all of these issues.

We have concentrated our research efforts to date on preclinical work to bring therapeutics to the clinic for our initial indications, and our future success is highly dependent on the successful development of base editing technologies, cellular delivery methods and therapeutic applications of that technology. While some of the existing gene editing technologies have progressed to clinical trials, they continue to suffer from various limitations, and such limitations may affect our future success. We may decide to alter or abandon our initial programs as new data become available and we gain experience in developing base editing therapeutics. We cannot be sure that our technologies will yield satisfactory products that are safe and effective, scalable or profitable in our initial indications or any other indication we pursue.

Development activities in the field of base editing are currently subject to a number of risks related to the ownership and use of certain intellectual property rights that are subject to patent interference proceedings in the United States and opposition proceedings in Europe. For additional information regarding the risks that may apply to our and our licensors' intellectual property rights, see the section entitled "—Risks related to our intellectual property" for more information.

We may not be successful in our efforts to identify and develop potential product candidates. If these efforts are unsuccessful, we may never become a commercial stage company or generate any revenues.

The success of our business depends primarily upon our ability to identify, develop, and commercialize product candidates based on our gene editing platform. All of our product development programs are still in the research or preclinical stage of development. Our research programs may fail to identify potential product candidates for clinical development for a number of reasons. Our research methodology may be unsuccessful in identifying potential product candidates, our potential product candidates may be shown to have harmful side effects in preclinical *in vitro* experiments or animal model studies, they may not show promising signals of therapeutic effect in such experiments or studies or they may have other characteristics that may make the product candidates impractical to manufacture, unmarketable, or unlikely to receive marketing approval.

In addition, although we believe base editing will position us to rapidly expand our portfolio of product candidates beyond our current product candidates we may develop after only minimal changes to the product candidate construct, we have not yet successfully developed any product candidate and our ability to expand our portfolio may never materialize.

If any of these events occur, we may be forced to abandon our research or development efforts for a program or programs, which would have a material adverse effect on our business, financial condition, results of operations, and prospects. Research programs to identify new product candidates require substantial technical, financial, and human resources. We may focus our efforts and resources on potential programs or product candidates that ultimately prove to be unsuccessful, which would be costly and time-consuming.

The gene editing field is relatively new and is evolving rapidly. We are focusing our research and development efforts on gene editing using base editing technology, but other gene editing technologies may be discovered that provide significant advantages over base editing, which could materially harm our business.

To date, we have focused our efforts on gene editing technologies using base editing. Other companies have previously undertaken research and development of gene editing technologies using zinc finger nucleases, engineered meganucleases, and transcription activator-like effector nucleases, or TALENs, but to date none has obtained marketing approval for a product candidate. There can be no certainty that base editing technology will lead to the development of genetic medicines or that other gene editing technologies will not be considered better or more attractive for the development of medicines. For example, Feng Zhang's group at MIT and Broad Institute, and, separately, Samuel Sternberg's group at Columbia University recently announced the discovery of the use of transposons, or "jumping genes." Transposons can insert themselves into different places in the genome and can be programmed to carry specific DNA sequences to specific sites, without the need for making double-stranded breaks in DNA. In addition, we have

become aware of novel gene editing technology recently developed by one of our founders David Liu, and his group at Broad Institute. We have secured an exclusive license from Prime Medicine, Inc., or Prime Medicine, a company founded by David Liu, to pursue this new technology in certain fields and for certain applications similar to those we are already pursuing with base editing. Our license does not cover all fields and applications of this new technology for gene editing and Prime Medicine retains broad rights to use this technology outside of the fields licensed to us. It is possible that this gene editing technology developed by David Liu's group is competitive with our business, and it is also possible that such gene editing technology may potentially be considered more attractive than base editing. Therefore, Prime Medicine may pursue this technology in other fields and for other applications and may develop competing products using such technology. For more information regarding our agreement with Prime Medicine, see Item 13, *Certain relationships and related party transactions, director independence—License and collaboration agreement*, in this Annual Report on Form 10-K. Similarly, another new gene editing technology that has not been discovered yet may be determined to be more attractive than base editing. Moreover, if we decide to develop gene editing technologies other than those involving base editing, we cannot be certain we will be able to obtain rights to such technologies. Although all of our founders who currently provide consulting and advisory services to us in the area of base editing technologies have assignment of inventions obligations to us with respect to the services they perform for us, these assignment of inventions obligations are subject to limitations and do not extend to their work in other fields or to the intellectual property arising from their employment with their respective academic and research institutions. To obtain intellectual property rights assigned by these founders to such institutions, we would need to enter into license agreements with such institutions, which may not be available on commercially reasonable terms or at all. Further, while our three founders have non-competition clauses in their respective consulting agreements, the non-competition obligation is limited to the field of base editing for human therapeutics, and our founders have developed and may in the future develop new technologies that are outside of the field of their non-competition obligations but may be competitive to our business. For example, as discussed above, David Liu and his group at Broad Institute have developed novel gene editing technology outside of the field of his non-competition obligations that may be used to develop products that compete with our business. Any of these factors could reduce or eliminate our commercial opportunity, and could have a material adverse effect on our business, financial condition, results of operations, and prospects.

We are very early in our development efforts. All of our product candidates are still in preclinical development or earlier stages and it will be many years before we or our collaborators commercialize a product candidate, if ever. If we are unable to advance our product candidates to clinical development, obtain regulatory approval and ultimately commercialize our product candidates, or experience significant delays in doing so, our business will be materially harmed.

We are very early in our development efforts and have focused our research and development efforts to date on base editing technology, identifying our initial targeted disease indications and our initial product candidates. We have not yet achieved preclinical proof of concept *in vivo* for the majority of our programs and there is no guarantee that we will achieve it for these programs. Our future success depends heavily on the successful development of our base editing product candidates. Currently, all of our product candidates are in preclinical development or in discovery. We have invested substantially all of our efforts and financial resources in building our base editing platform, and the identification and preclinical development of our current product candidates. Our ability to generate product revenue, which we do not expect will occur for many years, if ever, will depend heavily on the successful development and eventual commercialization of our product candidates, which may never occur. We currently generate no revenue from sales of any product, and we may never be able to develop or commercialize a marketable product.

Commencing clinical trials in the United States is also subject to acceptance by the FDA of our Investigational New Drug application, or IND, and finalizing the trial design based on discussions with the FDA and other regulatory authorities. In the event that the FDA requires us to complete additional preclinical studies or we are required to satisfy other FDA requests, the start of our first clinical trials may be delayed. Even after we receive and incorporate guidance from these regulatory authorities, the FDA or other regulatory authorities could disagree that we have satisfied their requirements to commence our clinical trial or change their position on the acceptability of our trial design or the clinical endpoints selected, which may require us to complete additional preclinical studies or clinical trials or impose stricter approval conditions than we currently expect. There are equivalent processes and risks applicable to clinical trial applications in other countries, including in Europe.

Commercialization of our product candidates we may develop will require additional preclinical and clinical development; regulatory and marketing approval in multiple jurisdictions, including by the FDA and the EMA; obtaining manufacturing supply, capacity and expertise; building of a commercial organization; and significant marketing efforts. The success of product candidates we may identify and develop will depend on many factors, including the following:

- sufficiency of our financial and other resources to complete the necessary preclinical studies, IND-enabling studies, and clinical trials;
- successful enrollment in, and completion of, clinical trials;
- receipt of marketing approvals from applicable regulatory authorities;
- establishment of arrangements with third-party manufacturers for clinical supply and commercial manufacturing and, where applicable, commercial manufacturing capabilities;

- successful development of our internal manufacturing processes and transfer to larger-scale facilities operated by either a contract manufacturing organization, or CMO, or by us;

- obtaining and maintaining patent, trade secret, and other intellectual property protection and non-patent exclusivity for our medicines;
- launching commercial sales of the medicines, if and when approved, whether alone or in collaboration with others;
- acceptance of the products, if and when approved, by patients, the medical community, and third-party payors;
- effectively competing with other therapies and treatment options;
- a continued acceptable safety profile of the medicines following approval;
- enforcing and defending intellectual property and proprietary rights and claims; and
- supplying the product at a price that is acceptable to the pricing or reimbursement authorities in different countries.

If we do not successfully achieve one or more of these activities in a timely manner or at all, we could experience significant delays or an inability to successfully commercialize any product candidates we may develop, which would materially harm our business. If we do not receive regulatory approvals for our product candidates, we may not be able to continue our operations.

If any of the product candidates we may develop, or the delivery modes we rely on to administer them, cause serious adverse events, undesirable side effects, or unexpected characteristics, such events, side effects or characteristics could delay or prevent regulatory approval of the product candidates, limit the commercial potential, or result in significant negative consequences following any potential marketing approval.

We have not evaluated any product candidates in human clinical trials. Moreover, there have been only a limited number of clinical trials involving the use of gene editing technologies and none involving base editing technology similar to our technology. It is impossible to predict when or if any product candidates we may develop will prove safe in humans. In the genetic medicine field, there have been several significant adverse events from gene therapy treatments in the past, including reported cases of leukemia and death. There can be no assurance that base editing technologies will not cause undesirable side effects, as improper editing of a patient's DNA could lead to lymphoma, leukemia, or other cancers, or other aberrantly functioning cells.

A significant risk in any base editing product candidate is that "off-target" edits may occur, which could cause serious adverse events, undesirable side effects or unexpected characteristics. For example, Erwei Zuo et al. reported that cytosine base editors generated substantial off-target edits, that is, edits in unintended locations on the DNA, when tested in mouse embryos. Such unintended edits are referred to as "spurious deamination." We cannot be certain that off-target editing will not occur in any of our planned or future clinical studies, and the lack of observed side effects in preclinical studies does not guarantee that such side effects will not occur in human clinical studies. There is also the potential risk of delayed adverse events following exposure to base editing therapy due to the permanence of edits to DNA or due to other components of product candidates used to carry the genetic material. Further, because base editing makes a permanent change, the therapy cannot be withdrawn, even after a side effect is observed. In addition, Rees et al. and Grunewald et al. have reported that the deaminases we currently use in our C base editors and our A base editors for use in DNA base editing also cause unintended mutations in RNA for as long as the editor is present in the cell.

Although we and others have demonstrated the ability to engineer base editors to improve the specificity of their edits in a laboratory setting, we cannot be sure that our engineering efforts will be effective in any product candidates that we may develop. For example, we might not be able to engineer an editor to make the desired change or a by-stander edit could diminish the effectiveness of an edit that we make.

In certain of our programs, we plan to use lipid nanoparticles, or LNPs to deliver our base editors. LNPs have been shown to induce oxidative stress in the liver at certain doses, as well as initiate systemic inflammatory responses that can be fatal in some cases. While we aim to continue to optimize our LNPs, there can be no assurance that our LNPs will not have undesired effects. Our LNPs could contribute, in whole or in part, to one or more of the following: immune reactions, infusion reactions, complement reactions, opsonation reactions, antibody reactions including IgA, IgM, IgE or IgG or some combination thereof, or reactions to the PEG from some lipids or PEG otherwise associated with the LNP. Certain aspects of our investigational medicines may induce immune reactions from either the mRNA or the lipid as well as adverse reactions within liver pathways or degradation of the mRNA or the LNP, any of which could lead to significant adverse events in one or more of our future clinical trials. Many of these types of side effects have been seen for legacy LNPs. There may be uncertainty as to the underlying cause of any such adverse event, which would make it difficult to accurately predict side effects in future clinical trials and would result in significant delays in our programs.

Our viral vectors including AAV or lentiviruses, which are relatively new approaches used for disease treatment, also have known side effects, and for which additional risks could develop in the future. In past clinical trials that were conducted by others with non-AAV vectors, several significant side effects were caused by gene therapy treatments, including reported cases of leukemia and death.

Other potential side effects could include an immunologic reaction and insertional oncogenesis, which is the process whereby the insertion of a functional gene near a gene that is important in cell growth or division results in uncontrolled cell division, which could potentially enhance the risk of malignant transformation. If the vectors we use demonstrate a similar side effect, or other adverse events, we may be required to halt or delay further clinical development of any potential product candidates. Furthermore, the FDA has stated that lentiviral vectors possess characteristics that may pose high risks of delayed adverse events. Such delayed adverse events may occur in other viral vectors, including AAV vectors, at a lower rate.

In addition to side effects and adverse events caused by our product candidates, the conditioning, administration process or related procedures which may be used in our electroporation pipeline also can cause adverse side effects and adverse events. A gene therapy patient is generally administered cytotoxic drugs to remove stem cells from the bone marrow to create sufficient space in the bone marrow for the modified stem cells to engraft and produce new cells. This procedure compromises the patient's immune system. If in the future we are unable to demonstrate that such adverse events were caused by the conditioning regimens used, or administration process or related procedure, the FDA, the European Commission, EMA or other regulatory authorities could order us to cease further development of, or deny approval of, our product candidates for any or all target indications. Even if we are able to demonstrate that adverse events are not related to the drug product or the administration of such drug product, such occurrences could affect patient recruitment, the ability of enrolled patients to complete the clinical trial, or the commercial viability of any product candidates that obtain regulatory approval.

If any product candidates we develop are associated with serious adverse events, undesirable side effects, or unexpected characteristics, we may need to abandon their development or limit development to certain uses or subpopulations in which the serious adverse events, undesirable side effects or other characteristics are less prevalent, less severe, or more acceptable from a risk-benefit perspective, any of which would have a material adverse effect on our business, financial condition, results of operations, and prospects. Many product candidates that initially showed promise in early stage testing for treating cancer or other diseases have later been found to cause side effects that prevented further clinical development of the product candidates.

If in the future we are unable to demonstrate that any of the above adverse events were caused by factors other than our product candidate, the FDA, the EMA or other regulatory authorities could order us to cease further development of, or deny approval of, any product candidates we are able to develop for any or all targeted indications. Even if we are able to demonstrate that all future serious adverse events are not product-related, such occurrences could affect patient recruitment or the ability of enrolled patients to complete the trial. Moreover, if we elect, or are required, to delay, suspend or terminate any clinical trial of any product candidate we may develop, the commercial prospects of such product candidates may be harmed and our ability to generate product revenues from any of these product candidates may be delayed or eliminated. Any of these occurrences may harm our ability to identify and develop product candidates, and may harm our business, financial condition, result of operations, and prospects significantly.

Additionally, if we successfully develop a product candidate and it receives marketing approval, the FDA could require us to adopt a Risk Evaluation and Mitigation Strategy, or REMS, to ensure that the benefits of treatment with such product candidate outweighs the risks for each potential patient, which may include, among other things, a medication guide outlining the risks of the product for distribution to patients, a communication plan to health care practitioners, extensive patient monitoring, or distribution systems and processes that are highly controlled, restrictive, and more costly than what is typical for the industry. Furthermore, if we or others later identify undesirable side effects caused by any product candidate that we develop, several potentially significant negative consequences could result, including:

- regulatory authorities may suspend or withdraw approvals of such product candidate;
- regulatory authorities may require additional warnings on the label or limit the approved use of such product candidate;
- we may be required to conduct additional clinical trials;
- we could be sued and held liable for harm caused to patients; and
- our reputation may suffer.

Any of these events could prevent us from achieving or maintaining market acceptance of any product candidates we may identify and develop and could have a material adverse effect on our business, financial condition, and results of operations.

We have not tested any of our proposed delivery modalities and product candidates in clinical trials and any favorable preclinical results are not predictive of results that may be observed in clinical trials.

We have not tested any of our proposed delivery modalities in clinical trials. For example, we intend to use novel split intein technology for AAV gene therapy that allows us to deliver the base editor and guide RNA construct by co-infection with two viruses, where each virus contains one half of the editor. The scientific evidence to support the feasibility of developing product candidates based on this technology is both preliminary and limited. We also intend to use LNPs to deliver some of our base editors. While LNPs have been used to deliver smaller molecules, such as RNAi, they have not been clinically proven to deliver larger RNA molecules, such as the ones we intend to use for our base editors. Furthermore, as with many AAV-mediated gene therapy approaches, certain

patients' immune systems might prohibit the successful delivery, thereby potentially limiting treatment outcomes of these patients. Even if initial clinical trials in any of our product candidates we may develop are successful, these product candidates we may develop may fail to show the desired safety and efficacy in later stages of clinical development despite having successfully advanced through preclinical studies and initial clinical trials.

There is a high failure rate for drugs and biologics proceeding through clinical trials. A number of companies in the pharmaceutical and biotechnology industries have suffered significant setbacks in later stage clinical trials even after achieving promising results in earlier stage clinical trials. Data obtained from preclinical and clinical activities are subject to varying interpretations, which may delay, limit, or prevent regulatory approval. In addition, regulatory delays or rejections may be encountered as a result of many factors, including changes in regulatory policy during the period of product development.

Any such adverse events may cause us to delay, limit, or terminate planned clinical trials, any of which would have a material adverse effect on our business, financial condition, results of operations, and prospects.

In addition, the results of preclinical studies may not be predictive of the results of later-stage preclinical studies or clinical trials. To date, we have not generated preclinical or clinical trial results. If we generate preclinical results, such results will not ensure that later preclinical studies or clinical trials will demonstrate similar results. Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses, and many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their product candidates.

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

Because we have limited financial and managerial resources, we focus on research programs and product candidates that we identify for specific indications among many potential options. As a result, we may forego or delay pursuit of opportunities with other product 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 products or profitable market opportunities. Our spending on current and future research and development programs and product candidates for specific indications may not yield any commercially viable medicines. If we do not accurately evaluate the commercial potential or target market for a particular product candidate, we may relinquish valuable rights to that product candidate through collaboration, licensing, or other royalty arrangements in cases in which it would have been more advantageous for us to retain sole development and commercialization rights to such product candidate. Any such event could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Even if we complete the necessary clinical trials, we cannot predict when, or if, we will obtain regulatory approval to commercialize a product candidate we may develop in the United States or any other jurisdiction, and any such approval may be for a more narrow indication than we seek.

We cannot commercialize a product candidate until the appropriate regulatory authorities have reviewed and approved the product candidate. Even if any product candidates we may develop meet their safety and efficacy endpoints in clinical trials, the regulatory authorities may not complete their review processes in a timely manner, or we may not be able to obtain regulatory approval. Additional delays may result if an FDA Advisory Committee or other regulatory authority recommends non-approval or restrictions on approval. In addition, we may experience delays or rejections based upon additional government regulation from future legislation or administrative action, or changes in regulatory authority policy during the period of product development, clinical trials, and the review process.

Regulatory authorities also may approve a product candidate for more limited indications than requested or they may impose significant limitations in the form of narrow indications, warnings or a REMS. These regulatory authorities may require labeling that includes precautions or contra-indications with respect to conditions of use, or they may grant approval subject to the performance of costly post-marketing clinical trials. In addition, regulatory authorities may not approve the labeling claims that are necessary or desirable for the successful commercialization of any product candidates we may develop. Any of the foregoing scenarios could materially harm the commercial prospects for any product candidates we may develop and materially adversely affect our business, financial condition, results of operations, and prospects.

Marketing approval by the FDA in the United States, if obtained, does not ensure approval by regulatory authorities in other countries or jurisdictions. In addition, clinical trials conducted in one country may not be accepted by regulatory authorities in other countries, and regulatory approval in one country does not guarantee regulatory approval in any other country. Approval processes vary among countries and can involve additional product candidate testing and validation and additional administrative review periods. Seeking foreign regulatory approval could result in difficulties and costs for us and require additional preclinical studies or clinical trials which could be costly and time-consuming. Regulatory requirements can vary widely from country to country and could delay or prevent the introduction of our product candidates we may develop in those countries. The foreign regulatory approval process involves all of the risks associated with FDA approval. We do not have any product candidates approved for sale in any jurisdiction, including international markets, and we do not have experience in obtaining regulatory approval in international markets. If we fail to comply with regulatory requirements in international markets or to obtain and maintain required approvals, or if regulatory approvals in

international markets are delayed, our target market will be reduced and our ability to realize the full market potential of our product candidates will be unrealized.

Even if any product candidates we may develop receive marketing approval, they may fail to achieve the degree of market acceptance by physicians, patients, healthcare payors, and others in the medical community necessary for commercial success.

The commercial success of any of our product candidates we may develop will depend upon its degree of market acceptance by physicians, patients, third-party payors, and others in the medical community. Ethical, social, and legal concerns about genetic medicines generally and base editing technologies specifically could result in additional regulations restricting or prohibiting the marketing of our product candidates we may develop. Even if any product candidates we may develop receive marketing approval, they may nonetheless fail to gain sufficient market acceptance by physicians, patients, healthcare payors, and others in the medical community. The degree of market acceptance of any product candidates we may develop, if approved for commercial sale, will depend on a number of factors, including:

- the efficacy and safety of such product candidates as demonstrated in clinical trials;
- the potential and perceived advantages compared to alternative treatments;
- the limitation to our targeted patient population and limitations or warnings contained in approved labeling by the FDA or other regulatory authorities;
- the ability to offer our medicines for sale at competitive prices;
- convenience and ease of administration compared to alternative treatments;
- the clinical indications for which the product candidate is approved by the FDA, the EMA, or other regulatory agencies;
- public attitudes regarding genetic medicine generally and gene editing and base editing technologies specifically;
- the willingness of the target patient population to try novel therapies and of physicians to prescribe these therapies, as well as their willingness to accept a therapeutic intervention that involves the editing of the patient's gene;
- product labeling or product insert requirements of the FDA, the EMA, or other regulatory authorities, including any limitations or warnings contained in a product's approved labeling;
- relative convenience and ease of administration;
- the timing of market introduction of competitive products;
- publicity concerning our products or competing products and treatments;
- the strength of marketing and distribution support;
- sufficient third-party coverage or reimbursement; and
- the prevalence and severity of any side effects.

Even if any of our product candidates we may develop are approved, such products may not achieve an adequate level of acceptance, we may not generate significant product revenues, and we may not become profitable.

If, in the future, we are unable to establish sales and marketing capabilities or enter into agreements with third parties to sell and market any product candidates we may develop, we may not be successful in commercializing those product candidates if and when they are approved.

We do not have a sales or marketing infrastructure and have limited experience in the sale, marketing, or distribution of pharmaceutical products. To achieve commercial success for any approved medicine for which we retain sales and marketing responsibilities, we must either develop a sales and marketing organization or outsource these functions to third parties. In the future, we may choose to build a focused sales, marketing, and commercial support infrastructure to sell, or participate in sales activities with our collaborators for, some of our product candidates we may develop if and when they are approved.

There are risks involved with both establishing our own commercial capabilities and entering into arrangements with third parties to perform these services. For example, recruiting and training a sales force or reimbursement specialists is expensive and time consuming and could delay any product launch. If the commercial launch of a product candidate for which we recruit a sales force and establish marketing and other commercialization capabilities is delayed or does not occur for any reason, we would have prematurely or unnecessarily incurred these commercialization expenses. This may be costly, and our investment would be lost if we cannot retain or reposition our commercialization personnel.

Factors that may inhibit our efforts to commercialize our product candidates we may develop on our own include:

- our inability to recruit and retain adequate numbers of effective sales, marketing, reimbursement, customer service, medical affairs, and other support personnel;
- the inability of sales personnel to obtain access to physicians or persuade adequate numbers of physicians to prescribe any future medicines;
- the inability of reimbursement professionals to negotiate arrangements for formulary access, reimbursement, and other acceptance by payors;
- restricted or closed distribution channels that make it difficult to distribute our product candidates we may develop to segments of the patient population;
- the lack of complementary medicines to be offered by sales personnel, which may put us at a competitive disadvantage relative to companies with more extensive product lines; and
- unforeseen costs and expenses associated with creating an independent commercialization organization.

If we enter into arrangements with third parties to perform sales, marketing, commercial support, and distribution services, our product revenues or the profitability of these product revenues to us may be lower than if we were to market and sell any medicines we may develop ourselves. In addition, we may not be successful in entering into arrangements with third parties to commercialize our product candidates we may develop or may be unable to do so on terms that are favorable to us. We may have little control over such third parties, and any of them may fail to devote the necessary resources and attention to sell and market our medicines effectively. If we do not establish commercialization capabilities successfully, either on our own or in collaboration with third parties, we will not be successful in commercializing our product candidates we may develop.

We face significant competition in an environment of rapid technological change, and there is a possibility that our competitors may achieve regulatory approval before us or develop therapies that are safer or more advanced or effective than ours, which may harm our financial condition and our ability to successfully market or commercialize any product candidates we may develop.

The development and commercialization of new drug products is highly competitive. Moreover, the base editing field is characterized by rapidly changing technologies, significant competition, and a strong emphasis on intellectual property. We will face competition with respect to any product candidates that we may seek to develop or commercialize in the future from major pharmaceutical companies, specialty pharmaceutical companies, and biotechnology companies worldwide. Potential competitors also include academic institutions, government agencies, and other public and private research organizations that conduct research, seek patent protection, and establish collaborative arrangements for research, development, manufacturing, and commercialization.

There are a number of large pharmaceutical and biotechnology companies that currently market and sell products or are pursuing the development of products for the treatment of the disease indications for which we have research programs. Some of these competitive products and therapies are based on scientific approaches that are the same as or similar to our approach, and others are based on entirely different approaches.

There are several other companies utilizing CRISPR/Cas9 nuclease technology, including Caribou Biosciences, Editas Medicine, CRISPR Therapeutics, and Intellia Therapeutics. Several additional companies utilize other nuclease-based genome editing technologies, including Zinc Fingers, Arcuses, and TAL Nucleases, which includes Sangamo Biosciences, Precision BioSciences and bluebird bio. The Horizon Discovery Group reported that it licensed base editing technology from Rutgers. In addition, we face competition from companies utilizing gene therapy, oligonucleotides, and CAR-T therapeutic approaches.

Any product candidates that we successfully develop and commercialize will compete with existing therapies and new therapies that may become available in the future that are approved to treat the same diseases for which we may obtain approval for our product candidates we may develop. This may include other types of therapies, such as small molecule, antibody, and/or protein therapies.

Many of our current or potential competitors, either alone or with their collaboration partners, may have significantly greater financial resources and expertise in research and development, manufacturing, preclinical testing, conducting clinical trials, obtaining regulatory approvals, and marketing approved products than we do. Mergers and acquisitions in the pharmaceutical, biotechnology, and gene therapy industries may result in even more resources being concentrated among a smaller number of our competitors. Smaller or early-stage companies may also prove to be significant competitors, particularly through collaborative arrangements with large and established companies. These competitors also compete with us in recruiting and retaining qualified scientific and management personnel and establishing clinical trial sites and patient registration for clinical trials, as well as in acquiring technologies complementary to, or necessary for, our programs. Our commercial opportunity could be reduced or eliminated if our competitors develop and commercialize product candidates that are safer, more effective, have fewer or less severe side effects, are more convenient, or are less expensive than any product candidates that we may develop or that would render any product candidates that we may develop obsolete or non-competitive. Our competitors also may obtain FDA or other regulatory approval for their product

candidates more rapidly than we may obtain approval for ours, which could result in our competitors establishing a strong market position before we are able to enter the market. Additionally, technologies developed by our competitors may render our potential product candidates uneconomical or obsolete, and we may not be successful in marketing any product candidates we may develop against competitors.

In addition, as a result of the expiration or successful challenge of our patent rights, we could face more litigation with respect to the validity and/or scope of patents relating to our competitors' products. The availability of our competitors' products could limit the demand, and the price we are able to charge, for any product candidates that we may develop and commercialize.

Adverse public perception of genetic medicines, and gene editing and base editing in particular, may negatively impact regulatory approval of, and/or demand for, our potential products.

Our potential therapeutic products involve editing the human genome. The clinical and commercial success of our potential products will depend in part on public understanding and acceptance of the use of gene editing therapy for the prevention or treatment of human diseases. Public attitudes may be influenced by claims that gene editing is unsafe, unethical, or immoral, and, consequently, our product candidates may not gain the acceptance of the public or the medical community. For example, a public backlash developed against gene therapy following the death of a patient in 1999 during a gene therapy clinical trial. The death of the clinical trial subject was due to complications related to AAV vector administration. Adverse public attitudes may adversely impact our ability to enroll clinical trials. Moreover, our success will depend upon physicians prescribing, and their patients being willing to receive, treatments that involve the use of product candidates we may develop in lieu of, or in addition to, existing treatments with which they are already familiar and for which greater clinical data may be available.

In addition, gene editing technology is subject to public debate and heightened regulatory scrutiny due to ethical concerns relating to the application of gene editing technology to human embryos or the human germline. For example, academic scientists in several countries, including the United States, have reported on their attempts to edit the gene of human embryos as part of basic research. In addition, in November 2018, Dr. Jiankui He, a Chinese biophysics researcher who was an associate professor in the Department of Biology of the Southern University of Science and Technology in Shenzhen, China, reportedly claimed he had created the first human genetically edited babies, twin girls. This claim, and another that Dr. He had helped create a second gene-edited pregnancy, was subsequently confirmed by Chinese authorities and was negatively received by the public, in particular those in the scientific community. News reports indicate that Dr. He was sentenced to three years in prison and fined $430,000 in December 2019 by the Chinese government for illegal medical practice in connection with such activities. In the wake of the claim, the World Health Organization established a new advisory committee to create global governance and oversight standards for human gene editing. The Alliance for Regenerative Medicine also released principles for the use of gene editing in therapeutic applications endorsed by a number of companies that use gene editing technologies.

Regulation of gene editing technology varies across jurisdictions. In the United States, germline editing for clinical application has been expressly prohibited since enactment of a December 2015 FDA ban on such activity. Prohibitions are also in place in the U.K., across most of Europe, in China, and many other countries around the world. In the United States, the National Institutes of Health, or NIH, has announced that the agency would not fund any use of gene editing technologies in human embryos, noting that there are multiple existing legislative and regulatory prohibitions against such work, including the Dickey-Wicker Amendment, which prohibits the use of appropriated funds for the creation of human embryos for research purposes or for research in which human embryos are destroyed. Laws in the U.K. prohibit genetically modified embryos from being implanted into women, except that mitochondrial replacement therapy has been permitted in the U.K. since 2016. Separately, embryos can be altered in the U.K. in research labs under license from the Human Fertilisation and Embryology Authority. Research on embryos is more tightly controlled in some other European countries.

Moreover, in an annual worldwide threat assessment report delivered to the U.S. Congress in February 2016, the U.S. Director of National Intelligence stated that research into gene editing that is conducted under different regulatory standards than those of Western countries probably increases the risk of the creation of potentially harmful biological agents or products, including weapons of mass destruction. He noted that given the broad distribution, low cost, and accelerated pace of development of gene editing technology, its deliberate or unintentional misuse could have far-reaching economic and national security implications.

Although we do not use our technologies to edit human embryos or the human germline, such public debate about the use of gene editing technologies in human embryos and heightened regulatory scrutiny could prevent or delay our development of product candidates. More restrictive government regulations or negative public opinion would have a negative effect on our business or financial condition and may delay or impair our development and commercialization of product candidates or demand for any product candidates we may develop. Adverse events in our preclinical studies or clinical trials or those of our competitors or of academic researchers utilizing gene editing technologies, even if not ultimately attributable to product candidates we may identify and develop, and the gene publicity could result in increased governmental regulation, unfavorable public perception, potential regulatory delays in the testing or approval of potential product candidates we may identify and develop, stricter labeling requirements for those product candidates that are approved, and a decrease in demand for any such product candidates. Use of gene editing technology by a third

party or government to develop biological agents or products that threaten U.S. national security could similarly result in such negative impacts to us.

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

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

Our ability to commercialize any medicines successfully also will depend in part on the extent to which reimbursement for these medicines and related treatments will be available from government authorities or healthcare program, private health plans, and other organizations. Government authorities and third-party payors, such as private health plans, decide which medications they will pay for and establish reimbursement levels. A primary trend in the U.S. healthcare industry and elsewhere is cost containment. Government authorities and third-party payors have attempted to control costs by limiting coverage and the amount of reimbursement for particular medications. Increasingly, third-party payors are challenging the prices charged for medical products and requiring that drug companies provide them with predetermined discounts from list prices. Novel medical products, if covered at all, may be subject to enhanced utilization management controls designed to ensure that the products are used only when medically necessary. Such utilization management controls may discourage the prescription or use of a medical product by increasing the administrative burden associated with its prescription or creating coverage uncertainties for prescribers and patients. We cannot be sure that reimbursement will be available for any medicine that we commercialize and, if reimbursement is available, that the level of reimbursement will be adequate. Reimbursement may impact the demand for, or the price of, any product candidate for which we obtain marketing approval. If reimbursement is not available or is available only to limited levels, we may not be able to successfully commercialize any product candidate for which we obtain marketing approval.

There may be significant delays in obtaining reimbursement for newly approved medicines, and coverage may be more limited than the purposes for which the medicine is approved by the FDA, the EMA or other regulatory authorities outside the United States. Moreover, eligibility for reimbursement does not imply that any medicine will be paid for in all cases or at a rate that covers our costs, including research, development, manufacture, sale, and distribution. Interim reimbursement levels for new medicines, if applicable, may also not be sufficient to cover our costs and may not be made permanent. Reimbursement rates may vary according to the use of the medicine and the clinical setting in which it is used, may be based on reimbursement levels already set for lower cost medicines and may be incorporated into existing payments for other services. Net prices for medicines may be reduced by mandatory discounts or rebates required by government healthcare programs or private payors and by any future relaxation of laws that presently restrict imports of medicines from countries where they may be sold at lower prices than in the United States. Our inability to promptly obtain coverage and profitable payment rates from both government-funded and private payors for any approved medicines we may develop could have a material adverse effect on our operating results, our ability to raise capital needed to commercialize medicines, and our overall financial condition.

Due to the novel nature of our technology and the potential for any product candidates we may develop to offer therapeutic benefit in a single administration or limited number of administrations, we face uncertainty related to pricing and reimbursement for these product candidates.

Our initial target patient populations are relatively small, as a result of which the pricing and reimbursement of any product candidates we may develop, if approved, must be adequate to support the necessary commercial infrastructure. If we are unable to obtain adequate levels of reimbursement, our ability to successfully market and sell any such product candidates will be adversely affected. The manner and level at which reimbursement is provided for services related to any product candidates we may develop (e.g., for administration of our product candidate to patients) is also important. Inadequate reimbursement for such services may lead to physician and payor resistance and adversely affect our ability to market or sell our product candidates we may develop. In addition, we may need to develop new reimbursement models in order to realize adequate value. Payors may not be able or willing to adopt such new models, and patients may be unable to afford that portion of the cost that such models may require them to bear. If we determine such new models are necessary but we are unsuccessful in developing them, or if such models are not adopted by payors, our business, financial condition, results of operations, and prospects could be adversely affected.

We expect the cost of a single administration of genetic medicines, such as those we are seeking to develop, to be substantial, when and if they achieve regulatory approval. We expect that coverage and reimbursement by government and private payors will be essential for most patients to be able to afford these treatments. Accordingly, sales of any such product candidates will depend substantially, both domestically and abroad, on the extent to which the costs of any product candidates we may develop will be paid

by government authorities, private health plans, and other third-party payors. Payors may not be willing to pay high prices for a single administration. Coverage and reimbursement by a third-party payor may depend upon several factors, including the third-party payor's determination that use of a product is:

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

Obtaining coverage and reimbursement for a product from third-party payors is a time-consuming and costly process that could require us to provide to the payor supporting scientific, clinical, and cost-effectiveness data. There is significant uncertainty related to third-party coverage and reimbursement of newly approved products. We may not be able to provide data sufficient to gain acceptance with respect to coverage and reimbursement. If coverage and reimbursement are not available, or are available only at limited levels, we may not be able to successfully commercialize any product candidates we may develop. Even if coverage is provided, the approved reimbursement amount may not be adequate to realize a sufficient return on our investment.

Moreover, the downward pressure on healthcare costs in general, particularly prescription drugs and surgical procedures and other treatments, has become intense. As a result, increasingly high barriers are being erected to the entry of new product candidates such as ours. If we are unable to obtain adequate levels of reimbursement, our ability to successfully market and sell any product candidates we may develop will be harmed.

If the market opportunities for any product candidates we may develop are smaller than we believe they are, our potential revenues may be adversely affected, and our business may suffer. Because the target patient populations for many of the product candidates we may develop are small, we must be able to successfully identify patients and achieve a significant market share to maintain profitability and growth.

We focus our research and product development on treatments for rare genetically defined diseases. Many of our product candidates we may develop are expected to target a single mutation; as a result, the relevant patient population may therefore be small. Our projections of both the number of people who have these diseases, as well as the subset of people with these diseases who have the potential to benefit from treatment with product candidates we may develop, are based on estimates. These estimates may prove to be incorrect and new studies may change the estimated incidence or prevalence of these diseases. The number of patients in the United States, Europe, and elsewhere may turn out to be lower than expected, and patients may not be amenable to treatment with our product candidates we may develop, or may become increasingly difficult to identify or gain access to, all of which would adversely affect our business, financial condition, results of operations, and prospects. Additionally, because of the potential that any product candidates we develop could cure a target disease, we may not receive recurring revenues from patients and may deplete the patient population prevalence through curative therapy.

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

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

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

Although we maintain product liability insurance coverage, it may not be adequate to cover all liabilities that we may incur. We anticipate that we will need to increase our insurance coverage when we begin clinical trials and if we successfully commercialize any

medicine. Insurance coverage is increasingly expensive. We may not be able to maintain insurance coverage at a reasonable cost or in an amount adequate to satisfy any liability that may arise.

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

We and any contract manufacturers and suppliers we engage are subject to numerous federal, state, and local environmental, health, and safety laws, regulations, and permitting requirements, including those governing laboratory procedures; the generation, handling, use, storage, treatment, and disposal of hazardous and regulated materials and wastes; the emission and discharge of hazardous materials into the ground, air, and water; and employee health and safety. Our operations involve the use of hazardous and flammable materials, including chemicals and biological and radioactive materials. Our operations also produce hazardous waste. We generally contract with third parties for the disposal of these materials and wastes. We cannot eliminate the risk of contamination or injury from these materials. In the event of contamination or injury resulting from our use of hazardous materials, we could be held liable for any resulting damages, and any liability could exceed our resources. Under certain environmental laws, we could be held responsible for costs relating to any contamination at our current or past facilities and at third-party facilities. We also could incur significant costs associated with civil or criminal fines and penalties.

Compliance with applicable environmental laws and regulations may be expensive, and current or future environmental laws and regulations may impair our research and product development efforts. In addition, we cannot entirely eliminate the risk of accidental injury or contamination from these materials or wastes. Although we maintain workers' compensation insurance to cover us for costs and expenses, we may incur due to injuries to our employees resulting from the use of hazardous materials, this insurance may not provide adequate coverage against potential liabilities. We do not carry specific biological or hazardous waste insurance coverage, and our property, casualty, and general liability insurance policies specifically exclude coverage for damages and fines arising from biological or hazardous waste exposure or contamination. Accordingly, in the event of contamination or injury, we could be held liable for damages or be penalized with fines in an amount exceeding our resources, and our clinical trials or regulatory approvals could be suspended, which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

In addition, we may incur substantial costs in order to comply with current or future environmental, health, and safety laws, regulations, and permitting requirements. These current or future laws, regulations, and permitting requirements may impair our research, development, or production efforts. Failure to comply with these laws, regulations, and permitting requirements also may result in substantial fines, penalties, or other sanctions or business disruption, which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Any third-party contract manufacturers and suppliers we engage will also be subject to these and other environmental, health, and safety laws and regulations. Liabilities they incur pursuant to these laws and regulations could result in significant costs or an interruption in operations, which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Genetic medicines are novel, and any product candidates we develop may be complex and difficult to manufacture. We could experience delays in satisfying regulatory authorities or production problems that result in delays in our development or commercialization programs, limit the supply of our product candidates we may develop, or otherwise harm our business.

Any product candidates we may develop will likely require processing steps that are more complex than those required for most chemical pharmaceuticals. Moreover, unlike chemical pharmaceuticals, the physical and chemical properties of a biologic such as the product candidates we intend to develop generally cannot be fully characterized. As a result, assays of the finished product candidate may not be sufficient to ensure that the product candidate will perform in the intended manner. Problems with the manufacturing process, even minor deviations from the normal process, could result in product defects or manufacturing failures that result in lot failures, product recalls, product liability claims, insufficient inventory, or potentially delay progression of our potential IND filings. If we successfully develop product candidates, we may encounter problems achieving adequate quantities and quality of clinical-grade materials that meet FDA, EMA or other comparable applicable foreign standards or specifications with consistent and acceptable production yields and costs. For example, the current approach of manufacturing AAV vectors may fall short of supplying required number of doses needed for advanced stages of pre-clinical studies or clinical trials, and the FDA may ask us to demonstrate that we have the appropriate manufacturing processes in place to support the higher-dose group in our future pre-clinical studies or clinical trials. In addition, our product candidates we may develop will require complicated delivery modalities, such as electroporation, LNPs, or viral vectors, each of which will introduce additional complexities in the manufacturing process.

In addition, the FDA, the EMA, and other regulatory authorities may require us to submit samples of any lot of any approved product together with the protocols showing the results of applicable tests at any time. Under some circumstances, the FDA, the EMA, or other regulatory authorities may require that we not distribute a lot until the agency authorizes its release. Slight deviations in the manufacturing process, including those affecting quality attributes and stability, may result in unacceptable changes in the product that

could result in lot failures or product recalls. Lot failures or product recalls could cause us to delay clinical trials or product launches, which could be costly to us and otherwise harm our business, financial condition, results of operations, and prospects.

Furthermore, we intend to use novel split intein technology for any AAV gene therapy that allows us to deliver the base editor and guide RNA construct by co-infection with two viruses, where each virus contains one half of the editor. The scientific evidence to support the feasibility of developing product candidates based on this technology is both preliminary and limited.

We also may encounter problems hiring and retaining the experienced scientific, quality control, and manufacturing personnel needed to manage our manufacturing process, which could result in delays in our production or difficulties in maintaining compliance with applicable regulatory requirements.

Given the nature of biologics manufacturing, including for the lentivirus vectors and AAV vectors, there is a risk of contamination during manufacturing. Any contamination could materially harm our ability to produce product candidates on schedule and could harm our results of operations and cause reputational damage. Some of the raw materials that we anticipate will be required in our manufacturing process are derived from biologic sources. Such raw materials are difficult to procure and may be subject to contamination or recall. A material shortage, contamination, recall, or restriction on the use of biologically derived substances in the manufacture of any product candidates we may develop could adversely impact or disrupt the commercial manufacturing or the production of clinical material, which could materially harm our development timelines and our business, financial condition, results of operations, and prospects.

Any problems in our manufacturing process or the facilities with which we contract could make us a less attractive collaborator for potential partners, including larger pharmaceutical companies and academic research institutions, which could limit our access to additional attractive development programs. Problems in third-party manufacturing process or facilities also could restrict our ability to ensure sufficient clinical material for any clinical trials we may be conducting or are planning to conduct and meet market demand for any product candidates we develop and commercialize.

Risks related to regulatory review

Because base editing is novel and the regulatory landscape that will govern any product candidates, we may develop is uncertain and may change, we cannot predict the time and cost of obtaining regulatory approval, if we receive it at all, for any product candidates we may develop.

The regulatory requirements that will govern any novel base editing product candidates we develop are not entirely clear and may change. Within the broader genetic medicine field, we are aware of a limited number of gene therapy products that have received marketing authorization from the FDA and the EMA. Even with respect to more established products that fit into the categories of gene therapies or cell therapies, the regulatory landscape is still developing. Regulatory requirements governing gene therapy products and cell therapy products have changed frequently and will likely continue to change in the future. Moreover, there is substantial, and sometimes uncoordinated, overlap in those responsible for regulation of existing gene therapy products and cell therapy products. For example, in the United States, the FDA has established the Office of Tissues and Advanced Therapies within its Center for Biologics Evaluation and Research, or CBER, to consolidate the review of gene therapy and related products, and the Cellular, Tissue and Gene Therapies Advisory Committee to advise CBER on its review. Gene therapy clinical trials are also subject to review and oversight by an institutional biosafety committee, or IBC, a local institutional committee that reviews and oversees basic and clinical research conducted at the institution participating in the clinical trial. Although the FDA decides whether individual gene therapy protocols may proceed, the review process and determinations of other reviewing bodies can impede or delay the initiation of a clinical trial, even if the FDA has reviewed the trial and approved its initiation.

The same applies in the EU. The EMA's Committee for Advanced Therapies, or CAT, is responsible for assessing the quality, safety, and efficacy of advanced-therapy medicinal products. The role of the CAT is to prepare a draft opinion on an application for marketing authorization for a gene therapy medicinal candidate that is submitted to the Committee for Medicinal Products for Human Use, or CHMP, before CHMP adopts its final opinion. In the EU, the development and evaluation of a gene therapy medicinal product must be considered in the context of the relevant EU guidelines. The EMA may issue new guidelines concerning the development and marketing authorization for gene therapy medicinal products and require that we comply with these new guidelines. As a result, the procedures and standards applied to gene therapy products and cell therapy products may be applied to any product candidates we may develop, but that remains uncertain at this point.

Adverse developments in post-marketing experience or in clinical trials conducted by others of gene therapy products, cell therapy products, or products developed through the application of a base editing or other gene editing technology may cause the FDA, the EMA, and other regulatory bodies to revise the requirements for development or approval of any product candidates we may develop or limit the use of products utilizing base editing technologies, either of which could materially harm our business. In addition, the clinical trial requirements of the FDA, the EMA, and other regulatory authorities and the criteria these regulators use to determine the safety and efficacy of a product candidate vary substantially according to the type, complexity, novelty, and intended use and market of the potential products. The regulatory approval process for novel product candidates such as the product candidates we may develop can be more expensive and take longer than for other, better known, or more extensively studied pharmaceutical or other

product candidates. Regulatory agencies administering existing or future regulations or legislation may not allow production and marketing of products utilizing base editing technology in a timely manner or under technically or commercially feasible conditions. In addition, regulatory action or private litigation could result in expenses, delays, or other impediments to our research programs or the commercialization of resulting products.

The regulatory review committees and advisory groups described above and the new guidelines they promulgate may lengthen the regulatory review process, require us to perform additional studies or trials, increase our development costs, lead to changes in regulatory positions and interpretations, delay or prevent approval and commercialization of these treatment candidates, or lead to significant post-approval limitations or restrictions. As we advance our research programs and develop future product candidates, we will be required to consult with these regulatory and advisory groups and to comply with applicable guidelines. If we fail to do so, we may be required to delay or discontinue development of any product candidates we identify and develop.

Because we are developing product candidates in the field of genetic medicines, a field that includes gene therapy and gene editing, in which there is little clinical experience, there is increased risk that the FDA, the EMA, or other regulatory authorities may not consider the endpoints of our clinical trials to provide clinically meaningful results and that these results may be difficult to analyze.

During the regulatory review process, we will need to identify success criteria and endpoints such that the FDA, the EMA, or other regulatory authorities will be able to determine the clinical efficacy and safety profile of any product candidates we may develop. As we are initially seeking to identify and develop product candidates to treat diseases in which there is little clinical experience using new technologies, there is heightened risk that the FDA, the EMA, or other regulatory authorities may not consider the clinical trial endpoints that we propose to provide clinically meaningful results (reflecting a tangible benefit to patients). In addition, the resulting clinical data and results may be difficult to analyze. Even if the FDA does find our success criteria to be sufficiently validated and clinically meaningful, we may not achieve the pre-specified endpoints to a degree of statistical significance. This may be a particularly significant risk for many of the genetically defined diseases for which we plan to develop product candidates because many of these diseases, including T-cell acute lymphoblastic leukemia, glycogen storage disorder and Stargardt disease, have small patient populations, and designing and executing a rigorous clinical trial with appropriate statistical power is more difficult than with diseases that have larger patient populations. Further, even if we do achieve the pre-specified criteria, we may produce results that are unpredictable or inconsistent with the results of the non-primary endpoints or other relevant data. The FDA also weighs the benefits of a product against its risks, and the FDA may view the efficacy results in the context of safety as not being supportive of regulatory approval. Other regulatory authorities in the EU and other countries may make similar comments with respect to these endpoints and data. Any product candidates we may develop will be based on a novel technology that makes it difficult to predict the time and cost of development and of subsequently obtaining regulatory approval. No gene editing therapeutic product has been approved in the United States or in Europe.

If clinical trials of any product candidates we may identify and develop fail to demonstrate safety and efficacy 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 such product candidates.

Before obtaining marketing approval from regulatory authorities for the sale of any product candidates we identify and develop, we must complete preclinical development and then conduct extensive clinical trials to demonstrate the safety and efficacy in humans. Clinical testing is expensive, difficult to design and implement, can take many years to complete, and is uncertain as to outcome. A failure of one or more 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 results of a clinical trial do not necessarily predict final results.

Moreover, preclinical and clinical data are often susceptible to varying interpretations and analyses. Many companies that have believed their product candidates performed satisfactorily in preclinical studies and clinical trials have nonetheless failed to obtain marketing approval of their product candidates.

We and our collaborators, if any, may experience numerous unforeseen events during, or as a result of, clinical trials that could delay or prevent our ability to receive marketing approval or commercialize any product candidates we may identify and develop, including:

- delays in reaching a consensus with regulators on trial design;
- regulators, institutional review boards, or IRBs, or independent ethics committees may not authorize us or our investigators to commence a clinical trial or conduct a clinical trial at a prospective trial site;
- delays in reaching or failing to reach agreement on acceptable clinical trial contracts or clinical trial protocols with prospective contract research organizations, or CROs, and clinical trial sites;
- clinical trials of any product candidates we may develop may produce negative or inconclusive results, and we may decide, or regulators may require us, to conduct additional clinical trials or abandon product development or research programs;

- difficulty in designing well-controlled clinical trials due to ethical considerations which may render it inappropriate to conduct a trial with a control arm that can be effectively compared to a treatment arm;
- difficulty in designing clinical trials and selecting endpoints for diseases that have not been well-studied and for which the natural history and course of the disease is poorly understood;
- the number of patients required for clinical trials of any product candidates we may develop may be larger than we anticipate; enrollment of suitable participants in these clinical trials, which may be particularly challenging for some of the rare genetically defined diseases we are targeting in our most advanced programs, may be delayed or slower than we anticipate; or patients may drop out of these clinical trials at a higher rate than we anticipate;
- our third-party contractors may fail to comply with regulatory requirements or meet their contractual obligations to us in a timely manner, or at all;
- regulators, IRBs, or independent ethics committees may require that we or our investigators suspend or terminate clinical research or clinical trials of any product candidates we may develop for various reasons, including noncompliance with regulatory requirements, a finding of undesirable side effects or other unexpected characteristics, or that the participants are being exposed to unacceptable health risks or after an inspection of our clinical trial operations or trial sites;
- the cost of clinical trials of any product candidates we may develop may be greater than we anticipate;
- the supply or quality of any product candidates we may develop or other materials necessary to conduct clinical trials of any product candidates we may develop may be insufficient or inadequate, including as a result of delays in the testing, validation, manufacturing, and delivery of any product candidates we may develop to the clinical sites by us or by third parties with whom we have contracted to perform certain of those functions;
- delays in having patients complete participation in a trial or return for post-treatment follow-up;
- clinical trial sites dropping out of a trial;
- selection of clinical endpoints that require prolonged periods of clinical observation or analysis of the resulting data;
- occurrence of serious adverse events associated with any product candidates we may develop that are viewed to outweigh their potential benefits;
- occurrence of serious adverse events in trials of the same class of agents conducted by other sponsors; and
- changes in regulatory requirements and guidance that require amending or submitting new clinical protocols.

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

- be delayed in obtaining marketing approval for any such product candidates we may develop or not obtain marketing approval at all;
- obtain approval for indications or patient populations that are not as broad as intended or desired;
- obtain approval with labeling that includes significant use or distribution restrictions or safety warnings, including boxed warnings;
- be subject to changes in the way the product is administered;
- be required to perform additional clinical trials to support approval or be subject to additional post-marketing testing requirements;
- have regulatory authorities withdraw, or suspend, their approval of the product or impose restrictions on its distribution in the form of a REMS or through modification to an existing REMS;
- be sued; or
- experience damage to our reputation.

Product development costs will also increase if we or our collaborators experience delays in clinical trials or other testing or in obtaining 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 any product candidates we may develop, could allow our competitors to bring products to market

before we do, and could impair our ability to successfully commercialize any product candidates we may develop, any of which may harm our business, financial condition, results of operations, and prospects.

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

We or our collaborators may not be able to initiate or continue clinical trials for any product candidates we identify or develop if we are unable to locate and enroll a sufficient number of eligible patients to participate in these trials as required by the FDA, the EMA or other analogous regulatory authorities outside the United States, or as needed to provide appropriate statistical power for a given trial. Enrollment may be particularly challenging for some of the rare genetically defined diseases we are targeting in our most advanced programs. In addition, if patients are unwilling to participate in our base editing trials because of negative publicity from adverse events related to the biotechnology, gene therapy, or gene editing fields, competitive clinical trials for similar patient populations, clinical trials in competing products, or for other reasons, the timeline for recruiting patients, conducting studies, and obtaining regulatory approval of any product candidates we may develop may be delayed. Moreover, some of our competitors may have ongoing clinical trials for product candidates that would treat the same indications as any product candidates we may develop, and patients who would otherwise be eligible for our clinical trials may instead enroll in clinical trials of our competitors' product candidates.

Patient enrollment is also affected by other factors, including:

- severity of the disease under investigation;
- size of the patient population and process for identifying patients;
- design of the trial protocol;
- availability and efficacy of approved medications for the disease under investigation;
- availability of genetic testing for potential patients;
- ability to obtain and maintain patient informed consent;
- risk that enrolled patients will drop out before completion of the trial;
- eligibility and exclusion criteria for the trial in question;
- perceived risks and benefits of the product candidate under trial;
- perceived risks and benefits of base editing as a therapeutic approach;
- efforts to facilitate timely enrollment in clinical trials;
- patient referral practices of physicians;
- ability to monitor patients adequately during and after treatment; and
- proximity and availability of clinical trial sites for prospective patients, especially for those conditions which have small patient pools.

Our ability to successfully initiate, enroll, and complete a clinical trial in any foreign country is subject to numerous risks unique to conducting business in foreign countries, including:

- difficulty in establishing or managing relationships with CROs and physicians;
- different standards for the conduct of clinical trials;
- different standard-of-care for patients with a particular disease;
- difficulty in locating qualified local consultants, physicians, and partners; and
- potential burden of complying with a variety of foreign laws, medical standards, and regulatory requirements, including the regulation of pharmaceutical and biotechnology products and treatment and of gene editing technologies.

Enrollment delays in our clinical trials may result in increased development costs for any product candidates we may develop, which would cause the value of our company to decline and limit our ability to obtain additional financing. If we or our collaborators have difficulty enrolling a sufficient number of patients to conduct our clinical trials as planned, we may need to delay, limit, or terminate ongoing or planned clinical trials, any of which would have an adverse effect on our business, financial condition, results of operations, and prospects.

If we are unable to successfully identify patients who are likely to benefit from therapy with any product candidates we develop, or experience significant delays in doing so, we may not realize the full commercial potential of any medicines we may develop.

Our success may depend, in part, on our ability to identify patients who are likely to benefit from therapy with any medicines we may develop, which requires those potential patients to have their DNA analyzed for the presence or absence of a particular sequence. If we, or any third parties that we engage to assist us, are unable to successfully identify such patients, or experience delays in doing so, then:

- our ability to develop any product candidates may be adversely affected if we are unable to appropriately select patients for enrollment in our clinical trials; and
- we may not realize the full commercial potential of any product candidates we develop that receive marketing approval if, among other reasons, we are unable to appropriately select patients who are likely to benefit from therapy with our medicines.

Any product candidates we develop may require use of a companion diagnostic to identify patients who are likely to benefit from therapy. If safe and effective use of any of our product candidates we may develop depends on a companion diagnostic, we may not receive marketing approval, or marketing approval may be delayed, if we are unable to or are delayed in developing, identifying, or obtaining regulatory approval or clearance for the companion diagnostic product for use with our product candidate. Identifying a manufacturer of the companion diagnostic and entering into an agreement with the manufacturer could also delay the development of our product candidates.

As a result of these factors, we may be unable to successfully develop and realize the commercial potential of any product candidates we may identify and develop, and our business, financial condition, results of operations, and prospects would be materially adversely affected.

Risks related to our relationships with third parties

We expect to rely on third parties to manufacture components of our product candidates we may develop, conduct our clinical trials and some aspects of our research and preclinical testing, and those third parties may not perform satisfactorily, including failing to meet deadlines for the completion of such trials, research, or testing.

We expect to rely on third parties, such as CROs, clinical data management organizations, medical institutions, and clinical investigators, to manufacture components of our product candidates we may develop and to conduct our clinical trials. We currently rely and expect to continue to rely on third parties to conduct some aspects of our research and preclinical testing. For example, we rely on a third party to conduct electroporation; we rely on a third party to supply LNPs; and we rely on third parties to manufacture viral vectors. Any of these third parties may terminate their engagements with us at any time under certain criteria. If we need to enter into alternative arrangements, it may delay our product development activities.

Our reliance on these third parties for research and development activities will reduce our control over these activities but will not relieve us of our responsibilities. For example, we will remain responsible for ensuring that each of our clinical trials is conducted in accordance with the general investigational plan and protocols for the trial. Moreover, the FDA, EMA and other regulatory authorities require us to comply with standards, commonly referred to as Good Clinical Practices, for conducting, recording, and reporting the results of clinical trials to assure that data and reported results are credible and accurate and that the rights, integrity, and confidentiality of trial participants are protected. In the United States, we also are required to register ongoing clinical trials and post the results of completed clinical trials on a government-sponsored database, ClinicalTrials.gov, within certain timeframes. Failure to do so can result in fines, adverse publicity, and civil and criminal sanctions.

Although we intend to design the clinical trials for our product candidates, CROs will conduct some or all of the clinical trials. As a result, many important aspects of our development programs, including their conduct and timing, will be outside of our direct control. Our reliance on third parties to conduct future preclinical studies and clinical trials will also result in less direct control over the management of data developed through preclinical studies and clinical trials than would be the case if we were relying entirely upon our own staff. Communicating with outside parties can also be challenging, potentially leading to mistakes as well as difficulties in coordinating activities. Outside parties may:

- have staffing difficulties;
- fail to comply with contractual obligations;
- experience regulatory compliance issues;
- undergo changes in priorities or become financially distressed; or
- form relationships with other entities, some of which may be our competitors.

These factors may materially adversely affect the willingness or ability of third parties to conduct our preclinical studies and clinical trials and may subject us to unexpected cost increases that are beyond our control. If the CROs and other third parties do not perform preclinical studies and future clinical trials in a satisfactory manner, breach their obligations to us or fail to comply with regulatory requirements, the development, regulatory approval and commercialization of our product candidates may be delayed, we may not be able to obtain regulatory approval and commercialize our product candidates, or our development programs may be materially and irreversibly harmed. If we are unable to rely on preclinical and clinical data collected by our CROs and other third parties, we could be required to repeat, extend the duration of, or increase the size of any preclinical studies or clinical trials we conduct and this could significantly delay commercialization and require greater expenditures.

We also expect to rely on other third parties to store and distribute drug supplies for our clinical trials. Any performance failure on the part of our distributors could delay clinical development or marketing approval of any product candidates we may develop or commercialization of our medicines, producing additional losses and depriving us of potential product revenue.

We contract with third parties for the manufacture of materials for our research programs and preclinical studies and expect to continue to do so for clinical trials and for commercialization of any product candidates that we may develop. This reliance on third parties increases the risk that we will not have sufficient quantities of such materials, product candidates, or any medicines that we may develop and commercialize, or that such supply will not be available to us at an acceptable cost, which could delay, prevent, or impair our development or commercialization efforts.

We do not have any manufacturing facilities at the present time. We currently rely on third-party manufacturers for the manufacture of our materials for preclinical studies and may continue to do so for clinical testing and for commercial supply of any product candidates that we may develop and for which we or our collaborators obtain marketing approval. We do not have a long-term supply agreement with any of the third-party manufacturers, and we purchase our required supply on a purchase order basis.

We may be unable to establish any agreements with third-party manufacturers or to do so on acceptable terms. Even if we are able to establish agreements with third-party manufacturers, reliance on third-party manufacturers entails additional risks, including:

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

Third-party manufacturers may not be able to comply with cGMP regulations or similar regulatory requirements outside the United States. Our failure, or the failure of our third-party manufacturers, to comply with applicable regulations could result in sanctions being imposed on us, including fines, injunctions, civil penalties, delays, suspension or withdrawal of approvals, license revocations, seizures or recalls of product candidates or medicines, operating restrictions, and criminal prosecutions, any of which could significantly and adversely affect supplies of our medicines and harm our business, financial condition, results of operations, and prospects.

Any medicines that we may develop may compete with other product candidates and products for access to manufacturing facilities. There are a limited number of manufacturers that operate under cGMP regulations and that might be capable of manufacturing for us.

Any performance failure on the part of our existing or future manufacturers could delay clinical development or marketing approval. We do not currently have arrangements in place for redundant supply for bulk drug substances. If any one of our current contract manufacturers cannot perform as agreed, we may be required to replace that manufacturer. Although we believe that there are several potential alternative manufacturers who could manufacture any product candidates we may develop, we may incur added costs and delays in identifying and qualifying any such replacement.

Our current and anticipated future dependence upon others for the manufacture of any product candidates we may develop or medicines may adversely affect our future profit margins and our ability to commercialize any medicines that receive marketing approval on a timely and competitive basis.

We may enter into collaborations with third parties for the research, development, and commercialization of certain of the product candidates we may develop. If any such collaborations are not successful, we may not be able to capitalize on the market potential of those product candidates.

We may seek third-party collaborators for the research, development, and commercialization of certain of the product candidates we may develop. If we enter into any such arrangements with any third parties, we will likely have limited control over the amount and timing of resources that our collaborators dedicate to the development or commercialization of any product candidates we may seek to develop with them. Our ability to generate revenues from these arrangements will depend on our collaborators' abilities to successfully perform the functions assigned to them in these arrangements. We cannot predict the success of any collaboration that we enter into.

Collaborations involving our research programs or any product candidates we may develop pose numerous risks to us, including the following:

- Collaborators have significant discretion in determining the efforts and resources that they will apply to these collaborations.
- Collaborators may not pursue development and commercialization of any product candidates we may develop or may elect not to continue or renew development or commercialization programs based on clinical trial results, changes in the collaborator's strategic focus or available funding or external factors such as an acquisition that diverts resources or creates competing priorities.
- Collaborators may delay clinical trials, provide insufficient funding for a clinical trial program, stop a clinical trial or abandon a product candidate, repeat or conduct new clinical trials, or require a new formulation of a product candidate for clinical testing.
- Collaborators could independently develop, or develop with third parties, products that compete directly or indirectly with our medicines or product candidates we may develop if the collaborators believe that competitive products are more likely to be successfully developed or can be commercialized under terms that are more economically attractive than ours.
- Collaborators with marketing and distribution rights to one or more medicines may not commit sufficient resources to the marketing and distribution of such medicine or medicines.
- Collaborators may not properly obtain, maintain, enforce, or defend our intellectual property or proprietary rights or may use our proprietary information in such a way as to invite litigation that could jeopardize or invalidate our proprietary information or expose us to potential litigation.
- Disputes may arise between the collaborators and us that result in the delay or termination of the research, development, or commercialization of our medicines or product candidates or that result in costly litigation or arbitration that diverts management attention and resources.
- We may lose certain valuable rights under circumstances identified in our collaborations, including if we undergo a change of control.
- Collaborations may be terminated and, if terminated, may result in a need for additional capital to pursue further development or commercialization of the applicable product candidates we may develop.
- Collaboration agreements may not lead to development or commercialization of product candidates in the most efficient manner or at all. If a present or future collaborator of ours were to be involved in a business combination, the continued pursuit and emphasis on our product development or commercialization program under such collaboration could be delayed, diminished, or terminated.

If our collaborations do not result in the successful development and commercialization of product candidates, or if one of our collaborators terminates its agreement with us, we may not receive any future research funding or milestone or royalty payments under the collaboration. If we do not receive the funding we expect under these agreements, our development of product candidates could be delayed, and we may need additional resources to develop product candidates. In addition, if one of our collaborators terminates its agreement with us, we may find it more difficult to find a suitable replacement collaborator or attract new collaborators, and our development programs may be delayed or the perception of us in the business and financial communities could be adversely affected. All of the risks relating to product development, regulatory approval, and commercialization described in this Annual Report on Form 10-K apply to the activities of our collaborators.

These relationships, or those like them, may require us to incur non-recurring and other charges, increase our near- and long-term expenditures, issue securities that dilute our existing stockholders, or disrupt our management and business. In addition, we could face significant competition in seeking appropriate collaborators, and the negotiation process is time-consuming and complex. Our ability to reach a definitive collaboration agreement will depend, among other things, upon our assessment of the collaborator's resources and expertise, the terms and conditions of the proposed collaboration, and the proposed collaborator's evaluation of several factors. If we license rights to any product candidates, we may develop we or our collaborators may develop, we may not be able to realize the benefit of such transactions if we are unable to successfully integrate them with our existing operations and company culture.

If conflicts arise between us and our collaborators or strategic partners, these parties may act in a manner adverse to us and could limit our ability to implement our strategies.

If conflicts arise between our corporate or academic collaborators or strategic partners and us, the other party may act in a manner adverse to us and could limit our ability to implement our strategies. Some of our academic collaborators and strategic partners are conducting multiple product development efforts within each area that is the subject of the collaboration with us. Our collaborators or strategic partners, however, may develop, either alone or with others, products in related fields that are competitive with the product candidates we may develop that are the subject of these collaborations with us. Competing products, either developed by the

collaborators or strategic partners or to which the collaborators or strategic partners have rights, may result in the withdrawal of partner support for our product candidates we may develop.

Some of our collaborators or strategic partners could also become our competitors in the future. Our collaborators or strategic partners could develop competing products, preclude us from entering into collaborations with their competitors, fail to obtain timely regulatory approvals, terminate their agreements with us prematurely, or fail to devote sufficient resources to the development and commercialization of products. Any of these developments could harm our product development efforts.

If we are not able to establish collaborations on commercially reasonable terms, we may have to alter our development and commercialization plans.

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

We face significant competition in seeking appropriate collaborators. Whether we reach a definitive agreement for a collaboration will depend, among other things, upon our assessment of the collaborator's resources and expertise, the terms and conditions of the proposed collaboration, and the proposed collaborator's evaluation of a number of factors. Those factors may include the design or results of clinical trials, the likelihood of approval by the FDA, the EMA or similar regulatory authorities outside the United States, the potential market for the subject product candidate, the costs and complexities of manufacturing and delivering such product candidate to patients, the potential of competing products, the existence of uncertainty with respect to our ownership of technology, which can exist if there is a challenge to such ownership without regard to the merits of the challenge, and industry and market conditions generally. The collaborator may also consider alternative product candidates or technologies for similar indications that may be available to collaborate on and whether such a collaboration could be more attractive than the one with us.

We may also be restricted under existing collaboration agreements from entering into future agreements on certain terms with potential collaborators. Collaborations are complex and time-consuming to negotiate and document. In addition, there have been a significant number of recent business combinations among large pharmaceutical companies that have resulted in a reduced number of potential future collaborators.

We may not be able to negotiate collaborations on a timely basis, on acceptable terms, or at all. If we are unable to do so, we may have to curtail the development of the product candidate for which we are seeking to collaborate, reduce or delay its development program or one or more of our other development programs, delay its potential commercialization or reduce the scope of any sales or marketing activities, or increase our expenditures and undertake development or commercialization activities at our own expense. If we elect to increase our expenditures to fund development or commercialization activities on our own, we may need to obtain additional capital, which may not be available to us on acceptable terms or at all. If we do not have sufficient funds, we may not be able to develop product candidates or bring them to market and generate product revenue.

Public health epidemics or outbreaks, including COVID 2019, could adversely impact our business.

In December 2019, COVID-19 emerged in Wuhan, Hubei Province, China. Less than four months later, in March 2020, the World Health Organization declared COVID-19 a pandemic. While initially the outbreak was largely concentrated in China and caused significant disruptions to its economy, it has now spread to many other countries and regions, including Cambridge, Massachusetts where our primary offices and laboratory spaces are located.

The rapid spread of the virus has led to the implementation of various responses, including government-imposed quarantines, including shelter-in-place mandates, sweeping restrictions on travel, and other public health safety measures, as well as reported adverse impacts on healthcare resources, facilities and providers, in Massachusetts, across the United States, and in other countries. The extent to which the coronavirus impacts our operations and those of our third-party partners will depend on future developments, which are highly uncertain and cannot be predicted with confidence, including the duration of the outbreak, additional or modified government actions, new information which may emerge concerning the severity of the coronavirus and the actions taken to contain the coronavirus or treat its impact, among others.

To protect the health of our employees and their families, and our communities, in accordance with direction from state and local government authorities, we have restricted access to our facilities to personnel and third parties who must perform critical activities that must be completed on-site, limited the number of such personnel that can be present at our facilities at any one time, and requested that most of our personnel work remotely. In the event that governmental authorities were to further modify current restrictions, our employees conducting research and development, or manufacturing activities may not be able to access our laboratory or manufacturing space, and our core activities may be significantly limited or curtailed, possibly for an extended period of time.

Additionally, timely completion of preclinical activities is dependent upon the availability of, for example, preclinical sites, researchers and investigators, regulatory agency personnel, and materials, which may be adversely affected by global health matters,

such as pandemics. We plan to conduct preclinical activities for our programs in geographies which are currently being affected by COVID-19.

Some factors from the COVID-19 pandemic that could delay or otherwise adversely affect the completion of our preclinical activities and, depending on the duration of the outbreak, the initiation of any future clinical trials, as well as our business generally, include:

- business disruptions caused by potential workplace, laboratory and office closures and an increased reliance on employees working from home, disruptions to or delays in ongoing laboratory experiments and operations, staffing shortages, travel limitations, cyber security and data accessibility, or communication or mass transit disruptions, any of which could adversely impact our business operations or delay necessary interactions with local regulators, ethics committees, manufacturing sites, research sites and other important agencies and contractors;

- limitations on our business operations by local, state, or the federal government that could impact our ability to conduct our preclinical activities, including completing our IND-enabling studies;

- limitations on travel that could hinder our timelines;

- interruption in global shipping affecting the transport of key materials; and

- interruption of, or delays in receiving, key materials from our contract manufacturing organizations due to staffing shortages, production slowdowns or stoppages and disruptions in delivery systems.

These and other factors arising from COVID-19 could worsen in countries that are already afflicted with the coronavirus or could continue to spread to additional countries, each of which could further adversely impact our ability to conduct preclinical or any future clinical trials, and, in general, our business, and could have a material adverse impact on our operations and financial condition and results.

Additionally, the extent and duration of the impact of COVID-19 pandemic on our stock price and other biopharmaceutical companies is uncertain and may make us look less attractive to investors and, as a result, there may be a less active trading market for our common stock, our stock price may be more volatile, and our ability to raise capital could be impaired.

COVID-19 outbreak continues to rapidly evolve. The extent to which the outbreak may impact our business, preclinical studies and any future clinical trials will highly depend on future developments, which are very uncertain and cannot be predicted with confidence, such as the ultimate geographic spread of the disease, the duration of the outbreak, travel restrictions and other actions to contain the outbreak or address its impact, such as social distancing and quarantines or lockdowns in the United States and other countries, business closures or business disruptions and the effectiveness of actions taken in the United States and other countries to contain and address the disease.

Risks related to our intellectual property

If we are unable to obtain and maintain patent and other intellectual property protection for any product candidates we develop and for our base editing platform technology, or if the scope of the patent and other intellectual property protection obtained is not sufficiently broad, our competitors could develop and commercialize products and technology similar or identical to ours, and our ability to successfully commercialize any product candidates we may develop, and our base editing platform technology may be adversely affected.

Our commercial success will depend in large part on our ability to obtain and maintain patent, trademark, trade secret and other intellectual property protection of our base editing platform technology, product candidates and other technology, methods used to manufacture them and methods of treatment, as well as successfully defending our patent and other intellectual property rights against third-party challenges. It is difficult and costly to protect our base editing platform technology and protect candidates, and we may not be able to ensure their protection. Our ability to stop unauthorized third parties from making, using, selling, offering to sell, importing or otherwise commercializing our product candidates we may develop is dependent upon the extent to which we have rights under valid and enforceable patents or trade secrets that cover these activities.

We seek to protect our proprietary position by in-licensing intellectual property relating to our platform technology and filing patent applications in the United States and abroad related to our base editing platform technology and product candidates that are important to our business. If we or our licensors are unable to obtain or maintain patent protection with respect to our base editing platform technology and product candidates we may develop, or if the scope of the patent protection secured is not sufficiently broad, our competitors could develop and commercialize products and technology similar or identical to ours and our ability to commercialize any product candidates we may develop may be adversely affected.

The patent prosecution process is expensive, time-consuming, and complex, and we may not be able to file, prosecute, maintain, enforce, or license all necessary or desirable patent applications at a reasonable cost or in a timely manner. In addition, we may not pursue or obtain patent protection in all relevant markets. It is also possible that we will fail to identify patentable aspects of our research and development output in time to obtain patent protection. Although we enter into non-disclosure and confidentiality

agreements with parties who have access to confidential or patentable aspects of our research and development output, such as our employees, corporate collaborators, outside scientific collaborators, CROs, contract manufacturers, consultants, advisors, and other third parties, any of these parties may breach the agreements and disclose such output before a patent application is filed, thereby jeopardizing our ability to seek patent protection. In addition, our ability to obtain and maintain valid and enforceable patents depends on whether the differences between our inventions and the prior art allow our inventions to be patentable over the prior art. Furthermore, publications of discoveries in the scientific literature often lag behind the actual discoveries, and patent applications in the United States and other jurisdictions are typically not published until 18 months after filing, or in some cases not at all. Therefore, we cannot be certain that we or our licensors were the first to make the inventions claimed in our owned or any licensed patents or pending patent applications, or that we or our licensors were the first to file for patent protection of such inventions.

The patent position of biotechnology and pharmaceutical companies generally is highly uncertain, involves complex legal and factual questions, and has been the subject of much litigation in recent years. The field of genome editing, especially in the area of base editing technology, has been the subject of extensive patenting activity and litigation. As a result, the issuance, scope, validity, enforceability, and commercial value of our patent rights are highly uncertain and we may become involved in complex and costly litigation. Our pending and future patent applications may not result in patents being issued which protect our base editing platform technology and product candidates we may develop or which effectively prevent others from commercializing competitive technologies and product candidates.

No consistent policy regarding the scope of claims allowable in the field of genome editing, including base editing technology, has emerged in the United States. The scope of patent protection outside of the United States is also uncertain. Changes in either the patent laws or their interpretation in the United States and other countries may diminish our ability to protect our inventions, obtain, maintain, enforce and defend our intellectual property rights and, more generally, could affect the value of our intellectual property or narrow the scope of our owned and licensed patent rights. With respect to both in-licensed and owned intellectual property, we cannot predict whether the patent applications we and our licensors are currently pursuing will issue as patents in any particular jurisdiction or whether the claims of any issued patents will be valid and enforceable and provide sufficient protection from competitors.

Moreover, the coverage claimed in a patent application can be significantly reduced before the patent is issued, and its scope can be reinterpreted after issuance. Even if patent applications we license or own currently or in the future issue as patents, they may not issue in a form that will provide us with any meaningful protection, prevent competitors or other third parties from competing with us, or otherwise provide us with any competitive advantage. Any patents that we own or in-license may be challenged, narrowed, circumvented, or invalidated by third parties. Consequently, we do not know whether any of our platform advances and product candidates we may develop will be protectable or remain protected by valid and enforceable patents. Our competitors or other third parties may be able to circumvent our patents by developing similar or alternative technologies or products in a non-infringing manner.

In addition, given the amount of time required for the development, testing, and regulatory review of new product candidates, patents protecting such candidates might expire before or shortly after such candidates are commercialized. As a result, our intellectual property may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours. Moreover, some of our owned and in-licensed patents and patent applications are, and may in the future be, co-owned by us with third parties. For example, a patent application directed to our potential HBG1 and HBG2 product candidates is co-owned by us, the President and Fellows of Harvard College, or Harvard, and Broad Institute. At present, we do not have a license to the ownership interest of Harvard or Broad Institute. If we are unable to obtain an exclusive license to such third-party co-owners' interest in such patents or patent applications, such co-owners may be able to license their rights to other third parties, including our competitors, and our competitors could market competing products and technology. In addition, we may need the cooperation of any such co-owners of our patents in order to enforce such patents against third parties, and such cooperation may not be provided to us. Any of the foregoing could have a material adverse effect on our competitive position, business, financial conditions, results of operations, and prospects.

Our rights to develop and commercialize our base editing platform technology and product candidates are subject, in part, to the terms and conditions of licenses granted to us by others.

We depend on intellectual property licensed from third parties, and our licensors may not always act in our best interest. If we fail to comply with our obligations under our intellectual property licenses, if the licenses are terminated, or if disputes regarding these licenses arise, we could lose significant rights that are important to our business.

We have licensed and are dependent on certain patent rights and proprietary technology from third parties that are important or necessary to the development of our base editing technology and product candidates. For example, we are a party to license agreements with Broad Institute, Editas Medicine, Inc., or Editas, Harvard, and Bio Palette Co. Ltd., or Bio Palette, and others, pursuant to which we in-license key patents and patent applications for our base editing platform technology and product candidates (the Broad License Agreement, the Editas License Agreement, the Harvard License Agreement and the Bio Palette License Agreement, respectively). These license agreements impose various diligence, milestone payment, royalty, insurance, and other obligations on us. If we fail to comply with these obligations, our licensors may have the right to terminate our license, in which event we would not be able to develop or market our base editing platform or any other technology or product candidates covered by the

intellectual property licensed under these agreements. For example, under the Harvard License Agreement, we are required to initiate a discovery program in accordance with the development plan and development milestones for the development of a licensed product covered by certain sub-categories of licensed patents. If we fail to initiate such a discovery program, our rights with respect to the sub-category of licensed patents will terminate. For more information regarding these agreements, please see Item 1., *Business—Intellectual property licenses*, and Item 13., *Certain relationships and related party transactions—License and collaboration agreement*, in this Annual Report on Form 10-K.

These and other licenses may not provide exclusive rights to use such intellectual property and technology in all relevant fields of use and in all territories in which we may wish to develop or commercialize our base editing platform technology and product candidates in the future. Some licenses granted to us are expressly subject to certain preexisting rights held by the licensor or certain third parties. As a result, we may not be able to prevent competitors from developing and commercializing competitive products in certain territories or fields. For example, certain licensed patents developed by employees of the Howard Hughes Medical Institute, or HHMI, and subsequently assigned to Harvard and licensed to us under the Harvard License Agreement remain subject to a non-exclusive license between Harvard and HHMI. The Editas License Agreement provides that our field of use excludes the treatment and prevention of ocular disease and diagnosis, treatment, and prevention of human cancers through engineered T-cells, which are licensed to other licensees, including Allergan Pharmaceuticals International Limited and Juno Therapeutics, Inc. If we determine that rights to such excluded fields are necessary to commercialize our product candidates or maintain our competitive advantage, we may need to obtain a license from such third party in order to continue developing, manufacturing or marketing our product candidates. We may not be able to obtain such a license on an exclusive basis, on commercially reasonable terms, or at all, which could prevent us from commercializing our product candidates or allow our competitors or others the chance to access technology that is important to our business.

Under the Broad License Agreement, rights granted to us include certain patent applications directed to Cas12b or Cas13 that are limited to the United States. The co-owners of these patent applications include Broad Institute, Harvard, MIT, the State University of New Jersey, or Rutgers, Skolkovo Institute of Science and Technology, or Skoltech, and the NIH. At present, we do not have a license to the ownership interest of Rutgers, Skoltech, or the NIH. If we are unable to obtain an exclusive license to Rutgers, Skoltech, and the NIH's interest in such patent applications, Rutgers, Skoltech, and the NIH may be able to license its rights to other third parties, including our competitors, and such third parties could market competing products and technology. In addition, we may need the cooperation of Rutgers, Skoltech, or the NIH in order to enforce patents issuing from these patent applications against third parties, and such cooperation may not be provided to us. Any of the foregoing could have a material adverse effect on our competitive position, business, financial conditions, results of operations, and prospects.

In addition, pursuant to our license agreement with Broad Institute and our license agreement with Harvard, under certain specific circumstances (in each case), Broad Institute or Harvard (as applicable) may grant a license to the patents that are the subject of such license agreement to a third party in the same field as such patents are licensed to us. Such third party may then have full rights that are the subject of the Broad License Agreement or the Harvard License Agreement (as applicable), which could impact our competitive position and enable a third party to commercialize products similar to our potential future product candidates and technology. Any grant of rights to a third party in this scenario would narrow the scope of our exclusive rights to the patents and patent applications we have in-licensed from Broad Institute and/or Harvard, as applicable. For more information regarding our license agreements, see Item 1., *Business—Intellectual property licenses*, in this Annual Report on Form 10-K.

We do not have complete control in the preparation, filing, prosecution, maintenance, enforcement, and defense of patents and patent applications covering the technology that we license from third parties. For example, pursuant to each of our intellectual property licenses with Broad Institute, Harvard, Editas and Bio Palette, our licensors retain control of preparation, filing, prosecution, and maintenance, and, in certain circumstances, enforcement and defense of their patents and patent applications. It is possible that our licensors' enforcement of patents against infringers or defense of such patents against challenges of validity or claims of enforceability may be less vigorous than if we had conducted them ourselves, or may not be conducted in accordance with our best interests. We cannot be certain that these patents and patent applications will be prepared, filed, prosecuted, maintained, enforced, and defended in a manner consistent with the best interests of our business. If our licensors fail to prosecute, maintain, enforce, and defend such patents, or lose rights to those patents or patent applications, the rights we have licensed may be reduced or eliminated, our right to develop and commercialize any of our product candidates we may develop that are the subject of such licensed rights could be adversely affected and we may not be able to prevent competitors from making, using, and selling competing products.

Our licensors may have relied on third-party consultants or collaborators or on funds from third parties such that our licensors are not the sole and exclusive owners of the patents we in-licensed. If other third parties have ownership rights to our in-licensed patents, the license granted to us in jurisdictions where the consent of a co-owner is necessary to grant such a license may not be valid and such co-owners may be able to license such patents to our competitors, and our competitors could market competing products and technology. In addition, our rights to our in-licensed patents and patent applications are dependent, in part, on inter-institutional or other operating agreements between the joint owners of such in-licensed patents and patent applications. If one or more of such joint owners breaches such inter-institutional or operating agreements, our rights to such in-licensed patents and patent applications may be

adversely affected. Any of these events could have a material adverse effect on our competitive position, business, financial conditions, results of operations, and prospects.

Furthermore, inventions contained within some of our in-licensed patents and patent applications were made using U.S. government funding. We rely on our licensors to ensure compliance with applicable obligations arising from such funding, such as timely reporting, an obligation associated with our in-licensed patents and patent applications. The failure of our licensors to meet their obligations may lead to a loss of rights or the unenforceability of relevant patents. For example, the U.S. government could have certain rights in such in-licensed patents, including a non-exclusive license authorizing the U.S. government to use the invention or to have others use the invention on its behalf. If the U.S. government decides to exercise these rights, it is not required to engage us as its contractor in connection with doing so. The U.S. government's rights may also permit it to disclose the funded inventions and technology to third parties and to exercise march-in rights to use or allow third parties to use the technology we have licensed that was developed using U.S. government funding. The U.S. government may also exercise its march-in rights if it determines that action is necessary because we or our licensors failed to achieve practical application of the U.S. government-funded technology, because action is necessary to alleviate health or safety needs, to meet requirements of federal regulations, or to give preference to U.S. industry. In addition, our rights in such in-licensed U.S. government-funded inventions may be subject to certain requirements to manufacture product candidates embodying such inventions in the United States. Any of the foregoing could harm our business, financial condition, results of operations, and prospects significantly.

In the event any of our third-party licensors determine that, in spite of our efforts, we have materially breached a license agreement or have failed to meet certain obligations thereunder, it may elect to terminate the applicable license agreement or, in some cases, one or more license(s) under the applicable license agreement and such termination would result in us no longer having the ability to develop and commercialize product candidates and technology covered by that license agreement or license. In the event of such termination of a third-party in-license, or if the underlying patents under a third-party in-license fail to provide the intended exclusivity, competitors would have the freedom to seek regulatory approval of, and to market, products identical to ours. Any of these events could have a material adverse effect on our competitive position, business, financial conditions, results of operations, and prospects.

Our owned and in-licensed patents and patent applications may not provide sufficient protection of our base editing platform technologies, our product candidates and our future product candidates or result in any competitive advantage.

We have in-licensed a number of issued U.S. patents and patent applications that cover base editing and gene targeting technologies. We have applied for provisional patent applications or Patent Cooperation Treaty, or PCT, applications intended to specifically cover our base editing platform technology and uses with respect to treatment of particular diseases and conditions, but do not currently own any issued U.S. patents. Each U.S. provisional patent application is not eligible to become an issued patent until, among other things, we file a non-provisional patent application within 12 months of the filing date of the applicable provisional patent application. Any failure to file a non-provisional patent application within this timeline could cause us to lose the ability to obtain patent protection for the intentions disclosed in the associated provisional patent applications. We cannot be certain that any of these patent applications will issue as patents, and if they do, that such patents will cover or adequately protect our base editing platform technologies or our product candidates, or that such patents will not be challenged, narrowed, circumvented, invalidated or held unenforceable. Any failure to obtain or maintain patent protection with respect to our base editing platform technology and product candidates could have a material adverse effect on our business, financial condition, results of operations and growth prospects.

Our owned patent applications and in-licensed patents and patent applications contain claims directed to compositions of matter on our base editing product candidates, as well as methods directed to the use of such product candidates for gene therapy treatment. Method-of-use patents do not prevent a competitor or other third party from developing or marketing an identical product for an indication that is outside the scope of the patented method. Moreover, with respect to method-of-use patents, even if competitors or other third parties do not actively promote their product for our targeted indications or uses for which we may obtain patents, providers may recommend that patients use these products off-label, or patients may do so themselves.

The strength of patents in the biotechnology and pharmaceutical field involves complex legal and scientific questions and can be uncertain. The patent applications that we own or in-license may fail to result in issued patents with claims that cover our product candidates or uses thereof in the United States or in other foreign countries. For example, while our patent applications are pending, we may be subject to a third-party pre-issuance submission of prior art to the United States Patent and Trademark Office, or USPTO, or become involved in interference or derivation proceedings, or equivalent proceedings in foreign jurisdictions. Even if patents do successfully issue, third parties may challenge their inventorship, validity, enforceability or scope, including through opposition, revocation, reexamination, post-grant and *inter partes* review proceedings. An adverse determination in any such submission, proceeding or litigation could reduce the scope of, or invalidate or render unenforceable, our owned or in-licensed patent rights, allow third parties to commercialize our technology or product candidates and compete directly with us, without payment to us, or result in our inability to manufacture or commercialize products without infringing third-party patent rights. Moreover, we, or one of our licensors, may have to participate in interference proceedings declared by the USPTO to determine priority of invention or in post-grant challenge proceedings, such as oppositions in a foreign patent office, that challenge our or our licensor's priority of invention or other features of patentability with respect to our owned or in-licensed patents and patent applications. Such challenges may result in loss of patent rights, loss of exclusivity, or in patent claims being narrowed, invalidated, or held unenforceable, which could limit our

ability to stop others from using or commercializing similar or identical technology and products, or limit the duration of the patent protection of our technology and product candidates. Furthermore, even if they are unchallenged, our patents and patent applications may not adequately protect our intellectual property or prevent others from designing around our claims. If the breadth or strength of protection provided by the patent applications we own or the patents and patent applications we in-license with respect to our base editing platform technology and product candidates is threatened, it could dissuade companies from collaborating with us to develop, and threaten our ability to commercialize, our product candidates. Further, if we encounter delays in development, testing, and regulatory review of new product candidates, the period of time during which we could market our product candidates under patent protection would be reduced.

Given that patent applications in the United States and other countries are confidential for a period of time after filing, at any moment in time, we cannot be certain that we or our licensors were in the past or will be in the future the first to file any patent application related to our base editing technology or product candidates. In addition, some patent applications in the United States may be maintained in secrecy until the patents are issued. As a result, there may be prior art of which we or our licensors are not aware that may affect the validity or enforceability of a patent claim, and we or our licensors may be subject to priority disputes. For our in-licensed patent portfolios, we rely on our licensors to determine inventorship, and obtain and file inventor assignments of priority applications before their conversion as PCT applications. A failure to do so in a timely fashion may give rise to a challenge to entitlement of priority for foreign applications nationalized from such PCT applications. For example, the European Patent Office, or the EPO, Opposition Division, or the EPO Opposition Division, has revoked our optioned Broad Institute patent European Patent No. EP2771468 following a third-party challenge to its priority rights. The patent was revoked due to loss of priority. We or our licensors are subject to and may in the future become a party to proceedings or priority disputes in Europe or other foreign jurisdictions. The loss of priority for, or the loss of, these European patents could have a material adverse effect on the conduct of our business.

We may be required to disclaim part or all of the term of certain patents or patent applications. There may be prior art of which we are not aware that may affect the validity or enforceability of a patent claim. There also may be prior art of which we or our licensors are aware, but which we or our licensors do not believe affects the validity or enforceability of a claim, which may, nonetheless, ultimately be found to affect the validity or enforceability of a claim. No assurance can be given that, if challenged, our patents would be declared by a court, patent office or other governmental authority to be valid or enforceable or that even if found valid and enforceable, a competitor’s technology or product would be found by a court to infringe our patents. We may analyze patents or patent applications of our competitors that we believe are relevant to our activities, and consider that we are free to operate in relation to our product candidates, but our competitors may achieve issued claims, including in patents we consider to be unrelated, that block our efforts or potentially result in our product candidates or our activities infringing such claims. It is possible that our competitors may have filed, and may in the future file, patent applications covering our products or technology similar to ours. Those patent applications may have priority over our owned patent applications and in-licensed patent applications or patents, which could require us to obtain rights to issued patents covering such technologies. The possibility also exists that others will develop products that have the same effect as our product candidates on an independent basis that do not infringe our patents or other intellectual property rights, or will design around the claims of our patent applications or our in-licensed patents or patent applications that cover our product candidates.

Likewise, our currently owned patent applications, if issued as patents, and in-licensed patents and patent applications, if issued as patents, directed to our proprietary base editing technologies and our product candidates are expected to expire from 2034 through 2040, without taking into account any possible patent term adjustments or extensions. Our owned or in-licensed patents may expire before, or soon after, our first product candidate achieves marketing approval in the United States or foreign jurisdictions. Additionally, no assurance can be given that the USPTO or relevant foreign patent offices will grant any of the pending patent applications we own or in-license currently or in the future. Upon the expiration of our current in-licensed patents, we may lose the right to exclude others from practicing these inventions. The expiration of these patents could also have a similar material adverse effect on our business, financial condition, results of operations and prospects.

Our owned patent applications and in-licensed patents and patent applications and other intellectual property may be subject to priority disputes or to inventorship disputes and similar proceedings. If we or our licensors are unsuccessful in any of these proceedings, we may be required to obtain licenses from third parties, which may not be available on commercially reasonable terms or at all, or to cease the development, manufacture, and commercialization of one or more of the product candidates we may develop, which could have a material adverse impact on our business.

Although we have an option to exclusively license certain patents and patent applications directed to Cas9 and Cas12a from Editas, who in turn has licensed such patents from various academic institutions including the Broad Institute, we do not currently have a license to such patents and patent applications. Certain of the U.S. patents and one U.S. patent application to which we hold an option are co-owned by the Broad Institute and MIT, and in some cases co-owned by the Broad Institute, MIT, and Harvard, which we refer to together as the Boston Licensing Parties, and were involved in U.S. interference No. 106,048 with one U.S. patent application co-owned by the University of California, the University of Vienna, and Emmanuelle Charpentier, which we refer to together as the University of California. On September 10, 2018, the Court of Appeals for the Federal Circuit, or the CAFC, affirmed the Patent Trial

and Appeal Board of the USPTO's, or PTAB's, holding that there was no interference-in-fact. An interference is a proceeding within the USPTO to determine priority of invention of the subject matter of patent claims filed by different parties.

On June 24, 2019, the PTAB declared an interference (U.S. Interference No. 106,115) between 10 U.S. patent applications ((U.S. Serial Nos. 15/947,680; 15/947,700; 15/947,718; 15/981,807; 15/981,808; 15/981,809; 16/136,159; 16/136,165; 16/136,168; and 16/136,175) that are co-owned by the University of California, and 13 U.S. patents and one U.S. patent application ((U.S. Patent Nos. 8,697,359; 8,771,945; 8,795,965; 8,865,406; 8,871,445; 8,889,356; 8,895,308; 8,906,616; 8,932,814; 8,945,839; 8,993,233; 8,999,641; and 9,840,713, and U.S. Serial No. 14/704,551) that are co-owned by the Boston Licensing Parties, which we have an option to under the Editas License Agreement. In the declared interference, the University of California has been designated as the junior party and the Boston Licensing Parties have been designated as the senior party.

As a result of the declaration of interference, an adversarial proceeding in the USPTO before the PTAB has been initiated, which is declared to ultimately determine priority, specifically and which party was first to invent the claimed subject matter. An interference is typically divided into two phases. The first phase is referred to as the motions or preliminary motions phase while the second is referred to as the priority phase. In the first phase, each party may raise issues including but not limited to those relating to the patentability of a party's claims based on prior art, written description, and enablement. A party also may seek an earlier priority benefit or may challenge whether the declaration of interference was proper in the first place. Priority, or a determination of who first invented the commonly claimed invention, is determined in the second phase of an interference. Although we cannot predict with any certainty how long each phase will actually take, each phase may take approximately a year or longer before a decision is made by the PTAB. It is possible for motions filed in the preliminary motions phase to be dispositive of the interference proceeding, such that the second priority phase is not reached. The 10 University of California patent applications and the 13 U.S. patents and one U.S. patent application co-owned by the Boston Licensing Parties involved in U.S. Interference No. 106,115 generally relate to CRISPR/Cas9 systems or eukaryotic cells comprising CRISPR/Cas9 systems having fused or covalently linked RNA and the use thereof in eukaryotic cells. There can be no assurance that the U.S. interference will be resolved in favor of the Boston Licensing Parties. If the U.S. interference resolves in favor of University of California, or if the Boston Licensing Parties' patents and patent application are narrowed, invalidated, or held unenforceable, we will lose the ability to license the optioned patents and patent application and our ability to commercialize our product candidates may be adversely affected if we cannot obtain a license to relevant third party patents that cover our product candidates. We may not be able to obtain any required license on commercially reasonable terms or at all. Even if we were able to obtain a license, it could be nonexclusive, thereby giving our competitors and other third parties access to the same technologies licensed to us, and it could require us to make substantial licensing and royalty payments. If we are unable to obtain a necessary license to a third-party patent on commercially reasonable terms, we may be unable to commercialize our base editing platform technology or product candidates or such commercialization efforts may be significantly delayed, which could in turn significantly harm our business.

We or our licensors may also be subject to claims that former employees, collaborators, or other third parties have an interest in our owned patent applications or in-licensed patents or patent applications or other intellectual property as an inventor or co-inventor. If we are unable to obtain an exclusive license to any such third-party co-owners' interest in such patent applications, such co-owners may be able to license their rights to other third parties, including our competitors. In addition, we may need the cooperation of any such co-owners to enforce any patents that issue from such patent applications against third parties, and such cooperation may not be provided to us.

If we or our licensors are unsuccessful in any interference proceedings or other priority, validity (including any patent oppositions), or inventorship disputes to which we or they are subject, we may lose valuable intellectual property rights through the loss of one or more of our owned, licensed, or optioned patents, or such patent claims may be narrowed, invalidated, or held unenforceable, or through loss of exclusive ownership of or the exclusive right to use our owned or in-licensed patents. In the event of loss of patent rights as a result of any of these disputes, we may be required to obtain and maintain licenses from third parties, including parties involved in any such interference proceedings or other priority or inventorship disputes. Such licenses may not be available on commercially reasonable terms or at all, or may be non-exclusive. If we are unable to obtain and maintain such licenses, we may need to cease the development, manufacture, and commercialization of one or more of the product candidates we may develop. The loss of exclusivity or the narrowing of our patent claims could limit our ability to stop others from using or commercializing similar or identical technology and product candidates. Even if we or our licensors are successful in an interference proceeding or other similar priority or inventorship disputes, it could result in substantial costs and be a distraction to management and other employees. Any of the foregoing could result in a material adverse effect on our business, financial condition, results of operations, or prospects.

We have limited foreign intellectual property rights and may not be able to protect our intellectual property and proprietary rights throughout the world.

We have limited intellectual property rights outside the United States. Filing, prosecuting, and defending patents on product candidates in all countries throughout the world would be prohibitively expensive, and our intellectual property rights in some countries outside the United States can be less extensive than those in the United States. In addition, the laws of foreign countries do not protect intellectual property rights to the same extent as federal and state laws of the United States. In addition, our intellectual property license agreements may not always include worldwide rights. Consequently, we may not be able to prevent third parties from

practicing our inventions in all countries outside the United States, or from selling or importing products made using our inventions in and into the United States or other jurisdictions. Competitors may use our technologies in jurisdictions where we have not obtained patent protection to develop their own products and, further, may export otherwise infringing products to territories where we have patent protection but where enforcement is not as strong as that in the United States. These products may compete with our product candidates and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing.

Many companies have encountered significant problems in protecting and defending intellectual property rights in foreign jurisdictions. The legal systems of certain countries, particularly certain developing countries, do not favor the enforcement of patents, trade secrets, and other intellectual property protection, particularly those relating to biotechnology and pharmaceutical products, which could make it difficult for us to stop the infringement of our patents or marketing of competing products against third parties in violation of our intellectual property and proprietary rights generally. Proceedings to enforce our patents and intellectual property rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business, could put our patents at risk of being invalidated or interpreted narrowly and our patent applications at risk of not issuing, and could provoke third parties to assert claims against us. We may not prevail in any lawsuits that we initiate, and the damages or other remedies awarded, if any, may not be commercially meaningful. Moreover, the initiation of proceedings by third parties to challenge the scope or validity of our patent rights in foreign jurisdictions could result in substantial cost and divert our efforts and attention from other aspects of our business. Accordingly, our efforts to enforce our intellectual property and proprietary rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

Many countries have compulsory licensing laws under which a patent owner may be compelled to grant licenses to third parties. In addition, many countries limit the enforceability of patents against government agencies or government contractors. In these countries, the patent owner may have limited remedies, which could materially diminish the value of such patent. If we or any of our licensors is forced to grant a license to third parties with respect to any patents relevant to our business, our competitive position may be impaired, and our business, financial condition, results of operations, and prospects may be adversely affected.

If we fail to comply with our obligations in the agreements under which we license intellectual property rights from third parties or otherwise experience disruptions to our business relationships with our licensors, we could lose license rights that are important to our business.

We have entered into license agreements with third parties and may need to obtain additional licenses from our existing licensors and others to advance our research or allow commercialization of product candidates we may develop. It is possible that we may be unable to obtain any additional licenses at a reasonable cost or on reasonable terms, if at all. In either event, we may be required to expend significant time and resources to redesign our technology, product candidates, or the methods for manufacturing them or to develop or license replacement technology, all of which may not be feasible on a technical or commercial basis. If we are unable to do so, we may be unable to develop or commercialize the affected product candidates, which could harm our business, financial condition, results of operations, and prospects significantly. We cannot provide any assurances that third-party patents do not exist which might be enforced against our current technology, including base editing technology, manufacturing methods, product candidates, or future methods or products resulting in either an injunction prohibiting our manufacture or future sales, or, with respect to our future sales, an obligation on our part to pay royalties and/or other forms of compensation to third parties, which could be significant.

In each of our license agreements, we are generally responsible for bringing any actions against any third party for infringing on the patents we have licensed. Certain of our license agreements, also require us to meet development thresholds to maintain the license, including establishing a set timeline for developing and commercializing products. In spite of our efforts, our licensors might conclude that we have materially breached our obligations under such license agreements and might therefore terminate the license agreements, thereby removing or limiting our ability to develop and commercialize products and technology covered by these license agreements. If these in-licenses are terminated, or if the underlying patents fail to provide the intended exclusivity, competitors or other third parties would have the freedom to seek regulatory approval of, and to market, products identical to ours and we may be required to cease our development and commercialization of or base editing platform technology or product candidates. Any of the foregoing could have a material adverse effect on our competitive position, business, financial conditions, results of operations, and growth prospects. Disputes may arise regarding intellectual property subject to a licensing agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- the extent to which our technology and processes infringe on intellectual property of the licensor that is not subject to the licensing agreement;
- the sublicensing of patent and other rights to third parties under our collaborative development relationships;
- our diligence obligations under the license agreement with respect to the use of the licensed technology in relation to our development and commercialization of our product candidates and what activities satisfy those diligence obligations;
- the inventorship and ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and us and our partners; and

- the priority of invention of patented technology.

In addition, the agreements under which we currently license intellectual property or technology from third parties are complex, and certain provisions in such agreements may be susceptible to multiple interpretations. The resolution of any contract interpretation disagreement that may arise could narrow what we believe to be the scope of our rights to the relevant intellectual property or technology or broaden what we believe to be the scope of the licensor's rights to our intellectual property and technology, or increase what we believe to be our financial or other obligations under the relevant agreement, any of which could have a material adverse effect on our business, financial condition, results of operations, and prospects. Moreover, if disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on commercially acceptable terms, we may be unable to successfully develop and commercialize the affected product candidates. As a result, any termination of or disputes over our intellectual property licenses could result in the loss of our ability to develop and commercialize our base editing platform or other product candidates or we could lose other significant rights, any of which could have a material adverse effect on our business, financial conditions, results of operations, and prospects. It is also possible that a third party could be granted limited licenses to some of the same technology, in certain circumstances.

We may not be successful in acquiring or in-licensing necessary rights to key technologies or any product candidates we may develop.

We currently have rights to intellectual property, through licenses from third parties, to identify and develop product candidates, and we expect to seek to expand our product candidate pipeline in part by in-licensing the rights to key technologies. The future growth of our business will depend in part on our ability to in-license or otherwise acquire the rights to additional product candidates and technologies. Although we have succeeded in licensing technologies from third party licensees including Harvard, Broad Institute, Editas, and Bio Palette in the past, we cannot assure you that we will be able to in-license or acquire the rights to any product candidates or technologies from third parties on acceptable terms or at all.

For example, our agreements with certain of our third-party licensors provide that our filed of use excludes particular fields, for example, treatment and prevention of ocular disease, and diagnosis, treatment, and prevention of human cancers through engineered T-cells, which are licensed exclusively or non-exclusively to other third-party licensees. If we determine that rights to such fields are necessary to commercialize our drug candidates or maintain our competitive advantage, we may need to obtain a license from such third party in order to continue developing, manufacturing or marketing our drug candidates. We may not be able to obtain such a license on an exclusive basis, on commercially reasonable terms, or at all, which could prevent us from commercializing our drug candidates or allow our competitors or others the chance to access technology that is important to our business. For more information regarding these agreements, please see Item 1., *Business—License agreements*, in this Annual Report on Form 10-K.

Furthermore, there has been extensive patenting activity in the field of genome editing, and pharmaceutical companies, biotechnology companies, and academic institutions are competing with us or are expected to compete with us in the in the field of genome editing technology and filing patent applications potentially relevant to our business and we are aware of certain third-party patent applications that, if issued, may allow the third party to circumvent our patent rights. For example, we are aware of several third-party patents, and patent applications, that if issued, may be construed to cover our base editing technology and product candidates. In order to market our product candidates, we may find it necessary or prudent to obtain licenses from such third-party intellectual property holders. However, we may be unable to secure such licenses or otherwise acquire or in-license any compositions, methods of use, processes, or other intellectual property rights from third parties that we identify as necessary for product candidates we may develop and base editing technology. We may also require licenses from third parties for certain non-base editing technologies including certain delivery methods that we are evaluating for use with product candidates we may develop. In addition, some of our owned patent applications and in-licensed patents and patent applications are co-owned with third parties. With respect to any patents co-owned with third parties, we may require licenses to such co-owners' interest to such patents. If we are unable to obtain an exclusive license to any such third-party co-owners' interest in such patents or patent applications, such co-owners may be able to license their rights to other third parties, including our competitors, and our competitors could market competing products and technology. In addition, we may need the cooperation of any such co-owners of our patents in order to enforce such patents against third parties, and such cooperation may not be provided to us.

Additionally, we may collaborate with academic institutions to accelerate our preclinical research or development under written agreements with these institutions. In certain cases, these institutions provide us with an option to negotiate a license to any of the institution's rights in technology resulting from the collaboration. Even if we hold such an option, we may be unable to negotiate a license from the institution within the specified timeframe or under terms that are acceptable to us. If we are unable to do so, the institution may offer the intellectual property rights to others, potentially blocking our ability to pursue our program.

In addition, the licensing or acquisition of third-party intellectual property rights is a highly competitive area, and a number of more established companies are also pursuing strategies to license or acquire third party intellectual property rights that we may consider attractive or necessary. These established companies may have a competitive advantage over us due to their size, capital resources and greater clinical development and commercialization capabilities. In addition, companies that perceive us to be a competitor may be unwilling to assign or license rights to us. We also may be unable to license or acquire third party intellectual property rights on terms

that would allow us to make an appropriate return on our investment or at all. If we are unable to successfully obtain rights to required third party intellectual property rights or maintain the existing intellectual property rights we have, we may have to abandon development of the relevant program or product candidate, which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

The intellectual property landscape around genome editing technology, including base editing, is highly dynamic, and third parties may initiate legal proceedings alleging that we are infringing, misappropriating, or otherwise violating their intellectual property rights, the outcome of which would be uncertain and may prevent, delay or otherwise interfere with our product discovery and development efforts.

The field of genome editing, especially in the area of base editing technology, is still in its infancy, and no such product candidates have reached the market. Due to the intense research and development that is taking place by several companies, including us and our competitors, in this field, the intellectual property landscape is evolving and in flux, and it may remain uncertain for the coming years. There may be significant intellectual property related litigation and proceedings relating to our owned and in-licensed, and other third party, intellectual property and proprietary rights in the future.

Our commercial success depends upon our ability and the ability of our collaborators and licensors to develop, manufacture, market, and sell any product candidates that we may develop and use our proprietary technologies without infringing, misappropriating, or otherwise violating the intellectual property and proprietary rights of third parties. The biotechnology and pharmaceutical industries are characterized by extensive litigation regarding patents and other intellectual property rights as well as administrative proceedings for challenging patents, including interference, derivation, *inter partes* review, post grant review, and reexamination proceedings before the USPTO or oppositions and other comparable proceedings in foreign jurisdictions. We may be subject to and may in the future become party to, or threatened with, adversarial proceedings or litigation regarding intellectual property rights with respect to our base editing platform technology and any product candidates we may develop, including interference proceedings, post-grant review, *inter partes* review, and derivation proceedings before the USPTO and similar proceedings in foreign jurisdictions such as oppositions before the EPO. Numerous U.S. and foreign issued patents and pending patent applications that are owned by third parties exist in the fields in which we are developing our product candidates and they may assert infringement claims against us based on existing patents or patents that may be granted in the future, regardless of their merit.

As the biotechnology and pharmaceutical industries expand and more patents are issued, the risk increases that our base editing platform technology and product candidates may give rise to claims of infringement of the patent rights of others. Moreover, it is not always clear to industry participants, including us, which patents cover various types of therapies, products or their methods of use or manufacture. We are aware of certain third-party patent applications that, if issued, may be construed to cover our base editing technology and product candidates. There may also be third-party patents of which we are currently unaware with claims to technologies, methods of manufacture or methods for treatment related to the use or manufacture of our product candidates. Because patent applications can take many years to issue, there may be currently pending patent applications that may later result in issued patents that our product candidates may infringe. In addition, third parties may obtain patents in the future and claim that use of our technologies infringes upon these patents.

Numerous third-party U.S. and foreign issued patents and pending patent applications exist in the fields in which we are developing product candidates. Our product candidates make use of CRISPR-based technology, which is a field that is highly active for patent filings. In November 2018, it was reported that 211 patent families and 1835 patent family members worldwide referenced CRISPR or Cas in the title, abstracts or claims. The extensive patent filings related to CRISPR and Cas make it difficult for us to assess the full extent of relevant patents and pending applications that may cover our base editing platform technology and product candidates and their use or manufacture. 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 base editing platform technology and product candidates. For example, we are aware of a patent portfolio that is co-owned by the University of California, University of Vienna and Emmanuelle Charpentier, or the University of California Portfolio, which contains multiple patents and pending applications directed to gene editing. The University of California portfolio includes, for example, U.S. Patent Nos. 10,266,850; 10,227,611; 10,000,772; 10,113,167; 10,301,651; 10,308,961; 10,337,029; 10,351,878; 10,407,697; 10,358,659; 10,358,658; 10,385,360; 10,400,253; 10,421,980; 10,415,061; 10,443,076; 10,487,341; 10,513,712; 10,519,467; 10,526,619, which are expected to expire around March 2033, excluding any additional term for patent term adjustment, or PTA, or patent term extension, or PTE, and any disclaimed term for terminal disclaimers. The University of California portfolio also includes U.S. pre-grant patent publications 20190264233, 20190264235, 20190264236, 20190271008, and 20190256871, which are indicated as in condition for allowance by the USPTO, as well as numerous additional pending patent applications. If these patent applications issue as patents, they are expected to expire around March 2033, excluding any PTA, PTE, and any disclaimed term for terminal disclaimers. As discussed above, certain applications in the University of California Portfolio are currently subject to U.S. Interference No. 106,115 with certain U.S. patents and one U.S. patent application that are co-owned by the Boston Licensing Parties to which we have an option under the Editas License Agreement. Although we have an option to exclusively license certain patents and patent applications directed to Cas9 and Cas12a from Editas, who in turn has licensed such patents from various academic institutions including Broad Institute, we do not currently have a license to such patents and patent applications. Certain members of the University of California Portfolio are being

opposed in Europe by multiple parties. For example, the EPO Opposition Division has initiated opposition proceedings against European Patent Nos. EP3,241,902 B1 and EP2,800,811 B1, which are estimated to expire in March 2033 (excluding any patent term adjustments or extensions). In addition, notices of opposition have also been filed by several third parties against European Patent No. EP3,401,400 B1, which is estimated to expire in March 2033 (excluding any patent term adjustments or extensions). The opposition procedure before the EPO allows one or more third parties to challenge the validity of a granted European patent within nine months after grant date of the European patent. Opposition proceedings may involve issues including, but not limited to, priority, patentability of the claims involved, and procedural formalities related to the filing of the patent application. As a result of the opposition proceedings, the Opposition Division can revoke a patent, maintain the patent as granted, or maintain the patent in an amended form. It is uncertain when or in what manner the Opposition Division will act on the opposition proceedings of European patent EP3,241,902 B1 and how oppositions filed against EP3,401,400 B1 will be resolved. Most of the claims of European patent EP 2,800,811 B1 were maintained without amendment by the Opposition Division, but this decision is being appealed. If these patents are maintained by the Opposition Division with claims similar to those that are currently opposed, our ability to commercialize our product candidates may be adversely affected if we do not obtain a license to these patents. We may not be able to obtain any required license on commercially reasonable terms or at all. Even if we were able to obtain a license, it could be nonexclusive, thereby giving our competitors and other third parties access to the same technologies licensed to us, and it could require us to make substantial licensing and royalty payments. If we are unable to obtain a necessary license to a third-party patent on commercially reasonable terms, we may be unable to commercialize our base editing platform technology or product candidates or such commercialization efforts may be significantly delayed, which could in turn significantly harm our business.

Numerous other patents and patent applications have been filed by other third parties directed to gene editing, guide nucleic acids, PAM sequence variants, split inteins, Cas12b or gene editing in the context of immune therapy or chimeric antigen receptors.

Because of the large number of patents issued and patent applications filed in our field, third parties may allege they have patent rights encompassing our product candidates, technologies or methods. Third parties may assert that we are employing their proprietary technology without authorization and may file patent infringement claims or lawsuit against us, and if we are found to infringe such third-party patents, we may be required to pay damages, cease commercialization of the infringing technology, or obtain a license from such third parties, which may not be available on commercially reasonable terms or at all.

Our ability to commercialize our product candidates in the United States and abroad may be adversely affected if we cannot obtain a license on commercially reasonable terms to relevant third-party patents that cover our product candidates or base editing platform technology. Even if we believe third-party intellectual property claims are without merit, there is no assurance that a court would find in our favor on questions of infringement, validity, enforceability, or priority. A court of competent jurisdiction could hold that these third-party patents are valid, enforceable, and infringed, which could materially and adversely affect our ability to commercialize any product candidates we may develop and any other product candidates or technologies covered by the asserted third-party patents. In order to successfully challenge the validity of any such U.S. patent in federal court, we would need to overcome a presumption of validity. As this burden is a high one requiring us to present clear and convincing evidence as to the invalidity of any such U.S. patent claim, there is no assurance that a court of competent jurisdiction would invalidate the claims of any such U.S. patent. If we are found to infringe a third party's intellectual property rights, and we are unsuccessful in demonstrating that such patents are invalid or unenforceable, we could be required to obtain a license from such third party to continue developing, manufacturing, and marketing any product candidates we may develop and our technology. However, we may not be able to obtain any required license on commercially reasonable terms or at all. Even if we were able to obtain a license, it could be non-exclusive, thereby giving our competitors and other third parties access to the same technologies licensed to us, and it could require us to make substantial licensing and royalty payments. If we are unable to obtain a necessary license to a third-party patent on commercially reasonable terms, we may be unable to commercialize our base editing platform technology or product candidates or such commercialization efforts may be significantly delayed, which could in turn significantly harm our business. We also could be forced, including by court order, to cease developing, manufacturing, and commercializing the infringing technology or product candidates. In addition, we could be found liable for significant monetary damages, including treble damages and attorneys' fees, if we are found to have willfully infringed a patent or other intellectual property right. Claims that we have misappropriated the confidential information or trade secrets of third parties could have a similar material adverse effect on our business, financial condition, results of operations, and prospects.

Defense of third-party claims of infringement of misappropriation, or violation of intellectual property rights involves substantial litigation expense and would be a substantial diversion of management and employee time and resources from our business. Some third parties may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. In addition, any uncertainties resulting from the initiation and continuation of any litigation could have a material adverse effect on our ability to raise the funds necessary to continue our operations or could otherwise have a material adverse effect on our business, financial condition, results of operations and prospects. There could also be public announcements of the results of hearings, motions, or other interim proceedings or developments, and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Any of the foregoing events could have a material adverse effect on our business, financial condition, results of operations and prospects.

We may become involved in lawsuits to protect or enforce our future patents or the patents of our licensors, which could be expensive, time consuming, and unsuccessful and could result in a finding that such patents are unenforceable or invalid.

Competitors may infringe our future patents or the patents of our licensing partners, or we may be required to defend against claims of infringement. In addition, our future patents or the patents of our licensing partners also are, and may in the future become, involved in inventorship, priority, validity or enforceability disputes. Countering or defending against such claims can be expensive and time consuming. In an infringement proceeding, a court may decide that a patent owned or in-licensed by us is invalid or unenforceable, or may refuse to stop the other party from using the technology at issue on the grounds that our owned and in-licensed patents do not cover the technology in question. An adverse result in any litigation proceeding could put one or more of our owned or in-licensed patents at risk of being invalidated or interpreted narrowly.

In patent litigation in the United States, defendant counterclaims alleging invalidity and/or unenforceability are commonplace, and there are numerous grounds upon which a third party can assert invalidity or unenforceability of a patent. Third parties may also raise similar claims before administrative bodies in the United States or abroad, even outside the context of litigation. These types of mechanisms include re-examination, post-grant review, *inter partes* review, interference proceedings, derivation proceedings, and equivalent proceedings in foreign jurisdictions (e.g., opposition proceedings). These types of proceedings could result in revocation or amendment to our patents such that they no longer cover our product candidates. The outcome for any particular patent following legal assertions of invalidity and unenforceability is unpredictable. With respect to the validity question, for example, we cannot be certain that there is no invalidating prior art, of which we, our licensors, our patent counsel and the patent examiner were unaware during prosecution. If a defendant were to prevail on a legal assertion of invalidity and/or unenforceability, or if we are otherwise unable to adequately protect our rights, we would lose at least part, and perhaps all, of the patent protection on our technology and/or product candidates. Defense of these types of claims, regardless of their merit, would involve substantial litigation expense and would be a substantial diversion of employee resources from our business.

Conversely, we may choose to challenge the patentability of claims in a third party's U.S. patent by requesting that the USPTO review the patent claims in re-examination, post-grant review, *inter partes* review, interference proceedings, derivation proceedings, and equivalent proceedings in foreign jurisdictions (e.g., opposition proceedings). We are currently challenging, and in the future may choose to challenge, third party patents in patent opposition proceedings in the EPO or another foreign patent office. Even if successful, the costs of these opposition proceedings could be substantial, and may consume our time or other resources. If we fail to obtain a favorable result at the USPTO, EPO or other patent office then we may be exposed to litigation by a third party alleging that the patent may be infringed by our product candidates, base editing platform technology or other or proprietary technologies.

For example, as discussed above, elements of the University of California patent portfolio are being opposed in Europe by multiple parties and we are participating in the opposition proceedings. The EPO Opposition Division, or the Opposition Division, has initiated opposition proceedings against European patents estimated to expire in March 2033 (excluding any patent term adjustments or extensions) and co-owned by the University of California. The opposition procedure before the EPO allows one or more third parties to challenge the validity of a granted European patent within nine months after grant date of the European patent. Opposition proceedings may involve issues including, but not limited to, priority, patentability of the claims involved, and procedural formalities related to the filing of the patent application. As a result of the opposition proceedings, the Opposition Division can revoke a patent, maintain the patent as granted, or maintain the patent in an amended form. It is uncertain when or in what manner the Opposition Division will act on the opposition proceedings of these European patents. If these patents are maintained by the Opposition Division with claims similar to those that are currently opposed, our ability to commercialize our product candidates may be adversely affected if we do not obtain a license to these patents. We may not be able to obtain any required license on commercially reasonable terms or at all. Even if we were able to obtain a license, it could be nonexclusive, thereby giving our competitors and other third parties access to the same technologies licensed to us, and it could require us to make substantial licensing and royalty payments. If we are unable to obtain a necessary license to a third-party patent on commercially reasonable terms, we may be unable to commercialize our base editing platform technology or product candidates or such commercialization efforts may be significantly delayed, which could in turn significantly harm our business.

Even if resolved in our favor, litigation or other legal proceedings relating to intellectual property claims may cause us to incur significant expenses and could distract our personnel from their normal responsibilities. Furthermore, because of the substantial amount of discovery required in connection with intellectual property litigation, there is a risk that some of our confidential information could be compromised by disclosure during this type of litigation. In addition, there could be public announcements of the results of hearings, motions, or other interim proceedings or developments, and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. Such litigation or proceedings could substantially increase our operating losses and reduce the resources available for development activities or any future sales, marketing, or distribution activities. We may not have sufficient financial or other resources to conduct such litigation or proceedings adequately. Some of our competitors may be able to sustain the costs of such litigation or proceedings more effectively than we can because of their greater financial resources and more mature and developed intellectual property portfolios. Uncertainties resulting from the initiation and continuation of patent litigation or other proceedings could have a material adverse effect on our ability to compete in the marketplace.

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

Periodic maintenance fees, renewal fees, annuity fees, and various other government fees on patents and applications are due to be paid to the USPTO and foreign patent agencies outside of the United States over the lifetime of our owned or licensed patents and applications. In certain circumstances, we rely on our licensing partners to pay these fees due to U.S. and non-U.S. patent agencies. The USPTO and foreign patent agencies require compliance with several procedural, documentary, fee payment, and other similar provisions during the patent application process. We are also dependent on our licensors to take the necessary action to comply with these requirements with respect to our licensed intellectual property. While an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with the applicable rules, there are situations, however, in which non-compliance can result a partial or complete loss of patent rights in the relevant jurisdiction. Were a noncompliance event to occur, our competitors might be able to enter the market with similar or identical products or technology, which could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Changes in patent law in the United States and in non-U.S. jurisdictions could diminish the value of patents in general, thereby impairing our ability to protect our base editing platform technology and product candidates.

As is the case with other biotech and pharmaceutical companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biopharmaceutical industry involve 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 could increase the uncertainties and costs surrounding the prosecution of patent applications and the enforcement or defense of our issued patents. For example, in March 2013, under the Leahy-Smith America Invents Act, or the America Invents Act, the United States transitioned from a “first to invent” to a “first-to-file” patent system. Under a “first-to-file” system, assuming that other requirements for patentability are met, the first inventor to file a patent application generally will be entitled to a patent on an invention regardless of whether another inventor had made the invention earlier. A third party that files a patent application in the USPTO after March 2013, but before us could therefore be awarded a patent covering an invention of ours even if we had made the invention before it was made by such third party. This will require us to be cognizant going forward of the time from invention to filing of a patent application. Since patent applications in the United States and most other countries are confidential for a period of time after filing or until issuance, we cannot be certain that we or our licensors were the first to either file any patent application related to our technology or product candidates or invent any of the inventions claimed in our or our licensor’s patents or patent applications. The America Invents Act also includes a number of other significant changes to U.S. patent law, including provisions that affect the way patent applications will be prosecuted, allowing third party submission of prior art and establish a new post-grant review system including post-grant review, *inter partes* review, and derivation proceedings. Because of a lower evidentiary standard in USPTO proceedings compared to the evidentiary standard in United States federal courts necessary to invalidate a patent claim, a third party could potentially provide evidence in a USPTO proceeding sufficient for the USPTO to hold a claim invalid even though the same evidence would be insufficient to invalidate the claim if first presented in a district court action. Accordingly, a third party may attempt to use the USPTO procedures to invalidate our patent claims that would not have been invalidated if first challenged by the third party as a defendant in a district court action. The effects of these changes are currently unclear as the USPTO continues to promulgate new regulations and procedures in connection with the America Invents Act and many of the substantive changes to patent law, including the “first-to-file” provisions, only became effective in March 2013. In addition, the courts have yet to address many of these provisions and the applicability of the act and new regulations on the specific patents discussed in this filing have not been determined and would need to be reviewed. However, the America Invents Act and its implementation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents.

In addition, recent U.S. Supreme Court rulings have narrowed the scope of patent protection available in certain circumstances and weakened the rights of patent owners in certain situations. In addition to increasing uncertainty with regard to our ability to obtain patents in the future, this combination of events has created uncertainty with respect to the validity and enforceability of patents, once obtained. Depending on future actions by the U.S. Congress, the federal courts, and the USPTO, the laws and regulations governing patents could change in unpredictable ways that could weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future. For example, in the case, *Assoc. for Molecular Pathology v. Myriad Genetics, Inc.*, the U.S. Supreme Court held that certain claims to DNA molecules are not patentable. We cannot predict how this and future decisions by the courts, the U.S. Congress or the USPTO may impact the value of our patents. Any similar adverse changes in the patent laws of other jurisdictions could also have a material adverse effect on our business, financial condition, results of operations and prospects.

Patent terms may be inadequate to protect our competitive position on our product candidates for an adequate amount of time.

Patents have a limited lifespan. The terms of individual patents depend upon the legal term for patents in the countries in which they are granted. In most countries, including the United States, if all maintenance fees are timely paid, the natural expiration of a patent is generally 20 years from its earliest non-provisional filing date in the applicable country. However, the actual protection afforded by a

patent varies from country to country, and depends upon many factors, including the type of patent, the scope of its coverage, the availability of regulatory-related extensions, the availability of legal remedies in a particular country and the validity and enforceability of the patent. Various extensions including PTE and PTA, may be available, but the life of a patent, and the protection it affords, is limited. For more information regarding PTA and PTE, please see Item 1., *Business—Intellectual property*, in this Annual Report on Form 10-K. Even if patents covering our product candidates are obtained, once the patent life has expired, we may be open to competition from competitive products, including generics. Given the amount of time required for the development, testing and regulatory review of new product candidates, patents protecting our product candidates might expire before or shortly after we or our partners commercialize those candidates. As a result, our owned and licensed patent portfolio may not provide us with sufficient rights to exclude others from commercializing products similar or identical to ours.

If we do not obtain PTE and data exclusivity for any product candidates we may develop, our business may be materially harmed.

Depending upon the timing, duration and specifics of any FDA marketing approval of any product candidates we may develop, one or more of our U.S. patents may be eligible for limited PTE under the Drug Price Competition and Patent Term Restoration Act of 1984, or the Hatch-Waxman Amendments. The Hatch-Waxman Amendments PTE term of up to five years as compensation for patent term lost during the FDA regulatory review process. A PTE cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval, only one patent per product may be extended and only those claims covering the approved drug, a method for using it, or a method for manufacturing it may be extended. However, even if we were to seek a PTE, it may not be granted because of, for example, the failure to exercise due diligence during the testing phase or regulatory review process, the failure to apply within applicable deadlines, the failure to apply prior to expiration of relevant patents, or any other failure 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 PTE or term of any such extension is less than we request, 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.

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

In addition to seeking patents for our technology and product candidates, we also rely on know-how and trade secret protection, as well as confidentiality agreements, non-disclosure agreements and invention assignment agreements with our employees, consultants and third-parties, to protect our confidential and proprietary information, especially where we do not believe patent protection is appropriate or obtainable.

It is our policy to require our employees, corporate collaborators, outside scientific collaborators, CROs, contract manufacturers, consultants, advisors, and other third parties to execute confidentiality agreements upon the commencement of employment or consulting relationships with us. These agreements provide that all confidential information concerning our business or financial affairs developed by or made known to the individual or entity during the course of the party's relationship with us is to be kept confidential and not disclosed to third parties, except in certain specified circumstances. In the case of employees, the agreements provide that all inventions conceived by the individual, and that are related to our current or planned business or research and development or made during normal working hours, on our premises or using our equipment or proprietary information, are our exclusive property. In the case of consultants and other third parties, the agreements provide that all inventions conceived in connection with the services provided are our exclusive property. However, we cannot guarantee that we have entered into such agreements with each party that may have or have had access to our trade secrets or proprietary technology and processes. Additionally, the assignment of intellectual property rights may not be self-executing, or the assignment agreements may be breached, and we may be forced to bring claims against third parties, or defend claims that they may bring against us, to determine the ownership of what we regard as our intellectual property. Any of these parties may breach the agreements and disclose our proprietary information, including our trade secrets, and we may not be able to obtain adequate remedies for such breaches. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret is difficult, expensive, and time-consuming, and the outcome is unpredictable.

In addition to contractual measures, we try to protect the confidential nature of our proprietary information through other appropriate precautions, such as physical and technological security measures. However, trade secrets and know-how can be difficult to protect. These measures may not, for example, in the case of misappropriation of a trade secret by an employee or third party with authorized access, provide adequate protection for our proprietary information. Our security measures may not prevent an employee or consultant from misappropriating our trade secrets and providing them to a competitor, and any recourse we might take against this type of misconduct may not provide an adequate remedy to protect our interests fully. In addition, trade secrets may be independently developed by others in a manner that could prevent us from receiving legal recourse. If any of our confidential or proprietary information, such as our trade secrets, were to be disclosed or misappropriated, or if any of that information was independently developed by a competitor, our competitive position could be harmed.

In addition, some courts inside and outside the United States are sometimes less willing or unwilling to protect trade secrets. If we choose to go to court to stop a third party from using any of our trade secrets, we may incur substantial costs. Even if we are

successful, these types of lawsuits may consume our time and other resources. Any of the foregoing could have a material adverse effect on our business, financial condition, results of operations and prospects.

Third parties may assert that our employees, consultants, or advisors have wrongfully used or disclosed confidential information or misappropriated trade secrets.

As is common in the biotechnology and pharmaceutical industries, we employ individuals that are currently or were previously employed at universities, research institutions or other biotechnology or pharmaceutical companies, including our competitors or potential competitors. Although we try to ensure that our employees, consultants, and advisors do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or these individuals have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of any such individual's current or former employer. Also, we have in the past and may in the future be subject to claims that these individuals are violating non-compete agreements with their former employers. We may then have to pursue litigation to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to our technical and management personnel from their normal responsibilities. In addition, there could be public announcements of the results of hearings, motions or other interim proceedings or developments, and, if securities analysts or investors perceive these results to be negative, that perception could have a substantial adverse effect on the price of our common stock. This type of litigation or proceeding could substantially increase our operating losses and reduce our resources available for development activities, and we may not have sufficient financial or other resources to adequately conduct this type of litigation or proceedings. For example, some of our competitors may be able to sustain the costs of this type of litigation or proceedings more effectively than we can because of their substantially greater financial resources. In any case, uncertainties resulting from the initiation and continuation of intellectual property litigation or other intellectual property related proceedings could adversely affect our ability to compete in the marketplace.

If our trademarks and trade names are not adequately protected, then we may not be able to build name recognition in our markets of interest and our business may be adversely affected.

Our registered or unregistered trademarks or trade names may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. We may not be able to protect our rights to these trademarks and trade names, which we need to build name recognition among potential partners or customers in our markets of interest. At times, competitors or other third parties may adopt trade names or trademarks similar to ours, thereby impeding our ability to build brand identity and possibly leading to market confusion. In addition, there could be potential trade name or trademark infringement claims brought by owners of other registered trademarks or trademarks that incorporate variations of our registered or unregistered trademarks or trade names. Over the long term, if we are unable to establish name recognition based on our trademarks and trade names, then we may not be able to compete effectively, and our business may be adversely affected. Our efforts to enforce or protect our proprietary rights related to trademarks, trade secrets, domain names, copyrights or other intellectual property may be ineffective and could result in substantial costs and diversion of resources and could adversely affect our business, financial condition, results of operations and growth prospects.

Intellectual property rights do not necessarily address all potential threats.

The degree of future protection afforded by our intellectual property rights is uncertain because intellectual property rights have limitations and may not adequately protect our business or permit us to maintain our competitive advantage. For example:

- any product candidates we may develop will eventually become commercially available in generic or biosimilar product forms;
- others may be able to make gene therapy products that are similar to any product candidates we may develop or utilize similar base editing technology but that are not covered by the claims of the patents that we license or may own in the future;
- we, or our license partners or current or future collaborators, might not have been the first to make the inventions covered by the issued patent or pending patent application that we license or may own in the future;
- we, or our license partners or current or future collaborators, might not have been the first to file patent applications covering certain of our or their inventions;
- we, or our license partners or current or future collaborators, may fail to meet our obligations to the U.S. government regarding any in-licensed patents and patent applications funded by U.S. government grants, leading to the loss or unenforceability of patent rights;
- others may independently develop similar or alternative technologies or duplicate any of our technologies without infringing our owned or licensed intellectual property rights;
- it is possible that our pending, owned or licensed patent applications or those that we may own in the future will not lead to issued patents;

- it is possible that there are prior public disclosures that could invalidate our owned or in-licensed patents, or parts of our owned or in-licensed patents;
- it is possible that there are unpublished applications or patent applications maintained in secrecy that may later issue with claims covering our product candidates or technology similar to ours;
- it is possible that our owned or in-licensed patents or patent applications omit individual(s) that should be listed as inventor(s) or include individual(s) that should not be listed as inventor(s), which may cause these patents or patents issuing from these patent applications to be held invalid or unenforceable;
- issued patents that we hold rights to may be held invalid, unenforceable, or narrowed in scope, including as a result of legal challenges by our competitors;
- the claims of our owned or in-licensed issued patents or patent applications, if and when issued, may not cover our product candidates;
- the laws of foreign countries may not protect our proprietary rights or the proprietary rights of license partners or current or future collaborators to the same extent as the laws of the United States;
- the inventors of our owned or in-licensed patents or patent applications may become involved with competitors, develop products or processes that design around our patents, or become hostile to us or the patents or patent applications on which they are named as inventors;
- our competitors might conduct research and development activities in countries where we do not have patent rights and then use the information learned from such activities to develop competitive products for sale in our major commercial markets;
- we have engaged in scientific collaborations in the past and will continue to do so in the future and our collaborators may develop adjacent or competing products that are outside the scope of our patents;
- we may not develop additional proprietary technologies that are patentable;
- any product candidates we develop may be covered by third parties' patents or other exclusive rights;
- the patents of others may harm our business; or
- we may choose not to file a patent in order to maintain certain trade secrets or know-how, and a third party may subsequently file a patent covering such intellectual property.

Should any of these events occur, they could have a material adverse effect on our business, financial condition, results of operations, and prospects.

Risks related to regulatory and other legal compliance matters

Even if we complete the necessary preclinical studies and clinical trials, the marketing approval process is expensive, time-consuming, and uncertain and may prevent us from obtaining approvals for the commercialization of any product candidates we may develop. If we are not able to obtain, or if there are delays in obtaining, required regulatory approvals, we will not be able to commercialize, or will be delayed in commercializing, product candidates we may develop, and our ability to generate revenue will be materially impaired.

Any product candidates we may develop and the activities associated with their development and commercialization, including their design, testing, manufacture, recordkeeping, labeling, storage, approval, advertising, promotion, sale, import, export, and distribution, are subject to comprehensive regulation by the FDA, the EMA and other regulatory authorities in the United States and by comparable authorities in other countries. Failure to obtain marketing approval for a product candidate will prevent us from commercializing the product candidate in a given jurisdiction. We have not received approval to market any product candidates from regulatory authorities in any jurisdiction. We have only limited experience in filing and supporting the applications necessary to gain marketing approvals and expect to rely on third parties to assist us in this process. Securing regulatory approval requires the submission of extensive preclinical and clinical data and supporting information to the various regulatory authorities for each therapeutic indication to establish the biological product candidate's safety, purity, and potency. Securing regulatory approval also requires the submission of extensive information about the product manufacturing process, and inspection of manufacturing facilities by, the relevant regulatory authority. Any product candidates we develop may not be effective, may be only moderately effective, or may prove to have undesirable or unintended side effects, toxicities, or other characteristics that may preclude our obtaining marketing approval or prevent or limit commercial use.

The process of obtaining marketing approvals, both in the United States and abroad, is expensive, may take many years if approval is obtained at all, and can vary substantially based upon a variety of factors, including the type, complexity, and novelty of the product candidates involved. Changes in marketing approval policies during the development period, changes in or the enactment of additional

statutes or regulations, or changes in regulatory review for each submitted product application, may cause delays in the approval or rejection of an application. The FDA and comparable authorities in other countries have substantial discretion in the approval process and may refuse to accept any application or may decide that our data is insufficient for approval and require additional preclinical, clinical, or other studies. In addition, varying interpretations of the data obtained from preclinical and clinical testing could delay, limit, or prevent marketing approval of a product candidate. Any marketing approval we ultimately obtain may be limited or subject to restrictions or post-approval commitments that render the approved medicine not commercially viable.

If we experience delays in obtaining approval or if we fail to obtain approval of any product candidates we may develop, the commercial prospects for those product candidates may be harmed, and our ability to generate revenues will be materially impaired.

Failure to obtain marketing approval in foreign jurisdictions would prevent any product candidates we may develop from being marketed in such jurisdictions, which, in turn, would materially impair our ability to generate revenue.

In order to market and sell any product candidates we may develop in the EU and other foreign jurisdictions, we or our third-party collaborators must obtain separate marketing approvals (a single one for the EU) and comply with numerous and varying regulatory requirements. The approval procedure varies among countries and can involve additional testing. The time required to obtain approval may differ substantially from that required to obtain FDA approval. The regulatory approval process outside the United States generally includes all of the risks associated with obtaining FDA approval. In addition, in many countries outside the United States, it is required that the product candidate be approved for reimbursement before the product candidate can be approved for sale in that country. We or these third parties may not obtain approvals from regulatory authorities outside the United States on a timely basis, if at all. Approval by the FDA does not ensure approval by regulatory authorities in other countries or jurisdictions, and approval by one regulatory authority outside the United States does not ensure approval by regulatory authorities in other countries or jurisdictions or by the FDA. We may not be able to file for marketing approvals and may not receive necessary approvals to commercialize our medicines in any jurisdiction, which would materially impair our ability to generate revenue.

The withdrawal of the U.K. from the EU occurred on January 31, 2020, which is commonly known as “Brexit.” A “transition period” through December 31, 2020 has been established to allow the United Kingdom and EU to negotiate the terms of the United Kingdom’s.

Since the regulatory framework for pharmaceutical products in the U.K. relating to quality, safety and efficacy of pharmaceutical products, clinical trials, marketing authorization, commercial sales and distribution of pharmaceutical products is derived from EU directives and regulations, Brexit will materially impact the future regulatory regime which applies to products and the approval of product candidates in the U.K.. In the first instance, a separate U.K. authorization from any centralized authorization for the EU would need to be applied before the end of any agreed transition period. In the immediately foreseeable future, the process is likely to remain very similar to that applicable in the EU, albeit that the processes for applications will be separate. Longer term, the U.K. is likely to develop its own legislation that diverges from that in the EU.

Even if we, or any collaborators we may have, obtain marketing approvals for any product candidates we develop, the terms of approvals and ongoing regulation of our product candidates could require the substantial expenditure of resources and may limit how we, or they, manufacture and market our product candidates, which could materially impair our ability to generate revenue.

Any product candidate for which we obtain marketing approval, along with the manufacturing processes, post-approval clinical data, labeling, advertising, and promotional activities for such medicine, will be subject to continual requirements of and review by the FDA, EMA and other regulatory authorities. These requirements include submissions of safety and other post-marketing information and reports, facility registration and drug listing requirements, cGMP requirements relating to quality control, quality assurance and corresponding maintenance of records and documents, and requirements regarding the distribution of samples to physicians and recordkeeping. Even if marketing approval of a product candidate is granted, the approval may be subject to limitations on the indicated uses for which the medicine may be marketed or to the conditions of approval, or contain requirements for costly post-marketing testing and surveillance to monitor the safety or efficacy of the medicine.

Accordingly, assuming we, or any collaborators we may have, receive marketing approval for one or more product candidates we develop, we, and such collaborators, and our and their contract manufacturers will continue to expend time, money, and effort in all areas of regulatory compliance, including manufacturing, production, product surveillance, and quality control. If we and such collaborators are not able to comply with post-approval regulatory requirements, we and such collaborators could have the marketing approvals for our products withdrawn by regulatory authorities and our, or such collaborators’, ability to market any future products could be limited, which could adversely affect our ability to achieve or sustain profitability. Further, the cost of compliance with post-approval regulations may have a negative effect on our business, operating results, financial condition, and prospects.

Any product candidate for which we obtain marketing approval could be subject to restrictions or withdrawal from the market, and we may be subject to substantial penalties if we fail to comply with regulatory requirements or if we experience unanticipated problems with our medicines, when and if any of them are approved.

The FDA, the EMA, and other regulatory agencies closely regulate the post-approval marketing and promotion of medicines to ensure that they are marketed only for the approved indications and in accordance with the provisions of the approved labeling. The FDA, the

EMA and other regulatory agencies impose stringent restrictions on manufacturers' communications regarding off-label use, and if we market our medicines for off-label use, we may be subject to enforcement action for off-label marketing by the FDA and other federal and state enforcement agencies, including the Department of Justice. Violation of the Federal Food, Product, and Cosmetic Act and other statutes, including the False Claims Act, and equivalent legislation in other countries relating to the promotion and advertising of prescription products may also lead to investigations or allegations of violations of federal and state and other countries' health care fraud and abuse laws and state consumer protection laws. Even if it is later determined we were not in violation of these laws, we may be faced with negative publicity, incur significant expenses defending our actions and have to divert significant management resources from other matters.

In addition, later discovery of previously unknown problems with our medicines, manufacturers, or manufacturing processes, or failure to comply with regulatory requirements, may yield various negative consequences, including:

- restrictions on such medicines, manufacturers, or manufacturing processes;
- restrictions on the labeling or marketing of a medicine;
- restrictions on the distribution or use of a medicine;
- requirements to conduct post-marketing clinical trials;
- receipt of warning or untitled letters;
- withdrawal of the medicines from the market;
- refusal to approve pending applications or supplements to approved applications that we submit;
- recall of medicines;
- fines, restitution, or disgorgement of profits or revenue;
- restrictions on future procurements with governmental authorities;
- suspension or withdrawal of marketing approvals;
- suspension of any ongoing clinical trials;
- refusal to permit the import or export of our medicines;
- product seizure; and
- injunctions or the imposition of civil or criminal penalties.

Any government investigation of alleged violations of law could require us to expend significant time and resources in response and could generate negative publicity. The occurrence of any event or penalty described above may inhibit our ability to commercialize any product candidates we may develop and adversely affect our business, financial condition, results of operations, and prospects.

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

Healthcare providers, physicians, and third-party payors play a primary role in the recommendation and prescription of any product candidates that we may develop for which we obtain marketing approval. Our future arrangements with third-party payors and customers may expose us to broadly applicable fraud and abuse and other healthcare laws and regulations that may constrain the business or financial arrangements and relationships through which we market, sell, and distribute our medicines for which we obtain marketing approval. Restrictions under applicable federal and state healthcare laws and regulations, including certain laws and regulations applicable only if we have marketed products, include the following:

- federal false claims, false statements and civil monetary penalties laws prohibiting, among other things, any person from knowingly presenting, or causing to be presented, a false claim for payment of government funds or knowingly making, or causing to be made, a false statement to get a false claim paid;
- federal healthcare program anti-kickback law, which prohibits, among other things, persons from soliciting, receiving or providing remuneration, directly or indirectly, to induce either the referral of an individual, for an item or service or the purchasing or ordering of a good or service, for which payment may be made under federal healthcare programs such as Medicare and Medicaid;

- the federal Health Insurance Portability and Accountability Act of 1996, or HIPAA, which, in addition to privacy protections applicable to healthcare providers and other entities, prohibits executing a scheme to defraud any healthcare benefit program or making false statements relating to healthcare matters;

- the federal Food, Drug, and Cosmetic Act, or the FDCA, which among other things, strictly regulates drug marketing, prohibits manufacturers from marketing such products for off-label use and regulates the distribution of samples;

- 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 under the Healthcare Reform Act, which requires pharmaceutical and medical device companies to monitor and report certain financial interactions with certain healthcare providers to the Center for Medicare & Medicaid Services within the U.S. Department of Health and Human Services for re-disclosure to the public, as well as ownership and investment interests held by physicians and their immediate family members; and

- analogous state and foreign laws and regulations, such as state anti-kickback, anti-bribery and false claims laws, which may apply to healthcare items or services that are reimbursed by non-governmental third-party payors, including private insurers.

Some state laws also require pharmaceutical companies to comply with specific compliance standards, restrict financial interactions between pharmaceutical companies and healthcare providers or require pharmaceutical companies to report information related to payments to health care providers or marketing expenditures.

Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. Given the breadth of the laws and regulations, limited guidance for certain laws and regulations and evolving government interpretations of the laws and regulations, governmental authorities may possibly conclude that our business practices may not comply with healthcare laws and regulations. If our operations are found to be in violation of any of the laws described above or any other government regulations that apply to us, we may be subject to penalties, including civil and criminal penalties, damages, fines, exclusion from participation in government health care programs, such as Medicare and Medicaid, imprisonment, and the curtailment or restructuring of our operations, any of which could adversely affect our business, financial condition, results of operations, and prospects.

The provision of benefits or advantages to physicians to induce or encourage the prescription, recommendation, endorsement, purchase, supply, order, or use of medicinal products is prohibited in the EU. The provision of benefits or advantages to physicians is also governed by the national anti-bribery laws of EU Member States, such as the U.K. Bribery Act 2010. Infringement of these laws could result in substantial fines and imprisonment.

Payments made to physicians in certain EU Member States must be publicly disclosed. Moreover, agreements with physicians often must be the subject of prior notification and approval by the physician's employer, his or her competent professional organization, and/or the regulatory authorities of the individual EU Member States. These requirements are provided in the national laws, industry codes, or professional codes of conduct applicable in the EU Member States. Failure to comply with these requirements could result in reputational risk, public reprimands, administrative penalties, fines or imprisonment.

The efforts of the Trump Administration to pursue regulatory reform may limit the FDA's ability to engage in oversight and implementation activities in the normal course, and that could negatively impact our business.

The Trump Administration has taken several executive actions, including the issuance of a number of executive orders, that could impose significant burdens on, or otherwise materially delay, the FDA's ability to engage in routine regulatory and oversight activities such as implementing statutes through rulemaking, issuance of guidance. On January 30, 2017, President Trump issued an executive order, applicable to all executive agencies, including the FDA, that requires that for each notice of proposed rulemaking or final regulation to be issued in fiscal year 2017, the agency shall identify at least two existing regulations to be repealed, unless prohibited by law. These requirements are referred to as the "two-for-one" provisions. This executive order includes a budget neutrality provision that requires the total incremental cost of all new regulations in the 2017 fiscal year, including repealed regulations, to be no greater than zero, except in limited circumstances. For fiscal years 2018 and beyond, the executive order requires agencies to identify regulations to offset any incremental cost of a new regulation. In interim guidance issued by the Office of Information and Regulatory Affairs within the Office of Management and on February 2, 2017, the administration indicates that the "two-for-one" provisions may apply not only to agency regulations, but also to significant agency guidance documents. It is difficult to predict how these requirements will be implemented, and the extent to which they will impact the FDA's ability to exercise its regulatory authority. If these executive actions impose constraints on FDA's ability to engage in oversight and implementation activities in the normal course, our business may be negatively impacted.

Healthcare and other reform legislation may increase the difficulty and cost for us and any collaborators we may have to obtain marketing approval of and commercialize any product candidates we may develop and affect the prices we, or they, may obtain.

In the United States and some foreign jurisdictions, there have been and continue to be ongoing efforts to implement legislative and regulatory changes regarding the healthcare system. Such changes could prevent or delay marketing approval of any product candidates that we may develop, restrict or regulate post-approval activities, and affect our ability to profitably sell any product candidates for which we obtain marketing approval. Although we cannot predict what healthcare or other reform efforts will be successful, such efforts may result in more rigorous coverage criteria, in additional downward pressure on the price that we, or our future collaborators, may receive for any approved products or in other consequences that may adversely affect our ability to achieve or maintain profitability.

Within the United States, the federal government and individual states have aggressively pursued healthcare reform, as evidenced by the passing of the Healthcare Reform Act and the ongoing efforts to modify or repeal that legislation. The Healthcare Reform Act substantially changed the way healthcare is financed by both governmental and private insurers and contains a number of provisions that affect coverage and reimbursement of drug products and/or that could potentially reduce the demand for pharmaceutical products such as increasing drug rebates under state Medicaid programs for brand name prescription drugs and extending those rebates to Medicaid managed care and assessing a fee on manufacturers and importers of brand name prescription drugs reimbursed under certain government programs, including Medicare and Medicaid. Other aspects of healthcare reform, such as expanded government enforcement authority and heightened standards that could increase compliance-related costs, could also affect our business. Modifications have been implemented under the Trump Administration and additional modifications or repeal may occur. There are, and may continue to be, judicial challenges. 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, and we cannot predict how future federal or state legislative, judicial or administrative changes relating to healthcare reform will affect our business.

Federal and state governments have shown significant interest in implementing cost-containment programs to limit the growth of government-paid healthcare costs, including price controls, waivers from Medicaid drug rebate law requirements, restrictions on reimbursement and requirements for substitution of generic products for branded prescription drugs. The private sector has also sought to control healthcare costs by limiting coverage or reimbursement or requiring discounts and rebates on products. We are unable to predict what additional legislation, regulations or policies, if any, relating to the healthcare industry or third-party coverage and reimbursement may be enacted in the future or what effect such legislation, regulations or policies would have on our business. Any cost containment measures could significantly decrease the available coverage and the price we might establish for our potential products, which would have an adverse effect on our net revenues and operating results.

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

Fast track, breakthrough, or regenerative medicine advanced therapy designation by the FDA may not actually lead to a faster development or regulatory review or approval process and does not assure FDA approval of any product candidates we may develop.

FDA's fast track, breakthrough, and regenerative medicine advanced therapy, or RMAT, programs are intended to expedite the development of certain qualifying products intended for the treatment of serious diseases and conditions. If a product candidate is intended for the treatment of a serious or life-threatening condition and preclinical or clinical data demonstrate the product's potential to address an unmet medical need for this condition, the sponsor may apply for FDA fast track designation. A product candidate may be designated as a breakthrough therapy if it is intended to treat a serious or life-threatening condition and preliminary clinical evidence indicates that the product candidate may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints. A product candidate may receive RMAT designation if it is a regenerative medicine therapy that is intended to treat, modify, reverse or cure a serious or life-threatening condition, and preliminary clinical evidence indicates that the product candidate has the potential to address an unmet medical need for such condition. While we may seek fast track, breakthrough, and/or RMAT designation, there is no guarantee that we will be successful in obtaining any such designation. Even if we do obtain such designation, we may not experience a faster development process, review or approval compared to conventional FDA procedures. A fast track, breakthrough, or RMAT designation does not ensure that the product candidate will receive marketing approval or that approval will be granted within any particular timeframe. In addition, the FDA may withdraw fast track, breakthrough, or RMAT designation if it believes that the designation is no longer supported by data from our clinical development

program. Fast track, breakthrough, and/or RMAT designation alone do not guarantee qualification for the FDA's priority review procedures.

Priority review designation by the FDA may not lead to a faster regulatory review or approval process and, in any event, does not assure FDA approval of any product candidates we may develop.

If the FDA determines that a product candidate is intended to treat a serious disease or condition and, if approved, would provide a significant improvement in the safety or effectiveness of the treatment, prevention, or diagnosis of such disease or condition, the FDA may designate the product candidate for priority review. A priority review designation means that the goal for the FDA to review a marketing application is six months from filing of the application, rather than the standard review period of ten months. We may request priority review for certain of our product candidates. The FDA has broad discretion with respect to whether or not to grant priority review status to a product candidate, so even if we believe a particular product candidate is eligible for such designation or status, the FDA may disagree and decide not to grant it. Moreover, a priority review designation does not necessarily mean a faster regulatory review process or necessarily confer any advantage with respect to approval compared to conventional FDA procedures. Receiving priority review from the FDA does not guarantee approval within the six-month review cycle or thereafter.

We may not be able to obtain orphan drug exclusivity for one or more of our product candidates, and even if we do, that exclusivity may not prevent the FDA or the EMA from approving other competing products.

Under the Orphan Drug Act, the FDA may designate a product candidate as an orphan drug if it is a drug or biologic intended to treat a rare disease or condition. A similar regulatory scheme governs approval of orphan product candidates by the EMA in the EU. 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 FDA or the EMA from approving another marketing application for another product candidate for the same orphan therapeutic indication for that time period. The applicable period is seven years in the United States and ten years in the EU. The exclusivity period in the EU can be reduced to six years if a product no longer meets the criteria for orphan drug designation, in particular if the product is sufficiently profitable so that market exclusivity is no longer justified.

The FDA's standards for granting orphan drug exclusivity in the gene therapy context are unclear and evolving. In order for the FDA to grant orphan drug exclusivity to one of our product candidates, the agency must find that the product candidate is indicated for the treatment of a condition or disease that affects fewer than 200,000 individuals in the United States or that affects more than 200,000 individuals in the United States and for which there is no reasonable expectation that the cost of developing and making the product candidate available for the disease or condition will be recovered from sales of the product in the United States. The FDA may conclude that the condition or disease for which we seek orphan drug exclusivity does not meet this standard. Even if we obtain orphan drug exclusivity for a product candidate, that exclusivity may not effectively protect the product candidate from competition because different product candidates can be approved for the same condition. In addition, even after an orphan drug is approved, the FDA can subsequently approve the same product candidate for the same condition if the FDA concludes that the later product candidate is clinically superior in that it is shown to be safer, more effective or makes a major contribution to patient care compared with the product that has orphan exclusivity. Orphan drug exclusivity may also 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 the patients with the rare disease or condition.

On August 3, 2017, the Congress passed the FDA Reauthorization Act of 2017, or FDARA. FDARA, among other things, codified the FDA's pre-existing regulatory interpretation, to require that a drug sponsor demonstrate the clinical superiority of an orphan drug that is otherwise the same as a previously approved drug for the same rare disease in order to receive orphan drug exclusivity. The new legislation reverses prior precedent holding that the Orphan Drug Act unambiguously requires that the FDA recognize the orphan exclusivity period regardless of a showing of clinical superiority.

On January 28. 2020, the FDA issued a draft guidance document describing its current thinking on when a gene therapy product is the "same" as another product for purposes of orphan exclusivity. Under the Draft Guidance, if either the transgene or vector differs between two gene therapy products in a manner that does not reflect "minor" differences, the two products would be considered different drugs for orphan drug exclusivity purposes. FDA will determine whether two vectors from the same viral class are the same on a case-by-case basis and may consider additional key features in assessing sameness. There remains significant ambiguity and uncertainty under FDA's draft guidance, and the FDA may further reevaluate the Orphan Drug Act and its regulations and policies. We do not know if, when, or how the FDA may change the orphan drug regulations and policies in the future, and it is uncertain how any changes might affect our business. Depending on what changes the FDA may make to its orphan drug regulations and policies, our business could be adversely impacted.

Our employees, principal investigators, consultants, and commercial partners may engage in misconduct or other improper activities, including non-compliance with regulatory standards and requirements and insider trading.

We are exposed to the risk of fraud or other misconduct by our employees, consultants, and commercial partners, and, if we commence clinical trials, our principal investigators. Misconduct by these parties could include intentional failures to comply with

FDA regulations or the regulations applicable in the EU and other jurisdictions, provide accurate information to the FDA, the EMA, and other regulatory authorities, comply with healthcare fraud and abuse laws and regulations in the United States and abroad, report financial information or data accurately, or disclose unauthorized activities to us. In particular, sales, marketing, and business arrangements in the healthcare industry are subject to extensive laws and regulations intended to prevent fraud, misconduct, kickbacks, self-dealing and other abusive practices. These laws and regulations restrict or prohibit a wide range of pricing, discounting, marketing and promotion, sales commission, customer incentive programs, and other business arrangements. Such misconduct also could involve the improper use of information obtained in the course of clinical trials or interactions with the FDA, the EMA or other regulatory authorities, which could result in regulatory sanctions and cause serious harm to our reputation. We have adopted a code of conduct applicable to all of our employees, but it is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent this activity may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from government investigations or other actions or lawsuits stemming from a failure to comply with these laws or regulations. If any such actions are instituted against us, and we are not successful in defending ourselves or asserting our rights, those actions could have a significant impact on our business, financial condition, results of operations, and prospects, including the imposition of significant fines or other sanctions.

Laws and regulations governing any international operations we may have in the future may preclude us from developing, manufacturing and selling certain product candidates outside of the United States and require us to develop and implement costly compliance programs.

We are subject to numerous laws and regulations in each jurisdiction outside the United States in which we operate. The creation, implementation and maintenance of international business practices compliance programs is costly and such programs are difficult to enforce, particularly where reliance on third parties is required.

The Foreign Corrupt Practices Act, or FCPA, prohibits any U.S. individual or business from paying, offering, authorizing payment or offering of anything of value, directly or indirectly, to any foreign official, political party or candidate for the purpose of influencing any act or decision of the foreign entity in order to assist the individual or business in obtaining or retaining business. The FCPA also obligates companies whose securities are listed in the United States to comply with certain accounting provisions requiring the company to maintain books and records that accurately and fairly reflect all transactions of the corporation, including international subsidiaries, and to devise and maintain an adequate system of internal accounting controls for international operations. The anti-bribery provisions of the FCPA are enforced primarily by the Department of Justice. The SEC is involved with enforcement of the books and records provisions of the FCPA.

Similarly, the U.K. Bribery Act 2010 has extra-territorial effect for companies and individuals having a connection with the U.K. The U.K. Bribery Act prohibits inducements both to public officials and private individuals and organizations. Compliance with the FCPA and the U.K. Bribery Act is expensive and difficult, particularly in countries in which corruption is a recognized problem. In addition, the FCPA presents particular challenges in the pharmaceutical industry, because, in many countries, hospitals are operated by the government, and doctors and other hospital employees are considered foreign officials. Certain payments to hospitals in connection with clinical trials and other work have been deemed to be improper payments to government officials and have led to FCPA enforcement actions.

Various laws, regulations and executive orders also restrict the use and dissemination outside of the United States, or the sharing with certain non-U.S. nationals, of information classified for national security purposes, as well as certain products and technical data relating to those products. Our expansion outside of the United States has required, and will continue to require, us to dedicate additional resources to comply with these laws, and these laws may preclude us from developing, manufacturing, or selling certain drugs and drug candidates outside of the United States, which could limit our growth potential and increase our development costs. The failure to comply with laws governing international business practices may result in substantial penalties, including suspension or debarment from government contracting. Violation of the FCPA can result in significant civil and criminal penalties. Indictment alone under the FCPA can lead to suspension of the right to do business with the U.S. government until the pending claims are resolved. Conviction of a violation of the FCPA can result in long-term disqualification as a government contractor. The termination of a government contract or relationship as a result of our failure to satisfy any of our obligations under laws governing international business practices would have a negative impact on our operations and harm our reputation and ability to procure government contracts. The SEC also may suspend or bar issuers from trading securities on U.S. exchanges for violations of the FCPA's accounting provisions.

We are subject to stringent privacy laws, information security laws, regulations, policies and contractual obligations related to data privacy and security and changes in such laws, regulations, policies and contractual obligations could adversely affect our business.

We are subject to data privacy and protection laws and regulations that apply to the collection, transmission, storage and use of personally-identifying information, which among other things, impose certain requirements relating to the privacy, security and transmission of personal information, including comprehensive regulatory systems in the U.S. and EU. The legislative and regulatory landscape for privacy and data protection continues to evolve in jurisdictions worldwide, and there has been an increasing focus on

privacy and data protection issues with the potential to affect our business. Failure to comply with any of these laws and regulations could result in enforcement action against us, including fines, imprisonment of company officials and public censure, claims for damages by affected individuals, damage to our reputation and loss of goodwill, any of which could have a material adverse effect on our business, financial condition, results of operations or prospects.

There are numerous U.S. federal and state laws and regulations related to the privacy and security of personal information. In particular, regulations promulgated pursuant to the Health Insurance Portability and Accountability Act of 1996, or HIPAA, establish privacy and security standards that limit the use and disclosure of individually identifiable health information, or protected health information, and require the implementation of administrative, physical and technological safeguards to protect the privacy of protected health information and ensure the confidentiality, integrity and availability of electronic protected health information. Determining whether protected health information has been handled in compliance with applicable privacy standards and our contractual obligations can be complex and may be subject to changing interpretation.

If we are unable to properly protect the privacy and security of protected health information, we could be found to have breached our contracts. Further, if we fail to comply with applicable privacy laws, including applicable HIPAA privacy and security standards, we could face civil and criminal penalties. The U.S. Department of Health and Human Services, of HHS, has the discretion to impose penalties without attempting to resolve violations through informal means. HHS enforcement activity can result in financial liability and reputational harm, and responses to such enforcement activity can consume significant internal resources. In addition, state attorneys general are authorized to bring civil actions seeking either injunctions or damages in response to violations that threaten the privacy of state residents. We cannot be sure how these regulations will be interpreted, enforced or applied to our operations. In addition to the risks associated with enforcement activities and potential contractual liabilities, our ongoing efforts to comply with evolving laws and regulations at the federal and state level may be costly and require ongoing modifications to our policies, procedures and systems.

In the EU, we are subject to the General Data Protection Regulation, or GDPR, which went into effect in May 2018 and which imposes new obligations on companies that operate in our industry with respect to the processing of personal data and the cross-border transfer of such data. The GDPR imposes onerous accountability obligations requiring data controllers and processors to maintain a record of their data processing and policies. If our or our partners' or service providers' privacy or data security measures fail to comply with the GDPR requirements, we may be subject to litigation, regulatory investigations, enforcement notices requiring us to change the way we use personal data and/or fines of up to 20 million Euros or up to 4% of the total worldwide annual turnover of the preceding financial year, whichever is higher, as well as compensation claims by affected individuals, negative publicity, reputational harm and a potential loss of business and goodwill.

While we continue to address the implications of the recent changes to EU data privacy regulations, data privacy remains an evolving landscape at both the domestic and international level, with new regulations coming into effect and continued legal challenges, and our efforts to comply with the evolving data protection rules may be unsuccessful. It is possible that these laws may be interpreted and applied in a manner that is inconsistent with our practices. We must devote significant resources to understanding and complying with this changing landscape. Failure to comply with laws regarding data protection would expose us to risk of enforcement actions taken by data protection authorities in the EU and elsewhere and carries with it the potential for significant penalties if we are found to be non-compliant. Similarly, failure to comply with federal and state laws in the United States regarding privacy and security of personal information could expose us to penalties under such laws. Any such failure to comply with data protection and privacy laws could result in government-imposed fines or orders requiring that we change our practices, claims for damages or other liabilities, regulatory investigations and enforcement action, litigation and significant costs for remediation, any of which could adversely affect our business. Even if we are not determined to have violated these laws, government investigations into these issues typically require the expenditure of significant resources and generate negative publicity, which could harm our business, financial condition, results of operations or prospects.

Risks related to employee matters, managing growth and information technology

Our future success depends on our ability to retain our Chief Executive Officer, Chief Scientific Officer and other key executives and to attract, retain, and motivate qualified personnel.

We are highly dependent on John Evans, our Chief Executive Officer, and Dr. Giuseppe Ciaramella, our President and Chief Scientific Officer, as well as the other principal members of our management and scientific teams. Mr. Evans, Dr. Ciaramella and such other principal members are employed "at will," meaning we or they may terminate the employment at any time. We do not maintain "key person" insurance for any of our executives or other employees. The loss of the services of any of these persons could impede the achievement of our research, development, and commercialization objectives.

Recruiting and retaining qualified scientific, clinical, manufacturing, and sales and marketing personnel will also be critical to our success. We may not be able to attract and retain these personnel on acceptable terms given the competition among numerous pharmaceutical and biotechnology companies for similar personnel. We also experience competition for the hiring of scientific and clinical personnel from universities and research institutions. In addition, we rely on consultants and advisors, including scientific and clinical advisors, to assist us in formulating our research and development and commercialization strategy. Our consultants and

advisors, including our scientific co-founders, may be employed by employers other than us and may have commitments under consulting or advisory contracts with other entities that may limit their availability to us. The inability to recruit, or loss of services of certain executives, key employees, consultants, or advisors, may impede the progress of our research, development, and commercialization objectives and have a material adverse effect on our business, financial condition, results of operations, and prospects.

We expect to expand our development, regulatory, and future sales and marketing capabilities, and as a result, we may encounter difficulties in managing our growth, which could disrupt our operations.

As of December 31, 2019, we had more than 100 full-time employees and, in connection with the growth and advancement of our pipeline and becoming a public company, we expect to increase the number of our employees and the scope of our operations, particularly in the areas of drug development, regulatory affairs, and sales and marketing. To manage our anticipated future growth, we must continue to implement and improve our managerial, operational, and financial systems, expand our facilities, and continue to recruit and train additional qualified personnel. Due to our limited financial resources and the limited experience of our management team in managing a company with such anticipated growth, we may not be able to effectively manage the expected expansion of our operations or recruit and train additional qualified personnel. Moreover, the expected physical expansion of our operations may lead to significant costs and may divert our management and business development resources. Any inability to manage growth could delay the execution of our business plans or disrupt our operations.

As a growing biotechnology company, we are actively pursuing new platforms and product candidates in many therapeutic areas and across a wide range of diseases. Successfully developing product candidates for and fully understanding the regulatory and manufacturing pathways to all of these therapeutic areas and disease states requires a significant depth of talent, resources and corporate processes in order to allow simultaneous execution across multiple areas. Due to our limited resources, we may not be able to effectively manage this simultaneous execution and the expansion of our operations or recruit and train additional qualified personnel. This may result in weaknesses in our infrastructure, give rise to operational mistakes, legal or regulatory compliance failures, loss of business opportunities, loss of employees and reduced productivity among remaining employees. The physical expansion of our operations may lead to significant costs and may divert financial resources from other projects, such as the development of our product candidates. Further, in connection with our collaboration and license agreement with Prime Medicine, Inc., or Prime Medicine, we are obligated to provide management services to Prime Medicine for up to one year, which could distract our management team from their responsibilities to our own company. If our management is unable to effectively manage our expected development and expansion, our expenses may increase more than expected, our ability to generate or increase our revenue could be reduced and we may not be able to implement our business strategy. Our future financial performance and our ability to compete effectively and commercialize our product candidates, if approved, will depend in part on our ability to effectively manage the future development and expansion of our company.

Our internal computer systems, or those of our third-party vendors, collaborators or other contractors or consultants, may fail or suffer security breaches, which could result in a material disruption of our product development programs, compromise sensitive information related to our business or prevent us from accessing critical information, potentially exposing us to liability or otherwise adversely affecting our business.

Our internal computer systems and those of our current and any future third-party vendors, collaborators and other contractors or consultants are vulnerable to damage or interruption from computer viruses, computer hackers, malicious code, employee theft or misuse, denial-of-service attacks, sophisticated nation-state and nation-state-supported actors, unauthorized access, natural disasters, terrorism, war and telecommunication and electrical failures. While we seek to protect our information technology systems from system failure, accident and security breach, if such an event were to occur and cause interruptions in our operations, it could result in a disruption of our development programs and our business operations, whether due to a loss of our trade secrets or other proprietary information or other disruptions. For example, the loss of clinical trial data from future clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. If we were to experience a significant cybersecurity breach of our information systems or data, the costs associated with the investigation, remediation and potential notification of the breach to counterparties and data subjects could be material. In addition, our remediation efforts may not be successful. If we do not allocate and effectively manage the resources necessary to build and sustain the proper technology and cybersecurity infrastructure, we could suffer significant business disruption, including transaction errors, supply chain or manufacturing interruptions, processing inefficiencies, data loss or the loss of or damage to intellectual property or other proprietary information.

To the extent that any disruption or security breach were to result in a loss of, or damage to, our or our third-party vendors', collaborators' or other contractors' or consultants' data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability including litigation exposure, penalties and fines, we could become the subject of regulatory action or investigation, our competitive position could be harmed and the further development and commercialization of our product candidates could be delayed. Any of the above could have a material adverse effect on our business, financial condition, results of operations or prospects.

Risks related to our common stock

The market price of our common stock may be volatile and fluctuate substantially, which could result in substantially losses for purchasers of our common stock and subject us to securities class action litigation.

The market price of our common stock is likely to be highly volatile and may fluctuate substantially due to many factors, including:

- the success of existing or new competitive product candidates or technologies;
- the timing and results of preclinical studies for any product candidates that we may develop;
- failure or discontinuation of any of our product development and research programs;
- results of preclinical studies, clinical trials, or regulatory approvals of product candidates of our competitors, or announcements about new research programs or product candidates of our competitors;
- developments or changing views regarding the use of genetic medicines, including those that involve gene editing;
- commencement or termination of collaborations for our product development and research programs;
- regulatory or legal developments in the United States and other countries;
- developments or disputes concerning patent applications, issued patents, or other proprietary rights;
- the recruitment or departure of key personnel;
- the level of expenses related to any of our research programs, clinical development programs, or product candidates that we may develop;
- the results of our efforts to develop additional product candidates or products;
- actual or anticipated changes in estimates as to financial results, development timelines, or recommendations by securities analysts;
- announcement or expectation of additional financing efforts;
- sales of our common stock by us, our insiders or other stockholders;
- expiration of market stand-off or lock-up agreement;
- variations in our financial results or those of companies that are perceived to be similar to us;
- changes in estimates or recommendations by securities analysts, if any, that cover our stock;
- changes in the structure of healthcare payment systems;
- market conditions in the pharmaceutical and biotechnology sectors;
- general economic, industry, and market conditions; and
- the other factors described in this “Risk factors” section.

In recent years, the stock market in general, and the market for pharmaceutical and biotechnology companies in particular, has experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to changes in the operating performance of the companies whose stock is experiencing those price and volume fluctuations. Broad market and industry factors may seriously affect the market price of our common stock, regardless of our actual operating performance. Following periods of such volatility in the market price of a company’s securities, securities class action litigation has often been brought against that company. Because of the potential volatility of our stock price, we may become the target of securities litigation in the future.

Securities litigation could result in substantial costs and divert management’s attention and resources from our business.

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

The trading market for our common stock relies in part on the research and reports that industry or financial analysts publish about us or our business. If one or more of these analysts ceases coverage of our company or fails to publish reports on us regularly, we could lose visibility in the financial markets, which in turn could cause our stock price or trading volume to decline. Moreover, if any of the analysts who cover us issue an adverse or misleading opinion regarding us, our business model or our stock performance, or if our operating results fail to meet the expectations of the investor community, one or more of the analysts who cover our company may change their recommendations regarding our company, and our stock price could decline.

Our directors, executive officers and affiliates have significant voting power and may take actions that are not in the best interests of our other stockholders.

Our directors and executive officers and their affiliates beneficially own shares representing approximately 33.1% of our outstanding common stock. As a result, these stockholders, if they act together, will be able to influence our management and affairs and all matters requiring stockholder approval, including the election of directors and approval of significant corporate transactions. This concentration of ownership may have the effect of delaying or preventing a change in control of our company and might affect the market price of our common stock.

If we fail to establish and maintain proper and effective internal control over financial reporting, our operating results and our ability to operate our business could be harmed.

Ensuring that we have adequate internal financial and accounting controls and procedures in place so that we can produce accurate financial statements on a timely basis is a costly and time-consuming effort that needs to be re-evaluated frequently. Our 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 in accordance with generally accepted accounting principles. To comply with the requirements of being a public company, we have undertaken certain actions, such as documenting, reviewing and improving our internal controls and procedures for compliance with Section 404 of the Sarbanes-Oxley Act of 2002, or SOX, which will require annual management assessment of the effectiveness of our internal control over financial reporting. While we outsourced our finance and accounting personnel until the end of 2018, we have added additional finance and accounting personnel with certain skill sets that we need as a public company.

Implementing any appropriate changes to our internal controls may distract our officers and employees, entail substantial costs to modify our existing processes and take significant time to complete. These changes may not, however, be effective in maintaining the adequacy of our internal controls, and any failure to maintain that adequacy, or consequent inability to produce accurate financial statements on a timely basis, could increase our operating costs and harm our business. In addition, investors' perceptions that our internal controls are inadequate or that we are unable to produce accurate financial statements on a timely basis may harm our common share price and make it more difficult for us to effectively market and sell our service to new and existing customers.

We are an "emerging growth company" and a "smaller reporting company," and the reduced disclosure requirements applicable to emerging growth companies and smaller reporting companies may make our common stock less attractive to investors.

We are an "emerging growth company," as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act, and may remain an emerging growth company for up to five years. For so long as we remain an emerging growth company, we are permitted and plan to rely on exemptions from certain disclosure requirements that are applicable to other public companies that are not emerging growth companies. These exemptions include not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, or SOX Section 404, not being required to comply with any requirement that may be adopted by the Public Company Accounting Oversight Board regarding mandatory audit firm rotation or a supplement to the auditor's report providing additional information about the audit and the financial statements, reduced disclosure obligations regarding executive compensation, and exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved. As a result, the information we provide stockholders will be different than the information that is available with respect to other public companies. In this Annual Report on Form 10-K, we have not included all of the executive compensation related information that would be required if we were not an emerging growth company. We cannot predict whether investors will find our common stock less attractive if we rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock, and our stock price may be more volatile.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. This allows an emerging growth company to delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have elected not to "opt out" of such extended transition period, which means that when a standard is issued or revised and it has different application dates for public or private companies, we will adopt the new or revised standard at the time private companies adopt the new or revised standard and will do so until such time that we either (i) irrevocably elect to "opt out" of such extended transition period or (ii) no longer qualify as an emerging growth company. Therefore, the reported results of operations contained in our consolidated financial statements may not be directly comparable to those of other public companies.

We are also a "smaller reporting company" as defined in Regulation S-K. We will continue to be a smaller reporting company if either (i) the market value of our stock held by non-affiliates is less than $250 million or (ii) our annual revenue is less than $100 million during the most recently completed fiscal year and the market value of our stock held by non-affiliates is less than $700 million. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, as a smaller reporting company we may choose to present only the two most recent fiscal years of audited financial statements in our Annual Report on Form 10-K

and, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation.

We have incurred and expect to continue to incur increased costs as a result of operating as a public company, and our management is required to devote substantial time to new compliance initiatives and corporate governance practices.

As a public company, and particularly after we are no longer an "emerging growth company," we have incurred and expect to continue to incur significant legal, accounting, and other expenses. The Sarbanes-Oxley Act of 2002, the Dodd-Frank Wall Street Reform and Consumer Protection Act, the listing requirements of The Nasdaq Global Market, and other applicable securities rules and regulations impose various requirements on public companies, including establishment and maintenance of effective disclosure and financial controls and corporate governance practices. We have added additional accounting, finance, and other personnel in connection with our becoming, and our efforts to comply with the requirements of being, a public company, and our management and other personnel will need to devote a substantial amount of time towards maintaining compliance with these requirements. These requirements will increase our legal and financial compliance costs and will make some activities more time-consuming and costly. For example, we expect that the rules and regulations applicable to us as a public company may make it more difficult and more expensive for us to maintain director and officer liability insurance, which could make it more difficult for us to attract and retain qualified members of our board of directors. These rules and regulations are often subject to varying interpretations, in many cases due to their lack of specificity, and, as a result, their application in practice may evolve over time as new guidance is provided by regulatory and governing bodies. This could result in continuing uncertainty regarding compliance matters and higher costs necessitated by ongoing revisions to disclosure and governance practices.

Pursuant to SOX Section 404, we will be required to furnish a report by our management on our internal control over financial reporting beginning with our Annual Report on Form 10-K for the year ended December 31, 2020. However, while we remain an emerging growth company, we will not be required to include an attestation report on internal control over financial reporting issued by our independent registered public accounting firm. To achieve compliance with SOX Section 404 within the prescribed period, we will be engaged in a process to document and evaluate our internal control over financial reporting, which is both costly and challenging. In this regard, we will need to continue to dedicate internal resources, potentially engage outside consultants, adopt a detailed work plan to assess and document the adequacy of internal control over financial reporting, continue steps to improve control processes as appropriate, validate through testing that controls are functioning as documented, and implement a continuous reporting and improvement process for internal control over financial reporting. Despite our efforts, there is a risk that we will not be able to conclude, within the prescribed timeframe or at all, that our internal control over financial reporting is effective as required by SOX Section 404. If we identify one or more material weaknesses, it could result in an adverse reaction in the financial markets due to a loss of confidence in the reliability of our financial statements.

We do not expect to pay any dividends for the foreseeable future. Investors may never obtain a return on their investment unless they sell our common stock for a price higher than which they paid for it.

You should not rely on an investment in our common stock to provide dividend income. We do not anticipate that we will pay any dividends to holders of our common stock in the foreseeable future. Instead, we plan to retain any earnings to maintain and expand our existing operations. In addition, any future credit facility 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.

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

Our results of operations could be adversely affected by general conditions in the global economy and in the global financial markets. A severe or prolonged economic downturn, or additional global financial crises, could result in a variety of risks to our business, including weakened demand for our product candidates, if approved, or our ability to raise additional capital when needed on acceptable terms, if at all. A weak or declining economy could also strain our suppliers, possibly resulting in supply disruption. 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.

Provisions in our amended and 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 amended and restated certificate of incorporation, amended and restated by-laws and Delaware law contain provisions that may have the effect of discouraging, delaying or preventing a change in control of us or changes in our management that stockholders may consider favorable, including transactions in which you might otherwise receive a premium for your shares. Our amended and 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 vacancies on our board of directors may be filled only by a majority of directors then in office, even though less than a quorum;
- provide that our directors may be removed only for cause;
- specify that no stockholder is permitted to cumulate votes at any election of directors;
- expressly authorized our board of directors to make, alter, amend 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 amended and 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. These provisions could also limit the price that investors might be willing to pay for shares of our common stock, thereby depressing the market price of our common stock.

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

Any provision of our amended and restated certificate of incorporation, 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 amended and restated certificate of incorporation and amended and restated by-laws designate the state or federal courts 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 amended and restated certificate of incorporation provides that, subject to limited exceptions, the state or federal courts 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 DGCL, our amended and restated certificate of incorporation or our amended and restated by-laws, (4) any action to interpret, apply, enforce or determine the validity of our amended and restated certificate of incorporation or our amended and restated by-laws or (5) any other action asserting a claim against us that is governed by the internal affairs doctrine. Furthermore, our amended and restated by-laws also provide that unless we consent in writing to the selection of an alternative forum, the federal district courts of the United States shall be the exclusive forum for the resolution of any complaint asserting a cause of action arising under the Securities Act. 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 amended and restated certificate of incorporation and amended and restated by-laws described above. These choice of forum provisions 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 amended and restated certificate of incorporation or amended and restated by-laws 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. For example, the Court of Chancery of the State of Delaware recently determined that a provision stating that federal district courts of the United States are the exclusive forum for resolving any complaint asserting a cause of action under the Securities Act is not enforceable. However, this decision may be reviewed and ultimately overturned by the Delaware Supreme Court.

Item 1B. Unresolved Staff Comments.

Not Applicable.

Item 2. Properties.

We occupy approximately 38,203 square feet of office and laboratory space in Cambridge, Massachusetts under a lease that expires in October 2028. We have entered into a lease agreement with the Massachusetts Institute of Technology for approximately 123,209 square feet of office and laboratory space, which is currently under construction. We currently anticipate commencing this lease at the earliest in late 2021 upon completion of construction. Upon completion of construction and our commencement of our occupancy within the space, the lease will expire on the twelfth anniversary of commencement. We believe that our facilities are sufficient to meet our current needs and that suitable additional space will be available as and when needed.

Item 3. Legal Proceedings.

We are not currently a party to any material legal proceedings. From time to time, we may be subject to various legal proceedings and claims that arise in the ordinary course of our business activities. Regardless of the outcome, litigation can have a material adverse effect on us because of defense and settlement costs, diversion of management resources, and other factors.

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

Our common stock has been publicly traded on the Nasdaq Global Select Market under the symbol "BEAM" since February 6, 2020. Prior to that time, there was no public market for our common stock.

Holders

As of March 25, 2020, there were approximately 85 holders of record of our common stock. This number does not include beneficial owners whose shares are held by nominees in street name.

Dividends

We have not declared or paid any cash dividends on our capital stock since our inception. We intend to retain future earnings, if any, to finance the operation and expansion of our business and do not anticipate paying any cash dividends to holders of common stock in the foreseeable future.

Securities authorized for issuance under equity compensation plans

Information about our equity compensation plans is incorporated herein by reference to Item 12, *Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters*, of this Annual Report on Form 10-K.

Recent sales of unregistered securities

The following list sets forth information regarding all unregistered securities sold by us since January 1, 2019. No underwriters were involved in the sales and the certificates representing the securities sold and issued contain legends restricting transfer of the securities without registration under the Securities Act or an applicable exemption from registration.

Issuances of capital stock

In 2019, we issued an aggregate of 11,308,397 shares of our Series B Preferred Stock for aggregate consideration of $38.0 million to four investors. No underwriters were used in the foregoing transaction. All sales of securities described above were made in reliance upon the exemption from registration provided by Section 4(a)(2) of the Securities Act for transactions by an issuer not involving a public offering. Each series of Preferred Stock automatically converted into shares of our common stock upon the closing of the initial public offering, or IPO, of our common stock in February 2020.

Grants of stock options and restricted stock

During the year ended December 31, 2019, we have granted stock options to purchase an aggregate of 2,671,871 shares of our common stock at a weighted-average exercise price of $7.66 to employees and directors. The issuances of these securities were exempt pursuant to Rule 701, as transactions pursuant to a compensatory benefit plan.

Use of proceeds from registered securities

On February 10, 2020, we closed our IPO in which we issued and sold 12,176,471 shares of our common stock, including 1,588,235 shares of common stock sold pursuant to the underwriters' full exercise of their option to purchase additional shares, at a public offering price of $17.00 per share, for aggregate gross proceeds of $207.0 million. All of the shares issued and sold in the IPO were registered under the Securities Act pursuant to a Registration Statement on Form S-1 (File No. 333-233985), which was declared effective by the SEC on February 5, 2020, and a Registration Statement on Form S-1 MEF (File No. 333-236284) filed pursuant to Rule 462(b) of the Securities Act. J.P. Morgan Securities LLC, Jeffries LLC, and Barclays Capital Inc. acted as joint bookrunning managers of the IPO and as representatives of the underwriters. Wedbush Securities Inc. acted as the lead manager for the IPO. The offering commenced on February 5, 2020 and did not terminate until the sale of all the shares offered.

The net offering proceeds to us, after deducting underwriting discounts and estimated offering expenses payable by us of $18.7 million, were $188.3 million. No offering expenses were paid directly or indirectly to any of our directors or officers (or their associates) or persons owning 10.0% or more of any class of our equity securities or to any other affiliates. We are holding a significant portion of the balance of the net proceeds from the offering in money market funds and short-term investments. Our use of the net offering proceeds through the date of the filing of this Annual Report on Form 10-K, is consistent with the use of proceeds described in our prospectus filed with the SEC pursuant to Rule 424(b)(4) on February 7, 2020, and there has been no material change in our planned use of the balance of the net proceeds from the offering described in such prospectus.

Purchases of equity securities by the issuer or affiliated purchasers

Neither we nor any affiliated purchaser or anyone acting on our behalf or on behalf of an affiliated purchaser made any purchases of shares of our common stock during the year ended December 31, 2019.

Item 6. Selected Financial Data.

The following tables set forth, for the periods and as of the dates indicated, our selected historical financial data, which have been derived from our audited consolidated financial statements. You should read this data together with Item 7, *Management's Discussion and Analysis of Financial Condition and Results of Operations*, and our consolidated financial statements and related notes thereto contained in this Annual Report on Form 10-K. Our historical results are not necessarily indicative of our future results.

Our consolidated statements of operations are summarized as follows (in thousands, except per share amounts):

	Years ended December 31,		
	2019	2018	Period from January 25, 2017 (Inception) through December 31, 2017
Consolidated Statement of Operations:			
License revenue	$ 18	$ —	$ —
Operating expenses:			
Research and development	54,619	33,873	5,859
General and administrative	20,553	11,868	2,021
Total operating expenses	75,172	45,741	7,880
Loss from operations	(75,154)	(45,741)	(7,880)
Other income (expense):			
Change in fair value of derivative liabilities	(5,400)	(11,749)	(500)
Loss on issuance of preferred stock in connection with Blink Merger (1)	—	(49,500)	—
Loss on issuance of preferred stock to investors	—	(5,715)	—
Change in fair value of preferred stock tranche liabilities	—	(4,325)	404
Interest income	2,486	292	—
Interest expense	(187)	—	—
Other expense	(71)	—	(26)
Total other income (expense)	(3,172)	(70,997)	(122)
Net loss	$ (78,326)	$ (116,738)	$ (8,002)
Net loss per common share attributable to common stockholders, basic and diluted	$ (14.05)	$ (40.54)	$ (37.47)
Weighted-average common shares used in net loss per share attributable to common stockholders, basic and diluted	6,479,591	2,893,978	258,520

Our consolidated balance sheets as of December 31 are summarized as follows (in thousands):

	2019	2018	2017
Consolidated Balance Sheet Data:			
Cash, cash equivalents and marketable securities	$ 91,848	$ 146,443	$ 1,901
Total assets	156,099	167,012	2,402
Redeemable convertible preferred stock	302,049	251,434	5,256
Total stockholders' deficit	(201,104)	(117,406)	(9,439)

(1) See Note 10, *Blink Therapeutics*, to our consolidated financial statements in this Annual Report on Form 10-K for a description of the Blink Merger.

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

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our consolidated financial statements and the related notes to those statements included elsewhere in this Annual Report on Form 10-K. In addition to historical financial information, the following discussion and analysis contains forward-looking statements that involve risks, uncertainties and assumptions. Some of the numbers included herein have been rounded for the convenience of presentation. Our actual results may differ materially from those anticipated in these forward-looking statements as a result of many factors, including those discussed under Item 1A, Risk factors, in this Annual Report on Form 10-K.

Overview

We are a research stage biotechnology company committed to creating a new class of precision genetic medicines, based on our proprietary base editing technology, with a vision of providing life-long cures to patients suffering from serious diseases.

Our proprietary base editing technology potentially enables an entirely new class of precision genetic medicines that targets a single base in the genome without making a double-stranded break in the DNA. This approach uses a chemical reaction designed to create precise, predictable and efficient genetic outcomes at the targeted sequence, which we believe will dramatically increase the impact of gene editing for a broad range of therapeutic applications. We believe we will be able to rapidly advance our portfolio of novel base editing programs by building on the significant recent advances in the field of genetic medicines.

Our novel base editors have two principal components that are fused together to form a single protein: (i) a CRISPR protein bound to a guide RNA, that leverages the established DNA-targeting ability of CRISPR, but modified to not cause a double-stranded break, and (ii) a base editing enzyme, such as a deaminase, which carries out the desired chemical modification of the target DNA base.

We have achieved proof-of-concept *in vivo* with long-term engraftment of *ex vivo* base edited human CD34 cells in mice for our Hereditary Persistence of Fetal Hemoglobin, or HPFH, program, and we have demonstrated base editing of cells *in vitro* at therapeutically relevant levels for the majority of our remaining programs. We have also successfully demonstrated feasibility of base editing with each of our three delivery modalities in relevant cell types (electroporation and AAV) and *in vivo* in mice (LNP).

We expect to achieve additional preclinical proofs-of-concept *in vivo* for additional programs in 2020, which could include engraftment results for the Makassar precise correction sickle cell program, xenograft models for our CAR-T programs or *in vivo* based editing in our programs using LNP or AAV delivery. If successful, and provided the coronavirus disease of 2019, or COVID-19, does not cause our timelines to slip materially, this will allow us to initiate investigational new drug, or IND, enabling studies for multiple programs beginning in 2020. We expect to file an initial wave of IND filings beginning in 2021.

Financial operations overview

General

We were incorporated on January 25, 2017 and commenced operations shortly thereafter. Since our inception, we have devoted substantially all of our resources to building our base editing platform and advancing development of our portfolio of programs, establishing and protecting our intellectual property, conducting research and development activities, organizing and staffing our company, business planning, raising capital and providing general and administrative support for these operations. To date, we have financed our operations primarily through the sales of our Series A-1 redeemable convertible preferred stock, or the Series A-1 Preferred Stock, Series A-2 redeemable convertible preferred stock, or the Series A-2 Preferred Stock, and Series B redeemable convertible preferred stock, or the Series B Preferred Stock and, together with the Series A-1 Preferred Stock and the Series A-2 Preferred Stock, the Preferred Stock, and through proceeds from our February 2020 IPO. Through December 31, 2019, we have raised an aggregate of $223.6 million from the sale of our Preferred Stock.

On May 9, 2018, we entered into a merger option agreement with Blink Therapeutics Inc., or Blink. In September 2018, we exercised our option to acquire Blink, or the Blink Merger, and Blink thereafter became our wholly owned subsidiary. Blink held rights to certain intellectual property related to RNA-based editing. Pursuant to the Blink Merger, we issued two shares of our Series A-2 Preferred Stock for each share of redeemable convertible series A preferred stock of Blink, and we issued 0.446 shares of our common stock for each share of Blink common stock. We began consolidating Blink on May 9, 2018.

We are a development stage company, and all of our programs are at a preclinical stage of development. To date, we have not generated any revenue from product sales and do not expect to generate revenue from the sale of products for the foreseeable future. Since inception we have incurred significant operating losses. Our net losses for the years ended December 31, 2019 and 2018 were $78.3 million and $116.7 million, respectively. As of December 31, 2019, we had an accumulated deficit of $203.0 million.

Our total operating expenses were $75.2 million and $45.7 million for the years ended December 31, 2019 and 2018, respectively. We expect to continue to incur significant expenses and increasing operating losses in connection with ongoing development activities related to our portfolio of programs as we continue our preclinical development of product candidates; advance these product candidates toward clinical development; further develop our base editing platform; research activities as we seek to discover and develop additional product candidates; maintenance, expansion enforcement, defense, and protection of our intellectual property portfolio; and hiring research and development, clinical and commercial personnel. In addition, upon the closing of our IPO, we expect to incur additional costs associated with operating as a public company.

As a result of these anticipated expenditures, we will need additional financing to support our continuing operations and pursue our growth strategy. Until such time as we can generate significant revenue from product sales, if ever, we expect to finance our operations through a combination of equity offerings, debt financings, collaborations, strategic alliances, and licensing arrangements. We may be unable to raise additional funds or enter into such other agreements when needed on favorable terms or at all. Our inability to raise capital as and when needed would have a negative impact on our financial condition and our ability to pursue our business strategy. We can give no assurance that we will be able to secure such additional sources of funds to support our operations, or, if such funds are available to us, that such additional funding will be sufficient to meet our needs.

Research and development expenses

Research and development expenses consist of costs incurred in performing research and development activities, which include:

- the cost to obtain licenses to intellectual property, such as those with Harvard University, or Harvard, Broad Institute of MIT and Harvard, or Broad Institute, and Editas Medicine, Inc, or Editas, and related future payments should certain success, development and regulatory milestones be achieved;
- personnel-related expenses, including salaries, bonuses, benefits and stock-based compensation for employees engaged in research and development functions;
- expenses incurred in connection with the discovery and preclinical development of our research programs, including under agreements with third parties, such as consultants, contractors and contract research organizations;
- the cost of developing and validating our manufacturing process for use in our preclinical studies and future clinical trials;
- laboratory supplies and research materials; and
- facilities, depreciation and other expenses which include direct and allocated expenses.

We expense research and development costs as incurred. Advance payments that we make for goods or services to be received in the future for use in research and development activities are recorded as prepaid expenses. The prepaid amounts are expensed as the benefits are consumed.

In the early phases of development, our research and development costs are often devoted to product platform and proof-of-concept studies that are not necessarily allocable to a specific target, therefore, we have not yet begun tracking our expenses on a program-by-program basis.

We expect that our research and development expenses will increase substantially in connection with our planned preclinical and future clinical development activities.

General and administrative expenses

General and administrative expenses consist primarily of salaries and other related costs, including stock-based compensation, for personnel in our executive, intellectual property, business development, and administrative functions. General and administrative expenses also include legal fees relating to intellectual property and corporate matters, professional fees for accounting, auditing, tax and consulting services, insurance costs, travel, and direct and allocated facility related expenses and other operating costs.

We anticipate that our general and administrative expenses will increase in the future to support increased research and development activities. We also expect to incur increased costs associated with being a public company, including costs of accounting, audit, legal, regulatory and tax-related services associated with maintaining compliance with Nasdaq and SEC requirements, director and officer insurance costs, and investor and public relations costs.

Other income and expenses

Other income and expenses consist of the following items:

- *Change in fair value of derivative liabilities* consists primarily of remeasurement gains or losses associated with changes in the anti-dilution issuance rights, finance milestone payment liabilities and success payment liabilities associated with our license agreement with Harvard, dated as of June 27, 2017, as amended, or the Harvard License Agreement, and the license agreement between Blink and Broad Institute, as amended, dated as of May 9, 2018, or the Broad License Agreement.

Anti-dilution issuance rights were issued to Harvard and Broad Institute allowing Harvard and Broad Institute to maintain a defined ownership percentage in us on a fully diluted basis upon subsequent equity financings until we achieved a defined aggregate level of preferred stock financing. At the inception of the agreements, the liability for the anti-dilution right was recorded at fair value with cost recorded as research and development expense and was remeasured at each reporting period and at the termination of the right with changes recorded in other income (expense).

Financing milestone payment liabilities are derived from future cash payments due to Harvard and Broad Institute upon the closing of additional rounds of Preferred Stock. At the inception of the agreements, the liabilities were recorded at fair value with cost recorded as research and development expense and were remeasured at each reporting period with changes recorded in other income (expense).

Success payment liabilities are derived from future increases in the per share fair market value of the Series A-1 Preferred Stock and Series A-2 Preferred Stock at specified future dates. At inception of the agreements, the success payment liabilities were recorded at fair market value with cost recorded as research and development expense and were remeasured at each reporting period with changes recorded in other income (expense). Depending on our valuation, the success payment liabilities could fluctuate significantly from period to period.

All anti-dilution issuance rights and finance milestone liabilities pursuant to our Harvard License Agreement and Broad License Agreement have been met as of December 31, 2018. Accordingly, we are no longer required to record liabilities for these rights.

- *Loss on issuance of preferred stock in connection with Blink Merger* represents the expense recognized upon the consummation of the Blink Merger. Pursuant to the Blink Merger, we issued two shares of our Series A-2 Preferred Stock for each share of Blink and took a charge representing the excess of the fair value of our Series A-2 Preferred Stock issued to Blink shareholders over the value of the Blink preferred stock exchanged by Blink shareholders.

- *Loss on issuance of preferred stock to investors* consists of a charge taken upon issuance of our Preferred Stock at a discount due to an increase in value above the sale price.

- *Change in fair value of preferred stock tranche liabilities* consist primarily of remeasurement gains or losses associated with changes in the fair value of the tranche rights associated with our Series A-1 Preferred Stock and Series A-2 Preferred Stock. All obligations have been met at December 31, 2018 and therefore there will be no further remeasurement.

Results of operations

Comparison of the years ended December 31, 2019 and 2018

The following table summarizes our results of operations for the years ended December 31, 2019 and 2018, together with the change in dollars (in thousands):

	2019	2018	Change
		(in thousands)	
License revenue	$ 18	$ —	$ 18
Operating expenses:			
Research and development	54,619	33,873	20,746
General and administrative	20,553	11,868	8,685
Total operating expenses	75,172	45,741	29,431
Loss from operations	(75,154)	(45,741)	(29,413)
Other income (expense):			
Change in fair value of derivative liabilities	(5,400)	(11,749)	6,349
Loss on issuance of preferred stock in connection with Blink Merger	—	(49,500)	49,500
Loss on issuance of preferred stock to investors	—	(5,715)	5,715
Change in fair value of preferred stock tranche liabilities	—	(4,325)	4,325
Interest income	2,486	292	2,194
Interest expense	(187)	—	(187)
Other expense	(71)	—	(71)
Total other income (expense)	(3,172)	(70,997)	67,825
Net loss	$ (78,326)	$ (116,738)	$ 38,412

License revenue

License revenue was $18,000 for the year ended December 31, 2019 representing Verve license revenue recorded under the Collaboration and License Agreement executed in April 2019. There was no revenue for the year ended December 31, 2018.

Research and development expenses

Research and development expenses were $54.6 million and $33.9 million for the years ended December 31, 2019 and 2018, respectively. The increase of $20.7 million was primarily due to the following:

- Increases of $16.4 million in lab supplies and outsourced services, $10.7 million in personnel-related costs, and $4.6 million in facility-related costs, including depreciation. These increases were due to the growth in the number of research and development employees from 40 at December 31, 2018 to 97 at December 31, 2019, and their related activities, as well as the expense allocated to research and development related to our leased facilities.

- A decrease of $1.7 million in stock compensation due to a one-time charge of $3.6 million for the year ended December 31, 2018 related to the Blink merger offset by an increase in stock compensation expense for additional stock option awards due to the increase in the number of research and development employees in 2019.

- A decrease of $10.0 million in expenses related to technology licenses. For the year ended December 31, 2019, technology license expense was $3.4 million, which consisted primarily of option fees of $2.4 million related to a technology license agreement and $0.8 million, which consisted primarily of the license fee and fair value of Beam common stock provided to Bio Palette in conjunction with a license agreement executed in March 2019. For the year ended December 31, 2018, technology license expense was $13.3 million, which included: $5.3 million related to the Broad License Agreement for the initial value of anti-dilution rights, financing milestone payment liabilities, success payment liabilities, and the initial shares of common stock issued to Broad Institute, $3.7 million related to the issuance of 3,055,555 shares of Preferred Stock under a license agreement with Editas, $2.2 million for additional shares of stock issued to Broad Institute upon the Blink merger, and other technology license expenses of $2.0 million.

Research and development expenses will continue to increase as we continue our current research programs, initiate new research programs, continue our preclinical development of product candidates and conduct future clinical trials for any of our product candidates.

General and administrative expenses

General and administrative expenses were $20.6 million and $11.9 million for the years ended December 31, 2019 and 2018, respectively. The increase of $8.7 million was primarily a result of a $4.4 million increase in personnel related costs due to an increase in general and administrative employees from eight employees as of December 31, 2018 to 21 employees as of December 31, 2019, a $1.7 million increase in stock-based compensation due to an increase in the number of general and administrative employees as well as an increase in the value of our common stock, a $1.2 million increase in outsourced services including audit services as well as consulting services to supplement our internal capabilities, a $1.1 million increase in other administrative expenses, and a $0.3 million increase in expense allocated to general and administrative expense related to our leased facilities, including depreciation, to support the growing organization.

Change in fair value of derivative liabilities

During the year ended December 31, 2018, the anti-dilution rights related to the Harvard License Agreement and the Broad License Agreement terminated and we issued 765,549 shares of our common stock to Harvard and Blink issued 920,000 shares of its common stock (which was converted into 410,320 shares of our common stock in connection with the Blink Merger) to Broad Institute. For the year ended December 31, 2018, we recorded a $1.3 million change in fair value expense related to these anti-dilution issuance rights.

During the year ended December 31, 2018, we recorded a $9.7 million change in fair value expense related to financial milestone payments. All remaining financing milestone obligations were met in 2018.

During the year ended December 31, 2019, we recorded a $5.4 million change in fair value expense related to the success payment liabilities as compared to a $0.7 million expense for the year ended December 31, 2018. The success payment obligations are still outstanding as of December 31, 2019 and will continue to be revalued at each reporting period.

Loss on issuance of preferred stock in connection with Blink Merger

Loss on issuance of preferred stock in connection with the Blink Merger of $49.5 million for the year ended December 31, 2018 represented the excess of the fair value of our Series A-2 Preferred Stock issued to Blink shareholders over the value of the Blink preferred stock exchanged by Blink shareholders at the time of the Blink Merger.

Loss on issuance of preferred stock to investors

Loss on issuance of preferred stock to investors of $5.7 million for the year ended December 31, 2018 resulted from issuance of our Series A-1 Preferred Stock at a fair value of the preferred stock in excess of the cash proceeds received.

Change in fair value of preferred stock tranche liabilities

We have determined that our obligation to issue and our investors' obligation to purchase additional shares of Series A-1 Preferred Stock and Series A-2 Preferred Stock represented a freestanding financial instrument. The resulting preferred stock tranche liability was initially recorded at fair value, with gains and losses arising from changes in fair value recognized in the consolidated statement of operations at each period while such instruments were outstanding. As a result of the changes in fair value, we recognized other expense of $4.3 million for the year ended December 31, 2018. As of December 31, 2018, the tranche rights had been exercised and the liabilities have been reclassified to preferred stock.

Interest income

Interest income was $2.5 million for the year ended December 31, 2019 as compared to $0.3 million for the year ended December 31, 2018. We began actively investing our funds in 2019.

Interest expense

Interest expense of $0.2 million for the year ended December 31, 2019 was related to our equipment financing leases. There was no corresponding interest expense in 2018.

Comparison of year ended December 31, 2018 and period ended December 31, 2017

	Year ended December 31, 2018	Period from January 25, 2017 (Inception) to December 31, 2017	Change
		(in thousands)	
Operating expenses:			
Research and development	$ 33,873	$ 5,859	$ 28,014
General and administrative	11,868	2,021	9,847
Total operating expenses	45,741	7,880	37,861
Other income (expense):			
Loss on issuance of preferred stock in connection with Blink Merger	(49,500)	—	(49,500)
Loss on issuance of preferred stock to investors	(5,715)	—	(5,715)
Change in fair value of derivative liabilities	(11,749)	(500)	(11,249)
Change in fair value of preferred stock tranche liabilities	(4,325)	404	(4,729)
Other expense	—	(26)	26
Interest income	292	—	292
Total other income (expense)	(70,997)	(122)	(70,875)
Net loss	$ (116,738)	$ (8,002)	$ (108,736)

Research and development expenses

Research and development expenses were $33.9 million for the year ended December 31, 2018, compared to $5.9 million for the period from January 25, 2017 (Inception) to December 31, 2017. The increase of $28.0 million was primarily due to the following:

- An $8.5 million increase in expenses related to technology licenses. In 2018, technology license expense included: $5.3 million related to the Broad License Agreement for the initial value of anti-dilution rights, financing milestone payment liabilities, success payment liabilities, and the initial shares of common stock issued to Broad Institute, $2.2 million related to the issuance of 410,320 additional shares of Beam common stock to Broad Institute in connection with the Blink Merger, $3.7 million related to the issuance of 3,055,555 shares of Preferred Stock under a license agreement with Editas; and other technology license expenses of $2.0 million. In 2017, technology license expenses included $4.8 million related to the Harvard License Agreement for the initial value of anti-dilution rights, financing milestone payment liabilities, success payment liabilities, and the initial shares of common stock issued to Harvard. These amounts were recorded as research and development expenses as they are considered compensation for the respective license agreements.

- Increases of $5.9 million in lab supplies and outsourced services, $4.4 million in personnel-related costs, and $3.2 million in facility-related costs, including depreciation. These increases were due to the growth in the number of research and development employees from four at December 31, 2017 to 40 at December 31, 2018, and their related activities, as well as the expense allocated to research and development related to our new leased facility.

- An increase of $5.7 million in stock compensation, including $3.6 million of expense representing the difference in value of the fully vested shares issued to the scientific founders of Blink and the value exchanged by the Blink shareholders at the

time of the Blink Merger. The remainder of the increase was due to the increase in the number of research and development employees from December 31, 2017 to December 31, 2018.

General and administrative expenses

General and administrative expenses were $11.9 million for the year ended December 31, 2018, compared to $2.0 million for the period from January 25, 2017 (Inception) ended December 31, 2017. The increase of $9.8 million was primarily due to an increase in legal and patent costs of $4.3 million associated with establishing our patent portfolio, $1.7 million increase in personnel related costs due to an increase in general and administrative employees from one employee as of December 31, 2017 to eight employees as of December 31, 2018, $1.3 million increase in consulting services to supplement our internal capabilities, $1.1 million increase in stock-based compensation, and an increase in expense allocated to general and administrative expense related to our new leased facility, including depreciation of $0.7 million, to support the growing organization.

Loss on issuance of preferred stock in connection with Blink Merger

Loss on issuance of preferred stock in connection with the Blink Merger consists of a $49.5 million charge for the year ended December 31, 2018 related to the Blink Merger. This charge represented the excess of the fair value of our Series A-2 Preferred Stock issued to Blink shareholders over the value of the Blink preferred stock exchanged by Blink shareholders at the time of the Blink Merger.

Loss on issuance of preferred stock to investors

Loss on issuance of preferred stock to investors consisted of a $5.7 million discount for the year ended December 31, 2018, resulted from issuance of our Series A-2 Preferred Stock due to the fair value of the preferred stock issued being in excess of the cash proceeds received.

Change in fair value of derivative liabilities

During the year ended December 31, 2018, the anti-dilution rights related to the Harvard License Agreement and the Broad License Agreement have terminated and, during the year ended December 31, 2018 we issued 765,549 shares of our common stock and Blink issued 920,000 shares of its common stock (which was converted into 410,320 shares of our common stock in connection with the Blink Merger) to Harvard and Broad Institute, respectively. In 2018, we recorded a $1.3 million change in fair value expense related to the anti-dilution issuance right as compared to no change in fair value expense in 2017.

In 2018, we recorded a $9.7 million change in fair value expense related to the financial milestone payment as compared to a $0.4 million expense in 2017. All remaining financing milestone obligations have been met in 2018, and we recorded a $13.8 million financing milestone liability for any unpaid balances on our consolidated balance sheets as of December 31, 2018.

In 2018, we recorded a $0.7 million change in fair value expense related to the success payment liabilities as compared to a $0.1 million expense in 2017. The increase was a result of an increase in our valuation from December 31, 2017 to December 31, 2018.

Change in fair value of preferred stock tranche liabilities

We have determined that our obligation to issue and our investors' obligation to purchase additional shares of Series A-1 Preferred Stock and Series A-2 Preferred Stock represented a freestanding financial instrument. The resulting preferred stock tranche liability was initially recorded at fair value, with gains and losses arising from changes in fair value recognized in the consolidated statement of operations at each period while such instruments were outstanding. As a result of the changes in fair value, we recognized other expense of $4.3 million for the year ended December 31, 2018, compared to $0.4 million in other income for the period from January 25, 2017 (Inception) to December 31, 2017. As of December 31, 2018, the tranche rights have been exercised and the liabilities have been reclassified to preferred stock.

Interest income

Interest income was $0.3 million in 2018 due our investment in money market funds. There were no investments in 2017.

Liquidity and capital resources

Since our inception in January 2017, we have incurred significant operating losses. We expect to incur significant expenses and operating losses for the foreseeable future as we advance the preclinical and, if successful, the clinical development of our programs. To date, we have funded our operations primarily with proceeds from the sales of Preferred Stock. Through December 31, 2019, we raised an aggregate of $223.6 million in gross proceeds from sales of our Preferred Stock. As of December 31, 2019, we had $91.8 million in cash, cash equivalents and marketable securities.

On February 10, 2020, we completed our IPO in which we issued and sold 12,176,471 shares of our common stock, including 1,588,235 shares of common stock sold pursuant to the underwriters' full exercise of their option to purchase additional shares, at a public offering price of $17.00 per share. We received net proceeds from our IPO of $188.3 million, after deducting underwriting discounts and estimated offering expenses payable by us.

To date, we have not generated any revenue from product sales and do not expect to generate revenue from the sale of products for the foreseeable future. We anticipate the need for additional capital in order to continue to fund our research and development, including our plans for clinical and preclinical trials and new product development, as well as to fund general operations. As and if necessary, we will seek to raise these additional funds through various potential sources, such as equity and debt financings or through corporate collaboration and license agreements. Especially in light of COVID-19, we can give no assurances that we will be able to secure such additional sources of funds to support our operations, or, if such funds are available to us, that such additional financing will be sufficient to meet our needs For a more detailed discussion of risks related to our COVID-19, please see Item 1A., *Risk factors—Risks related to our relationships with third parties*, in this Annual Report on Form 10-K.

Cash flows

The following table summarizes our sources and uses of cash for the years ended December 31, 2019 and 2018 (in thousands):

	2019	2018
Net cash used in operating activities	$ (72,003)	$ (20,298)
Net cash used in investing activities	(66,659)	(13,424)
Net cash provided by financing activities	41,279	179,727
Net (decrease) increase in in cash, cash equivalents and restricted cash	$ (97,383)	$ 146,005

Operating activities

Net cash used in operating activities for the year ended December 31, 2019 was $72.0 million, consisting primarily of our net loss of $78.3 million, a decrease in financing milestone liabilities of $13.8 million resulting from payment of these liabilities, a decrease in operating lease liabilities of $2.5 million, and an increase in prepaids and other assets of $1.9 million offset by cash provided by increases in accounts payable and accrued expenses of $7.7 million, and noncash charges consisting primarily of stock based compensation expense of $7.0 million, change in fair value of derivative liabilities of $5.4 million, depreciation of $3.5 million, and non-cash lease expense of $1.9 million, offset by amortization of investment premiums of $0.9 million.

Net cash used in operating activities for the year ended December 31, 2018 was $20.3 million, consisting primarily of our net loss of $116.7 million offset by the following noncash charges: loss on issuance of preferred stock in connection with the Blink Merger of $49.5 million, change in fair value of derivatives consisting of anti-dilution rights, financial milestone payment liabilities and success payment liabilities of $11.7 million, non-cash research and development license expense of $7.4 million, loss on issuance of preferred stock to investors of $5.7 million, change in fair value of preferred stock tranche liabilities of $4.3 million, and stock-based compensation of $7.0 million, as well as increases in deferred rent liability of $7.6 million due to the lease of a new facility in 2018 and increases in accounts payable and accrued expenses of $4.0 million due to our growth.

Net cash used in operating activities for the period from January 25, 2017 (Inception) to December 31, 2017 was $2.7 million, consisting primarily of our net loss of $8.0 million partially offset by non-cash charges of $4.6 million primarily consisting of a non-cash research and development license expense of $4.3 million associated with our Harvard License Agreement; and increases in accounts payable and accrued expenses of $0.9 million.

Investing activities

For the year ended December 31, 2019, cash used in investing activities was primarily the net result of purchases of marketable securities partially offset by maturities of marketable securities of $53.7 million, in addition to purchases of property and equipment of $12.5 million.

For the year ended December 31, 2018 and period from January 25, 2017 (Inception) to December 31, 2017, cash used in investing activities consisted primarily of $13.1 million and $0.3 million of purchases of property and equipment, respectively.

Financing activities

Net cash provided by financing activities for the year ended December 31, 2019 consisted primarily of the net proceeds from the issuance of Series B Preferred Stock of $37.9 million, and net proceeds of $5.7 million from equipment financing, offset by an increase in equity issuance costs of $2.5 million.

Net cash provided by financing activities for the year ended December 31, 2018 consisted primarily of the net proceeds from the issuance of Series A-1 Preferred Stock of $19.8 million, Series A-2 Preferred Stock of $48.5 million, Blink Series A Preferred Stock of $14.9 million, and Series B Preferred Stock of $96.5 million.

Net cash provided by financing activities for the period from January 25, 2017 (Inception) to December 31, 2017 was $5.0 million consisting of net proceeds from the first tranche of the issuance of Series A-1 Preferred Stock.

Funding requirements

Our operating expenses are expected to increase substantially as we continue to advance our portfolio of programs.

Specifically, our expenses will increase if and as we:

- continue our current research programs and our preclinical development of product candidates from our current research programs;
- seek to identify additional research programs and additional product candidates;
- initiate preclinical testing and clinical trials for any product candidates we identify and develop;
- maintain, expand, enforce, defend, and protect our intellectual property portfolio and provide reimbursement of third-party expenses related to our patent portfolio;
- seek marketing approvals for any of our product candidates that successfully complete clinical trials;
- ultimately establish a sales, marketing, and distribution infrastructure to commercialize any medicines for which we may obtain marketing approval;
- further develop our base editing platform;
- hire additional personnel including research and development, clinical and commercial personnel;
- add operational, financial, and management information systems and personnel, including personnel to support our product development;
- acquire or in-license products, intellectual property, medicines and technologies;
- should we decide to do so, build and maintain a commercial-scale current Good Manufacturing Practices, or cGMP, manufacturing facility; and
- operate as a public company.

We expect that our cash, cash equivalents and marketable securities at December 31, 2019, together with the net proceeds from our February 2020 IPO, will enable us to fund our current and planned operating expenses and capital expenditures for at least the next 12 months. We have based these estimates on assumptions that may prove to be imprecise, and we may exhaust our available capital resources sooner that we currently expect. Because of the numerous risks and uncertainties associated with the development our programs, we are unable to estimate the amounts of increased capital outlays and operating expenses associated with completing the research and development of our product candidates.

Our future funding requirements will depend on many factors including:

- the cost of continuing to build our base editing platform;
- the costs of acquiring licenses for the delivery modalities that will be used with our product candidates;
- the scope, progress, results, and costs of discovery, preclinical development, laboratory testing, manufacturing and clinical trials for the product candidates we may develop;
- the costs of preparing, filing, and prosecuting patent applications, maintaining and enforcing our intellectual property and proprietary rights, and defending intellectual property-related claims;
- the costs, timing, and outcome of regulatory review of the product candidates we may develop;
- the costs of future activities, including product sales, medical affairs, marketing, manufacturing, distribution, coverage and reimbursement for any product candidates for which we receive regulatory approval;
- the success of our license agreements and our collaborations;
- our ability to establish and maintain additional collaborations on favorable terms, if at all;
- the achievement of milestones or occurrence of other developments that trigger payments under any additional collaboration agreements we obtain;
- the extent to which we acquire or in-license products, intellectual property, and technologies; and
- the costs of operating as a public company.

Until such time, if ever, as we can generate substantial product revenues, we expect to finance our cash needs through a combination of equity offerings, debt financings, collaborations, strategic alliances, and licensing arrangements. We do not have any committed external source of funds. Debt financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures, or declaring dividends.

If we raise funds through additional collaborations, strategic alliances, or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs, or product candidates, or we may have to grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce, or terminate our product development or future commercialization efforts or grant rights to develop and market product candidates that we would otherwise prefer to develop and market ourselves. We can give no assurance that we will be able to secure such additional sources of funds to support our operations, or, if such funds are available to us, that such additional funding will be sufficient to meet our needs.

Contractual obligations

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

Contractual obligation	Total	Less than 1 year	More than 1 year and less than 3	More than 3 years and less than 5	More than 5 years
(in thousands)			(in thousands)		
Operating lease obligations (1)	$ 221,594	$ 6,528	$ 20,523	$ 31,721	$ 162,822
Financing obligations	6,319	1,742	3,485	1,092	—

(1) Represents future minimum lease payments under our operating leases for office and lab space in Cambridge, Massachusetts. The minimum lease payments above do not include any related common area maintenance charges or real estate taxes.

The table above does not include our amended lease for additional laboratory space in Cambridge, Massachusetts, which commenced on March 1, 2020 and expires on March 31, 2023. The incremental increase in total amount as a result of the amended lease is approximately $3.2 million, which does not include the additional lease payments of $1.6 million we would incur if we were to exercise our option to extend the lease for one year.

The table above also does not include potential milestone and success fees, sublicense fees, royalty fees, licensing maintenance fees, and reimbursement of patent maintenance costs that we may be required to pay under agreements we have entered into with certain institutions to license intellectual property. Our agreements to license intellectual property include potential milestone payments that are dependent upon the development of products using the intellectual property licensed under the agreements and contingent upon the achievement of development or regulatory approval milestones, as well as commercial and success payment milestones. We have not included such potential obligations in the table above because they are contingent upon the occurrence of future events and the timing and likelihood of such potential obligations are not known with certainty.

Additionally, we enter into contracts in the normal course of business with contract research organizations and other vendors to assist in the performance of our research and development activities 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.

Off-balance sheet arrangements

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

Critical accounting policies and significant judgements

Our management's discussion and analysis of our financial condition and results of operations is based on our consolidated financial statements, which we have prepared in accordance with U.S. generally accepted accounting principles. The preparation of these financial statements requires us to make estimates, judgments and assumptions that affect the reported amounts of assets, liabilities, and expenses and the disclosure of contingent assets and liabilities in our financial statements. We base our estimates on historical experience, known trends and events and various other factors that we believe are 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. We evaluate our estimates and assumptions on an ongoing basis. Our actual results may differ from these estimates under different assumptions or conditions.

While our significant accounting policies are described in more detail in Note 2, *Summary of significant accounting policies*, to our consolidated financial statements in this Annual Report on Form 10-K, we believe that the following accounting policies are those most critical to the judgments and estimates used in the preparation of our financial statements.

Stock-based compensation

We measure stock options and other stock-based awards granted to our employees, directors, consultants or founders based upon their fair value on the date of the grant and recognize stock-based compensation expense over the requisite service period, which is generally the vesting period of the respective award. We recognize forfeitures as they occur.

The majority of our stock-based compensation awards are subject to either service- or performance-based vesting conditions. We apply the straight-line method of expense recognition to all awards with service-based vesting and recognize stock-based compensation for performance-based awards over the service period using the accelerated attribution method to the extent achievement of the of performance condition is probable.

We estimate the fair value of each stock option grant on the date of grant using the Black-Scholes option-pricing model, which uses inputs such as the fair value of our common stock, assumptions we make for the volatility of our common stock, the expected term of our stock options, the risk-free interest rate for a period that approximates the expected term of our stock options and our expected dividend yield. The fair value of our common stock is used to determine the fair value of restricted stock awards.

Determination of the fair value of our common stock issued prior to our IPO

Prior to our IPO in February 2020, there was no public market for our common stock. As a result, prior to our IPO, the estimated fair value of our common stock was determined by our board of directors as of the date of each option grant, with input from management, considering our most recently available third-party valuations of common stock and our board of directors' assessment of additional objective and subjective factors that it believed were relevant and which may have changed from the date of the most recent valuation through the date of the grant. Third party valuations were performed in accordance with the framework of the American Institute of Certified Public Accountants, *Valuation of Privately-Held Company Equity Securities Issued as Compensation*. Our common stock valuations were prepared using either an option pricing method, or OPM, or a hybrid method of the probability-weighted expected return method, or PWERM, both of which used market approaches to estimate our enterprise value. The OPM treats common stock and preferred stock as call options on the total equity value of a company, with exercise prices based on the value thresholds at which the allocation among the various holders of a company's securities changes. Under this method, the common stock has value only if the funds available for distribution to stockholders exceeded the value of the preferred stock liquidation preferences at the time of the liquidity event, such as a strategic sale or a merger. The common stock is modeled as a call option on the underlying equity value at a predetermined exercise price. In the model, the exercise price is based on a comparison with the total equity value rather than, as in the case of a regular call option, a comparison with a per share stock price. Thus, common stock is considered to be a call option with a claim on the enterprise at an exercise price equal to the remaining value immediately after the preferred stock liquidation preference is paid. A discount for lack of marketability of the common stock is then applied to arrive at an indication of value for the common stock. The hybrid method is a probability-weighted expected return method, where the equity value in one or more scenarios is calculated using an OPM. The PWERM is a scenario-based methodology that estimates the fair value of our common stock based upon an analysis of future values, assuming various outcomes. The common stock value is based on the probability-weighted present value of expected future investment returns considering each of the possible outcomes available as well as the rights of each class of stock. The future value of the common stock under each outcome is discounted back to the valuation date at an appropriate risk-adjusted discount rate and probability weighted to arrive at an indication of value for the common stock. These third-party valuations were performed at various dates, which resulted in valuations of our common stock of $0.49 per share as of June 30, 2017, $0.67 per share as of March 26, 2018, $1.03 per share as of June 11, 2018, $4.22 per share as of December 1, 2018, $7.22 per share as of April 30, 2019, $11.88 per share as of July 22, 2019, and $13.68 per share as of August 27, 2019. In addition to considering the results of these third-party valuations, our board of directors considered various objective and subjective factors to determine the fair value of our common stock as of each grant date including:

- prices at which we sold shares of Preferred Stock and the superior rights and preferences of the Preferred Stock relative to our common stock at the time of each grant;
- the progress of our research and development programs, including the status and results of preclinical studies for our product candidates;
- our stage of development and our business strategy and the material risks related to our business and industry;
- external market conditions affecting the biopharmaceutical industry and the material risks related to our business and industry; and trends within the biopharmaceutical industry;
- our financial position, including cash on hand, and our historical and forecasted performance and operating results;
- the lack of an active public market for our common stock and our Preferred Stock;
- the likelihood of achieving a liquidity event, such as an IPO or sale of our company in light of prevailing market conditions; and
- the analysis of IPOs and the market performance of similar companies in the biopharmaceutical industry.

The assumptions underlying these valuations represent management's best estimates, which involve inherent uncertainties and the application of management judgement. As a result, if factors or expected outcomes change and we use significantly different assumptions or estimates, our stock-based compensation could be materially different.

Following our IPO, the fair value of our common stock will be determined based on the quoted market price of our common stock.

Variable interest entities

We review each legal entity formed by parties related to us to determine whether or not the entity is a variable interest entity, or VIE. If the entity is a VIE, we assess whether or not we are the primary beneficiary of that VIE based on a number of factors, including (i) which party has the power to direct the activities that most significantly affect the VIE's economic performance, (ii) the parties' contractual rights and responsibilities pursuant to any contractual agreements and (iii) which party has the obligation to absorb losses or the right to receive benefits from the VIE. If we determine that we are the primary beneficiary of a VIE, we consolidate the financial statements of the VIE into our consolidated financial statements at the time that determination is made. On a quarterly basis we evaluate whether we continue to be the primary beneficiary of any consolidated VIEs. If we determine that we are no longer the primary beneficiary of a consolidated VIE, or no longer have a variable interest in the VIE, we deconsolidate the VIE in the period that the determination is made.

On March 22, 2018, certain of our investors, or the Primary Investors, formed Blink to hold certain intellectual property related to RNA base editing.

On May 9, 2018, we entered into a merger option agreement, or the Option Agreement, with Blink. On the same date, Blink entered into the Broad License Agreement, issued 5,000,000 shares of Blink series A preferred stock to its investors at $1.00 per share, and issued restricted common stock to certain scientific founders. As of the date of the Option Agreement, Beam and Blink were both owned by members of the same group or Primary Investors, having over 75% ownership in each entity, which consisted primarily of our initial investors and scientific founders.

Under the Option Agreement, Blink granted us an option, exercisable on the date that Blink issued an aggregate of 10,000,000 additional shares of Blink series A preferred stock and ending on the second anniversary of such date, to consummate a merger with Blink in exchange for a $121,000 option premium. In connection with the Blink Merger, we issued two shares of our Series A-2 Preferred Stock for each share of Blink series A preferred stock and issued 0.446 shares of our common stock for each share of Blink common stock.

As of May 9, 2018, as a result of the design and purpose of Blink and the Option Agreement, we determined that Blink was a VIE and that we were the primary beneficiary, because we had both (1) the power to direct the activities of Blink that most significantly impacted Blink's economic performance and (2) the right to receive benefits from Blink that could be significant to Blink. As a result, we began consolidating Blink on May 9, 2018. The operating activity of Blink from its formation on March 22, 2018 to May 9, 2018 was immaterial. In August 2018, Blink issued 10,000,000 shares of Blink series A preferred stock at $1.00 per share to the Primary Investors and we paid the $121,000 option premium to exercise our option to merge with Blink. On September 25, 2018, or the Merger Date, the merger was consummated, and Blink became a wholly owned subsidiary of Beam. We recognized expense for the excess in value of the Beam Series A-2 Preferred Stock and common stock exchanged for the Blink series A preferred stock and common stock, because the excess value was only transferred to certain investors of Beam and there were no other rights or privileges identified that require separate accounting as an asset.

Fair value measurements

Preferred stock tranche rights

We have determined that our obligation to issue, and our investors' obligation to purchase, additional shares of Series A-1 Preferred Stock pursuant to the second closing and Series A-2 Preferred Stock pursuant to the third closing represented a freestanding instrument. The resulting preferred stock tranche liability was initially recorded at fair value, with gains and losses arising from changes in fair value recognized in other income (expense) in the consolidated statement of operations. The preferred stock tranche liabilities were remeasured at each reporting period and upon the exercise or expiration of the obligation. The preferred stock tranche liabilities were valued using an option pricing model which utilized the fair value of the Preferred Stock, expected volatility, as well as the expected term. As of December 31, 2018, all redeemable convertible Series A-1 Preferred Stock and redeemable convertible Series A-2 Preferred Stock closings have occurred, and all tranche liabilities have been remeasured and reclassified to Preferred Stock.

Anti-dilution issuance right

Additional shares of common stock were issued to Harvard and Broad Institute upon equity financings allowing Harvard and Broad Institute to maintain a defined ownership percentage in us on a fully diluted basis until we achieved a defined aggregate level of preferred stock financing. These anti-dilution issuance rights were accounted for under ASC 815, *Derivatives and Hedging*, and were initially recorded at fair value with a corresponding charge to research and development expense. As such, we recorded this instrument as a liability at its fair value with a corresponding amount recorded as research and development expense and marked it to market at each reporting period, with changes in fair value recognized in other income (expense) in the consolidated statement of operations at each period-end while this instrument was outstanding. The liability was valued using a Monte Carlo simulation model, which models the value of the liability based on the change of several key variables, including the time to the capital raise, the probability of the capital raise, as well as the fair value of our common stock. During 2018, the anti-dilution rights were satisfied and there is no additional derivative liability accounting.

Financing milestone payments

We were required to make cash payments to Harvard and Broad Institute upon the achievement of future financing milestones tied to the closing of additional rounds of Preferred Stock. The financing milestone payments were accounted for under ASC 815, and were initially recorded at fair value with a corresponding charge to research and development expense. The liabilities were marked to market at each balance sheet date with all changes in value recognized in other income or expense in the consolidated statement of operations. We adjusted the liability for changes in fair value until the achievement of the financing milestones. To determine the estimated fair value of the financial milestone payments, we used a Monte Carlo simulation model, which models the value of the liability based on the change of several key variables, including time to capital raise, probabilities to capital raise, cost of debt, as well as the projected price per share upon issuance. As of December 31, 2018, all financing milestone payments have been achieved and were either paid in cash or are recorded in accrued expenses for actual amounts due.

Success payments

We are required to make success payments to Harvard and Broad Institute based on increases in the per share fair market value of our Series A-1 Preferred Stock and Series A-2 Preferred Stock, payable in cash. Subsequent to the February 2020 IPO, the amount of success payments will be based on the market value of our common stock. The success payments are accounted for under ASC 815 and are initially recorded at fair value with a corresponding charge to research and development expense. The liabilities are marked to market at each balance sheet date with all changes in value recognized in other income (expense) in the consolidated statement of operations. We will continue to adjust the liability for changes in fair value until the earlier of the achievement or expiration of the success payment obligation. To determine the estimated fair value of the success payments, we used a Monte Carlo simulation model, which models the value of the liability based on several key variables, including probability of event occurrence, timing of event occurrence, as well as the price per share at the time of success payment.

Leases

On January 1, 2019, we adopted ASU No. 2016-02, *Leases (Topic 842),* or ASC 842, which requires the recognition of the right-of-use assets and related operating and finance lease liabilities on the balance sheet. We adopted ASC 842 using a modified retrospective approach for all leases existing at January 1, 2019. The adoption of ASC 842 had a substantial impact on our consolidated balance sheet but did not have a material effect on the company's consolidated statements of operations and other comprehensive loss, consolidated statements of redeemable convertible preferred stock and stockholders' deficit. Upon adoption of ASC 842, we recorded $14.2 million and $21.7 million to operating lease right-of-use assets and the related lease liabilities, respectively. The operating lease liabilities are based on the present value of the remaining minimum lease payments discounted using our secured incremental borrowing rate at the effective date of January 1, 2019.

For contracts entered into on or after the effective date, at the inception of a contract, we assess whether the contract is, or contains, a lease. The assessment is based on: (1) whether the contract involves the use of a distinct identified asset, (2) whether we obtain the right to substantially all the economic benefit from the use of the asset throughout the period, and (3) whether we have the right to direct the use of the asset. At inception of a lease, we allocate the consideration in the contract to each lease component based on its relative stand-alone price to determine the lease payments.

Leases are classified as either finance leases or operating leases. A lease is classified as a finance lease if any one of the following criteria are met: the lease transfers ownership of the asset by the end of the lease term, the lease contains an option to purchase the asset that is reasonably certain to be exercised, the lease term is for a major part of the remaining useful life of the asset or the present value of the lease payments equals or exceeds substantially all of the fair value of the asset. A lease is classified as an operating lease if it does not meet any of these criteria.

For all leases at the lease commencement date, a right-of-use asset and a lease liability are recognized. The right-of-use asset represents the right to use the leased asset for the lease term. The lease liability represents the present value of the lease payments under the lease.

The right-of-use asset is initially measured at cost, which primarily comprises the initial amount of the lease liability, plus any initial direct costs incurred if any, less any lease incentives received. All right-of-use assets are reviewed for impairment. The lease liability is initially measured at the present value of the lease payments, discounted using the interest rate implicit in the lease or, if that rate cannot be readily determined, our secured incremental borrowing rate for the same term as the underlying lease. For real estate leases and other operating leases, we use its secured incremental borrowing rate. For finance leases, we use the rate implicit in the lease or its secured incremental borrowing rate if the implicit lease rate cannot be determined.

Lease payments included in the measurement of the lease liability comprise the following: the fixed noncancelable lease payments, payments for optional renewal periods where it is reasonably certain the renewal period will be exercised, and payments for early termination options unless it is reasonably certain the lease will not be terminated early.

Lease cost for operating leases consists of the lease payments plus any initial direct costs, primarily brokerage commissions, and is recognized on a straight-line basis over the lease term. Included in lease cost are any variable lease payments incurred in the period that are not included in the initial lease liability and lease payments incurred in the period for any leases with an initial term of 12 months or less. Lease cost for finance leases consists of the amortization of the right-of-use asset on a straight-line basis over the lease term and interest expense determined on an amortized cost basis. The lease payments are allocated between a reduction of the lease liability and interest expense.

We made an accounting policy election to not recognize leases with an initial term of 12 months or less within our consolidated balance sheets and to recognize those lease payments on a straight-line basis in our consolidated statements of income over the lease term.

JOBS Act

We qualify as an “emerging growth company” as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. As an emerging growth company, we may take advantage of specified reduced disclosure and other requirements that are otherwise applicable generally to public companies, including reduced disclosure about our executive compensation arrangements, exemption from the requirements to hold non-binding advisory votes on executive compensation and golden parachute payments and exemption from the auditor attestation requirement in the assessment of our internal control over financial reporting.

We may take advantage of these exemptions until December 31, 2025 or such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company earlier if we have more than $1.07 billion in annual revenue, we have more than $700.0 million in market value of our stock held by non-affiliates (and we have been a public company for at least 12 months and have filed one annual report on Form 10-K) or we issue more than $1.0 billion of non-convertible debt securities over a three-year period. For so long as we remain an emerging growth company, we are permitted, and intend, to rely on exemptions from certain disclosure requirements that are applicable to other public companies that are not emerging growth companies. We may choose to take advantage of some, but not all, of the available exemptions.

In addition, the JOBS Act provides that an emerging growth company can take advantage of an extended transition period for complying with new or revised accounting standards. This allows an emerging growth company to delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have elected not to “opt out” of such extended transition period, which means that when a standard is issued or revised and it has different application dates for public or private companies, we will adopt the new or revised standard at the time private companies adopt the new or revised standard and will do so until such time that we either (i) irrevocably elect to “opt out” of such extended transition period or (ii) no longer qualify as an emerging growth company. Therefore, the reported results of operations contained in our consolidated financial statements may not be directly comparable to those of other public companies.

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

We are exposed to market risk related to changes in interest rates. As of December 31, 2019, we had cash, cash equivalents and marketable securities of $91.8 million, which consisted of cash, money market funds, repurchase agreements, commercial paper and corporate notes. Our primary exposure to market risk is interest rate sensitivity, which is affected by changes in the general level of U.S. interest rates, particularly because our investments are in short-term marketable securities. Due to the short-term duration of our investment portfolio and the low risk profile of our investments, we believe an immediate 10% change in interest rates would not have a material effect on the fair market value of our investment 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 investment portfolio.

We are not currently exposed to significant market risk related to changes in foreign currency exchange rates; however, we do contract with vendors that are located outside of the United States and may be subject to fluctuations in foreign currency rates. We may enter into additional contracts with vendors located outside of the United States in the future, which may increase our foreign currency exchange risk.

Item 8. Financial Statements and Supplementary Data.

The financial statements required to be filed pursuant to this Item 8 are appended to this Annual Report on Form 10-K. An index of those financial statements is found in Item 15, *Exhibits and Financial Statement Schedules*, of this Annual Report on Form 10-K.

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

None.

Item 9A. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our principal executive officer and our principal financial officer, evaluated, as of the end of the period covered by this Annual Report on Form 10-K, the effectiveness of our disclosure controls and procedures as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures.

Based on that evaluation of our disclosure controls and procedures as of December 31, 2019, our principal executive officer and principal financial officer concluded that our disclosure controls and procedures as of such date are effective at the reasonable assurance level.

Management's Annual Report on Internal Control over Financial Reporting

This Annual Report on Form 10-K does not include a report of management's assessment regarding our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) or an attestation report of our independent registered accounting firm due to a transition period established by rules of the SEC for newly public companies. Additionally, our independent registered accounting firm will not be required to opine on the effectiveness of our internal control over financial reporting pursuant to Section 404 until we are no longer an "emerging growth company" as defined in the JOBS Act.

Changes in Internal Control over Financial Reporting

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

Item 9B. Other Information.

On February 26, 2020, the Compensation Committee of our Board of Directors approved annual bonus awards to our employees, including our named executive officers for their performance during the fiscal year ended December 31, 2019. The annual bonus awards were paid in cash. The bonuses awarded to our named executive officers are set forth as follows:

Named Executive Officer	Nonequity incentive plan compensation
John Evans	$ 367,813
Giuseppe Ciaramella, Ph.D.	267,188
Terry-Ann Burrell	200,000

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

Executive officers and directors

Our executive officers and directors, and their ages and positions as of December 31, 2019, are as set forth below:

Name	Age	Position(s)
Executive Officers		
John Evans	42	Chief Executive Officer, Director
Giuseppe Ciaramella, Ph.D.	51	President and Chief Scientific Officer
Terry-Ann Burrell	42	Chief Financial Officer and Treasurer
Non-Employee Directors		
Kristina Burow	45	Director
Graham Cooper	49	Director
Mark Fishman, M.D.	68	Director
Carole Ho, M.D.	46	Director
Stephen Knight, M.D.	59	Director
Robert Nelsen	56	Director

Executive officers

John Evans has served as our Chief Executive Officer since January 2020, and previously served as our President and Chief Executive Officer since 2017. Mr. Evans has significant experience as a company builder, dealmaker, and drug developer in the biotechnology industry. Mr. Evans has also served as a Venture Partner with ARCH Venture Partners since 2017 and as a Director of Verve Therapeutics since August 2018. Mr. Evans was previously an early employee and member of the leadership team at Agios Pharmaceuticals, from September 2009 until April 2017, most recently serving as Senior Vice President for Corporate Development and Portfolio Leadership. At Agios, Mr. Evans served as IDH Portfolio Executive, providing strategic and operational leadership for a portfolio of first-in-class IDH inhibitors including IDHIFA and TIBSOVO. He helped initiate and lead Agios' landmark alliance with Celgene, resulting in over $600 million of funding and investments across multiple research collaborations in cancer metabolism. At Agios, Mr. Evans led a team of eight employees. He also co-led Agio's expansion into rare genetic diseases. Prior to joining Agios, Mr. Evans worked at Infinity Pharmaceuticals, McKinsey & Company's pharmaceuticals practice and MedImmune. Mr. Evans holds an MBA in Healthcare Management from Wharton, a M.S. in Biotechnology from the University of Pennsylvania, and a B.A. in English with distinction from Yale University. We believe that Mr. Evans is qualified to serve on our Board of Directors based on his extensive experience in the pharmaceutical industry and his expansive knowledge of our company based on his role as Chief Executive Officer.

Giuseppe Ciaramella, Ph.D., has served as our Chief Scientific Officer since February 2018 and as our President and Chief Scientific Officer since January 2020. Dr. Ciaramella has 25 years of drug discovery experience across different therapeutic modalities, from small molecule, to biologics, to advanced medicinal products, such as mRNA. Prior to joining Beam, Dr. Ciaramella was the Chief Scientific Officer of the Infectious Diseases division of Moderna Therapeutics from 2014 until February 2018, where he was instrumental in generating some of the first LNP-encapsulated, mRNA vaccines to be dosed in humans, several of which are progressing through clinical studies. From 2011 until 2014, Dr. Ciaramella served as Executive Director at Astrazeneca, where he led their small molecule antiviral strategy. Between 2010 and 2011 he served as Vice President and Head of Collaborative Research at Boehringer Ingelheim, where he had responsibility for external research. Prior to Boehringer Ingelheim, he spent 14 years at Pfizer in the U.K. where he held several leadership positions, including head of Biotherapeutics, head of Antivirals and head of the Hit Discovery Group. Dr. Ciaramella is a member of the Infectious Diseases Society of America and of the American Society of Gene Therapy. Dr. Ciaramella holds a Ph.D. in Biochemistry from University College London.

Terry-Ann Burrell has served as our Chief Financial Officer since August 2019 and as our Chief Financial Officer and Treasurer since September 2019. From May 2008 to August 2019, Ms. Burrell worked at J.P. Morgan Securities LLC, where she most recently served as Managing Director. Ms. Burrell was responsible for deal execution across both mergers and acquisitions and capital markets. In her role, she advised biotechnology and pharmaceutical companies on strategic considerations, including mergers and acquisitions, initial public and secondary offerings and valuation analysis. Ms. Burrell holds a bachelor's degree from Harvard College and an MBA from New York University's Leonard N. Stern School of Business.

Non-employee directors

Kristina Burow has served on our Board of Directors since June 2017. Ms. Burow is a Managing Director with ARCH Venture Partners. Ms. Burow is focused on the creation and development of biotechnology, pharmaceutical and biotechnology companies. Since joining ARCH in 2002, Ms. Burow has played a significant role in the creation and development of a number of companies. Ms. Burow is also a Director of Gossamer Bio, Scholar Rock, Unity Biotechnology, and Vir Biotechnology, and on the boards of a

number of private companies. Ms. Burow served on the board of Receptos, Inc. from 2010 to 2015 and of Sienna Biopharmaceuticals, Inc. from 2015 to 2019. She previously was a co-founder and Director of Receptos, Inc.. Ms. Burow has participated in a number of other ARCH portfolio companies including Siluria Technologies, Kythera Biopharmaceuticals, Ikaria and was a co-founder and board member of Sapphire Energy. Prior to joining ARCH Ms. Burow was an Associate with the Novartis BioVenture Fund in San Diego. Ms. Burow holds an M.B.A. from the University of Chicago, an M.A. in Chemistry from Columbia University and a B.S. in Chemistry from the University of California, Berkeley. We believe Ms. Burow's investment and leadership experience makes her qualified to serve on our Board of Directors.

Graham Cooper has served as a member of our Board of Directors since October 2019. From March 2018 until April 2019, Mr. Cooper served as the Chief Operating Officer and Chief Financial Officer of Assembly Biosciences, Inc. Mr. Cooper previously served as the Chief Financial Officer of Receptos, Inc., from February 2013 until its acquisition by Celgene in August 2015 and Chief Financial Officer of Geron Corporation from January 2012 to December 2012. From May 2006 until March 2011, Mr. Cooper served as Chief Financial Officer of Orexigen Therapeutics, Inc. Prior to that, Mr. Cooper held roles of increasing responsibility at Deutsche Bank Securities, an investment bank, from August 1997 to February 2006, including Director, Health Care Investment Banking. He began his career as an accountant at Deloitte & Touche and was previously a C.P.A. Mr. Cooper currently serves on the board of directors of Unity Biotechnology, Inc., a public biotechnology company, Kezar Life Sciences, a public biotechnology company, and Applied Molecular Therapeutics, Inc., a private biotechnology company. Mr. Cooper received a B.A. in Economics from the University of California at Berkeley and an M.B.A. from the Stanford Graduate School of Business. We believe that Mr. Cooper is qualified to serve on our board of directors due to his significant financial and accounting experience in the life sciences industry.

Mark C. Fishman, M.D., has served on our Board of Directors since May 2018. Dr. Fishman is a Professor in the Harvard Department of Stem Cell and Regenerative Biology and Chief of the Pathways Clinical Service at Massachusetts General Hospital. In February 2019, he became a Co-Founding Partner of Aditum Bio Fund and Chairman of its Scientific and Medical Advisory Board. From 2002 through 2016, Dr. Fishman was the founding President of the Novartis Institutes for BioMedical Research (NIBR), a member of the Executive Committee of Novartis, AG, and served on the Board of Directors of Novartis International Pharmaceutical LTD and Chaired the Board of Directors of the Genomics Institute of the Novartis Research Foundation. Prior to his time at NIBR, he was the Founding Director of the Cardiovascular Research Center and Chief of Cardiology at Massachusetts General Hospital. Dr. Fishman also has served as the Chairman of the Board of privately held Semma Therapeutics since 2016. He also serves as a consultant to and Scientific Advisory Board member of several other privately held biotechnology companies. Dr. Fishman graduated from Yale College and Harvard Medical School and trained in medicine and cardiology at Massachusetts General Hospital. We believe that Dr. Fishman's experience studying genetics and regenerative medicine makes him qualified to serve on our Board of Directors.

Carole Ho, M.D. has served on our Board of Directors since November 2018. Dr. Ho has served as the Chief Medical Officer and Head of Development of Denali Therapeutics since June 2015. Prior to joining Denali, Dr. Ho held various roles of increasing responsibility between at Genentech between 2007 and 2015 most recently as Vice President, Non-Oncology Early Clinical Development. From November 2006 to October 2007, Dr. Ho served as Associate Medical Director at Johnson & Johnson. From June 2002 to November 2006, she was an instructor in the Department of Neurology and Neurological Sciences at Stanford University. Dr. Ho received her M.D. from Cornell University and her B.S. in Biochemical Sciences from Harvard College. We believe that Dr. Ho's experience studying neurology and her experience in senior leadership at a public company makes her qualified to serve on our Board of Directors.

Stephen Knight, M.D. has served on our Board of Directors since June 2017. Dr. Knight joined F-Prime Capital, where he serves as President and Managing Partner, in 2003. He has worked in the pharmaceutical and biotechnology industries for over 25 years and invests broadly across healthcare. Steve serves on the Board of Directors of Iora Health, and Pulmocide. Steve previously served on the boards of several private and public health care companies including Semma Therapeutics, Innovent Biologics, Blueprint Medicines, Denali Therapeutics, FoldRx Pharmaceuticals, Ironwood Pharmaceuticals, NextWave Pharmaceuticals, Proteostasis Therapeutics, and Respivert, Ltd. Prior to joining F-Prime Capital, Steve held various senior management roles in private and public biotechnology and consulting companies. He was also a researcher at AT&T Bell Laboratories, the National Institutes of Health, and Yale University. He holds an M.D. from the Yale University School of Medicine, an M.B.A. from the Yale School of Organization and Management, and received a B.S. in biology from Columbia University, where he graduated summa cum laude and Phi Beta Kappa. We believe that Dr. Knight's experience in the medical industry makes him qualified to serve on our Board of Directors.

Robert Nelsen has served as a member of our board of directors since June 2017. Mr. Nelsen co-founded ARCH Venture Partners in 1986 and currently serves as a Managing Director. Mr. Nelsen currently serves on boards of directors of Denali Therapeutics, Inc., Karuna Therapeutics, Inc., Vir Biotechnology, Unity Biotechnology, Inc. and on the boards of a number of private companies. Mr. Nelsen served on the boards of Agios Pharmaceuticals Inc. from 2007 to 2017, Syros Pharmaceuticals, Inc. from 2012 to 2018, Sage Therapeutics, Inc. from 2013 to 2016, Juno Therapeutics, Inc. from 2013 to 2018, when it was acquired by Celgene Corporation, Bellerophon Therapeutics, Inc. from 2014 to 2015, Sienna Biopharmaceuticals, Inc. from 2015 to 2018 and Gossamer Bio, Inc. from 2017 to 2018, prior to its initial public offering. He previously served as a Trustee of the Fred Hutchinson Cancer Research Institute, the Institute for Systems Biology, and was a director of the National Venture Capital Association. Mr. Nelsen holds an M.B.A. from

the University of Chicago and a B.S. from the University of Puget Sound with majors in Economics and Biology. We believe that Mr. Nelsen's venture capital experience in the biotechnology industry makes him qualified to serve on our Board of Directors.

Family relationships

There are no family relationships among any of our directors and executive officers.

Audit committee

The audit committee's responsibilities include:

- appointing, approving the compensation of, and evaluating the qualifications, performance and independence of our independent registered public accounting firm;
- overseeing the work of our independent registered public accounting firm, including through the receipt and consideration of reports from such firm, and pre-approving all audit and permitted non-audit services to be performed by our independent registered public accounting firm;
- reviewing and discussing with management and our independent registered public accounting firm our annual and quarterly financial statements and related disclosures, including earnings releases;
- reviewing and discussing with management and our independent registered public accounting firm any material issues regarding accounting principles and financial statement presentations;
- coordinating our board of directors' oversight of our internal control over financial reporting, disclosure controls and procedures, code of business conduct and ethics, procedures for complaints and legal and regulatory matters;
- discussing our risk management policies with management;
- establishing policies regarding hiring employees from our independent registered public accounting firm and procedures for the receipt and retention of accounting related complaints and concerns;
- meeting independently with our independent registered public accounting firm and management;
- reviewing and approving any related person transactions;
- overseeing our guidelines and policies governing risk assessment and risk management;
- overseeing the integrity of our information technology systems, process and data;
- preparing the audit committee report required by SEC rules;
- reviewing and assessing, at least annually, the adequacy of the audit committee's charter; and
- performing, at least annually, an evaluation of the performance of the audit committee.

All audit services and all non-audit services, other than de minimis non-audit services, to be provided to us by our independent registered public accounting firm must be approved in advance by our audit committee.

The members of our audit committee are Graham Cooper, Kristina Burow and Mark Fishman. Mr. Cooper chairs the audit committee. Our board of directors has determined that each member of the audit committee, other than Ms. Burow, satisfies the independence standards of the applicable rules of the Nasdaq Stock Market applicable to audit committee members. Our board of directors has determined that each member of our audit committee has sufficient knowledge in financial and auditing matters to serve on the audit committee. Our board of directors has also determined that Mr. Cooper is an "audit committee financial expert," as defined under Item 407 of Regulation S-K.

We expect to satisfy the member independence requirements for the audit committee prior to the end of the transition period provided under current Nasdaq Listing Rules and SEC rules and regulations for newly public companies. The audit committee charter, which has been adopted by our board of directors, is available on our website.

Compensation committee

Our compensation committee's responsibilities include:

- assisting our board of directors in developing and reviewing potential candidates for executive positions;
- reviewing our overall compensation strategy, including base salary, incentive compensation and equity-based grants;
- reviewing and approving corporate goals and objectives relevant to compensation of our chief executive officer and our other executive officers;

- recommending to our board of directors the compensation of our chief executive officer and other executive officers;
- reviewing and making recommendations to the board of directors with respect to director compensation;
- overseeing and administering our cash and equity incentive plans;
- reviewing, considering and selecting, to the extent determined to be advisable, a peer group of appropriate companies for purposing of benchmarking and analysis of compensation for our executive officers and directors;
- reviewing and approving all employment contract and other compensation, severance and change-in- control arrangements for our executive officers;
- recommending to our board of directors any stock ownership guidelines for our executive officers and non-employee directors;
- retaining, appointing or obtaining advice of a compensation consultant, legal counsel or other advisor, and determining the compensation and independence of such consultant or advisor;
- preparing, if required, the compensation committee report on executive compensation for inclusion in our annual proxy statement in accordance with the proxy rules;
- monitoring our compliance with the requirements of Sarbanes-Oxley relating to loans to directors and officers;
- overseeing our compliance with applicable SEC rules regarding shareholder approval of certain executive compensation matters;
- reviewing the risks associated with our compensation policies and practices;
- reviewing and assessing, at least annually, the adequacy of the compensation committee's charter; and
- performing, on an annual basis, an evaluation of the performance of the compensation committee.

The members of our compensation committee are Kristina Burow, Stephen Knight and Carole Ho. Ms. Burow chairs the compensation committee. Our board of directors has determined that each member of the compensation committee satisfies the independence standards of the applicable rules of the Nasdaq Stock Market applicable to compensation committee members. Prior to establishing a compensation committee, our board of directors made decisions relating to the compensation of our executive officers. The compensation committee may delegate any of the responsibilities of the full committee to subcommittees and may delegate such responsibilities of the full committee to executive officers of the Company and other persons as may be permitted by applicable laws, rules or regulations and in accordance with the listing standards set forth by Nasdaq. The compensation committee charter, which has been adopted by our board of directors, is available on our website.

Nominating and governance committee

Our nominating and corporate governance committee's responsibilities include:

- identifying individuals qualified to become members of our board of directors consistent with criteria approved by the board and receiving nominations for such qualified individuals;
- recommending to our board of directors the persons to be nominated for election as directors and to each committee of the board;
- establishing a policy under which our shareholders may recommend a candidate to the nominating and corporate governance committee for consideration for nomination as a director;
- reviewing and recommending committee slates on an annual basis;
- recommending to our board of directors qualified candidates to fill vacancies on our board of directors;
- developing and recommending to our board of directors a set of corporate governance principals applicable to us and reviewing the principles on at least an annual basis;
- reviewing and making recommendations to our board with respect to our board leadership structure and board committee structure;
- reviewing, in concert with our board of directors, our policies with respect to significant issues of corporate public responsibility;
- making recommendations to our board of directors' processes for annual evaluations of the performance of our board of directors, our chief executive officer and committees of our board of directors;

- overseeing the process for annual evaluations of our board of directors, chief executive officer and committees of our board of directors and certifying that performance of our chief executive officer and other members of executive management is being properly evaluated;
- considering and reporting to our board of directors any questions of possible conflicts of interest of members of our board of directors;
- providing new director orientation and continuing education for existing directors on a periodic basis;
- overseeing the maintenance and presentation to our board of directors of management's plans for succession to senior management positions in the Company;
- reviewing and assessing, at least annually, the adequacy of the nominating and corporate governance committee's charter; and
- performing, on an annual basis, an evaluation of the performance of the nominating and corporate governance committee.

The members of our nominating and corporate governance committee are Mark Fishman, Carole Ho and Stephen Knight. Dr. Fishman chairs the nominating and corporate governance committee. Our board of directors has determined that each member of the nominating and corporate governance committee satisfies the independence standards of the applicable rules of the Nasdaq Stock Market. The nominating and governance committee charter, which has been adopted by our board of directors, is available on our website.

Our board of directors may establish other committees from time to time.

Code of business conduct and ethics

We have adopted a written code of business conduct and ethics that applies to our directors, officers and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions, which became effective upon the effectiveness of our registration statement on February 5, 2020. A current copy of the code is available on the investor section of our website. In addition, we posted on our website all disclosures that are required by law or Nasdaq Stock Market rules concerning any amendments to, or waivers from, any provision of the code.

Item 11. Executive Compensation.

The following discussion and analysis of compensation arrangements should be read with the compensation tables and related disclosures set forth below.

Introduction

This section provides an overview of the compensation awarded to, earned by, or paid to our principal executive officer and our next two most highly compensated executive officers in respect of their service to us for the fiscal year ended December 31, 2019. We refer to these individuals as our named executive officers. Our named executive officers are:

- John Evans, our Chief Executive Officer;
- Giuseppe Ciaramella, Ph.D., our President and Chief Scientific Officer; and
- Terry-Ann Burrell, our Chief Financial Officer and Treasurer.

Our board of directors was responsible for determining the compensation of our executive officers prior to the establishment of the compensation committee of our board of directors in February 2019. Following its establishment, our compensation committee is generally responsible for determining the compensation of our executive officers. Our Chief Executive Officer made recommendations to our compensation committee about the compensation of his direct reports in respect of fiscal year 2019.

Summary compensation table

The following table sets forth the compensation awarded to, earned by, or paid to our named executive officers in respect of their service to us for the fiscal years ended December 31, 2019 and December 31, 2018 (as applicable):

Name and principal position	Year	Salary ($)(1)	Bonus ($)(2)	Stock awards ($)(3)	Option awards ($)(4)	Nonequity incentive plan compensation ($)(5)	All other compensation ($)(6)	Total ($)
John Evans	2019	$ 472,500	$ —	$ —	$ 1,368,453	$ 367,813	$ 1,034	$ 2,209,800
Chief Executive Officer	2018	441,477	—	2,976,205	499,311	270,000	144	4,187,137
Giuseppe Ciaramella, Ph.D.	2019	413,502	—	—	888,812	267,188	18,948	1,588,450
President and Chief Scientific Officer	2018	338,889	250,000	—	256,492	162,017	18,451	1,025,849
Terry-Ann Burrell (7)	2019	147,180	—	—	3,901,485	200,000	54,058	4,302,723
Chief Financial Officer and Treasurer								

(1) Amounts shown for Mr. Evans and Dr. Ciaramella for the respective year include contributions made to our 401(k) plan.

(2) The amount shown for Dr. Ciaramella for fiscal year 2018 reflects a sign-on bonus.

(3) The amount reported in this column represents the aggregate grant date fair value of restricted shares of our common stock granted to Mr. Evans in fiscal year 2018 computed in accordance with FASB ASC 718, excluding the effect of estimated forfeitures. The assumptions used to value the restricted stock for this purpose are set forth in Note 13, *Stock option and grant plan*, to our consolidated financial statements included in this Annual Report on Form 10-K.

(4) The amounts reported in this column represent the aggregate grant date fair value of options to purchase our common stock granted to each of our named executive officers in fiscal year 2019 and to Mr. Evans and Dr. Ciaramella in fiscal year 2018 computed in accordance with FASB ASC 718, excluding the effect of estimated forfeitures. The assumptions used to value the options for this purpose are set forth in Note 13, *Stock option and grant plan*, to our consolidated financial statements included in this Annual Report on Form 10-K. With respect to performance-based stock options granted to Mr. Evans and Dr. Ciaramella in fiscal year 2019, the grant date fair value of such options based on the probable outcome of the performance conditions associated with the options on the grant date is $0. If all applicable performance milestones associated with such options were achieved at maximum levels, the grant date fair value of the 2019 performance-based stock options would be $552,901 for Mr. Evans and $132,976 for Dr. Ciaramella.

(5) Amounts shown represent the annual bonus earned by each of our named executive officers for 2019 and by Mr. Evans and Dr. Ciaramella for 2018, in each case based on the attainment of both corporate and individual performance goals.

(6) The amount reported for Mr. Evans for fiscal year 2019 includes commuting benefits ($720) and a tax-gross up associated with his commuting benefits ($314) and for 2018 reflects company-paid group term life insurance premiums ($144). The amount reported for Dr. Ciaramella for fiscal 2019 reflects reimbursement of his COBRA continuation coverage through August 31, 2019 ($17,914), commuting benefits ($720) and a tax gross-up associated with his commuting benefits ($314) and for fiscal year 2018 reflects reimbursement of his COBRA continuation coverage ($18,319) and company-paid group term life insurance premiums ($132). The amount reported for Ms. Burrell for fiscal year 2019 reflects commuting and temporary housing benefits ($38,328) and a tax gross-up associated with her commuting and temporary housing benefits ($15,730).

(7) Ms. Burrell commenced employment with us as our Chief Financial Officer on August 20, 2019.

Narrative disclosure to summary compensation table

Base salary

During fiscal year 2019, the base salary for each of Mr. Evans, Dr. Ciaramella and Ms. Burrell was $472,500, $413,502 and $400,000, respectively. Ms. Burrell's base salary was established at the time she commenced employment with us. The amended and restated employment agreement or letter agreement with each named executive officer, described below, establishes a base salary, which took effect in connection with our IPO and is subject to periodic review. Upon our IPO, Mr. Evans's base salary was increased to $535,000, and Dr. Ciaramella's base salary was increased to $475,000. Ms. Burrell's base salary was increased to $420,000, effective January 1, 2020.

Annual bonuses

With respect to fiscal year 2019, each of Mr. Evans, Dr. Ciaramella and Ms. Burrell was eligible to receive an annual bonus, with the target amount of such bonus for each named executive officer set forth in his or her employment or letter agreement with us. For fiscal year 2019, the target bonus amounts, expressed as a percentage of base salary, for each of Mr. Evans, Dr. Ciaramella and Ms. Burrell were as follows: 50%, 40% and 40%, respectively. Annual bonuses for fiscal year 2019 for our named executive officers are based on the attainment of both corporate and individual performance goals as recommended by our compensation committee and determined by our board of directors. The corporate performance goals for 2019 related to building the company and advancing our R&D pipeline, and the compensation committee of the board of directors determined that such goals were achieved collectively at 125% of target. With respect to fiscal year 2019, each named executive officer earned an annual bonus as follows: Mr. Evans, $367,813; Dr. Ciaramella $267,188; and Ms. Burrell $200,000. In connection with our IPO, the target bonus amount for Mr. Evans was increased to 55% of his base salary and for Dr. Ciaramella was increased to 45% of his base salary.

Equity compensation

Mr. Evans, Dr. Ciaramella and Ms. Burrell each received incentive equity grants in fiscal year 2019 under the Beam Therapeutics Inc. 2017 Stock Option and Grant Plan, or the 2017 Plan.

On February 13, 2019, Mr. Evans was granted an option to purchase 107,929 shares of our common stock, which vests as to 50% of the underlying shares upon the achievement of certain development milestones related to editing applications and as to 50% upon the achievement of a closing price hurdle following our IPO, in each case, generally subject to Mr. Evans's continued employment with us through December 31, 2022. On May 17, 2019, Mr. Evans was granted an option to purchase 223,000 shares of our common stock, which vests as to 25% of the underlying shares on October 1, 2020 and in 36 equal monthly installments thereafter, generally subject to Mr. Evans's continued employment with us through the applicable vesting date.

On February 13, 2019, Dr. Ciaramella was granted an option to purchase 25,957 shares of our common stock, which vests as to 50% of the underlying shares upon the achievement of certain development milestones related to editing applications and as to 50% upon the achievement of a closing price hurdle following our IPO, in each case, generally subject to Dr. Ciaramella's continued employment with us through December 31, 2022. On each of May 17, 2019 and May 31, 2019, Dr. Ciaramella was granted an option to purchase 121,646 shares of our common stock and an option to purchase 23,303 shares of our common stock, respectively, each of which vests as to 25% of the underlying shares on October 1, 2020 and in 36 equal monthly installments thereafter, generally subject to Dr. Ciaramella's continued employment with us through the applicable vesting date.

On August 31, 2019, Ms. Burrell was granted an option to purchase 390,250 shares of our common stock, which vests as to 25% of the underlying shares on August 20, 2020 and in 36 equal monthly installments thereafter, generally subject to Ms. Burrell's continued employment with us through the applicable vesting date.

In connection with our IPO and his promotion to the role of President, Dr. Ciaramella was granted an option to purchase 510,893 shares of our common stock under the Beam Therapeutics Inc. 2019 Equity Incentive Plan, or the 2019 Plan, which will vest as to 25% of the underlying shares on the first anniversary of the grant date and in 36 equal monthly installments thereafter, generally subject to Dr. Ciaramella's continued employment with us through the applicable vesting date.

Agreements with our named executive officers

Mr. Evans, Dr. Ciaramella and Ms. Burrell are each party to an employment or letter agreement with us that sets forth the terms and conditions of his or her employment. In connection with our IPO, these agreements were amended and restated. The material terms of the agreements, as amended and restated, are described below. The terms "cause," "good reason" and "change in control" referred to below are defined in the respective named executive officer's agreement.

Mr. Evans. We entered into an amended and restated letter agreement with Mr. Evans, which became effective upon our IPO, that provides for a base salary of $535,000 per year, subject to annual review by our compensation committee, and a target annual bonus equal to 55% of his annual base salary, with the actual amount of the bonus earned based on the terms of the applicable bonus plan developed by our board of directors or our compensation committee. The letter agreement also provides that, for so long as Mr. Evans serves as our Chief Executive Officer, at each annual meeting of our stockholders we will nominate him to serve as a member of our board of directors, and, if so elected at such meeting, he will continue to serve as a member of our board of directors.

Mr. Evans's amended and restated letter agreement contains a perpetual confidentiality covenant and an assignment of intellectual property covenant. Mr. Evans is also party to an Employee Non-Competition, Non-Solicitation, Confidentiality and Assignment Agreement under which he has agreed not to compete with us or solicit our employees, consultants, customers or suppliers during his employment and for one year following his termination and has agreed to a perpetual confidentiality covenant and an assignment of intellectual property covenant.

Dr. Ciaramella. We entered into an amended and restated employment agreement with Dr. Ciaramella, which became effective upon our IPO, that provides for a base salary of $475,000 per year, subject to adjustment by our board of directors (or a committee thereof), and a target annual bonus equal to 45% of his annual base salary, with the actual amount of the bonus earned determined by our board of directors, in its discretion, based on Dr. Ciaramella's performance and corporate performance compared to goals established by our compensation committee.

Dr. Ciaramella's amended and restated employment agreement contains a perpetual confidentiality covenant and an assignment of intellectual property covenant. Dr. Ciaramella is also party to an Employee Non-Competition, Non-Solicitation, Confidentiality and Assignment Agreement under which he has agreed not to compete with us or solicit our employees, consultants, customers or suppliers during his employment and for one year following his termination and has agreed to a perpetual confidentiality covenant and an assignment of intellectual property covenant.

Ms. Burrell. We entered into an amended and restated letter agreement with Ms. Burrell, which became effective upon our IPO, that provides for a base salary of $400,000 per year, subject to periodic review and adjustment by our compensation committee, and a target annual bonus equal to 40% of her annual base salary, with the actual amount of the bonus earned based on our compensation committee's assessment of individual and corporate performance.

Ms. Burrell is also party to an Employee Non-Solicitation, Confidentiality and Assignment Agreement under which she has agreed not to solicit our employees, independent contractors, customers, vendors or suppliers during her employment and for one year following her termination and has agreed to a perpetual confidentiality covenant and an assignment of intellectual property covenant.

Severance upon termination of employment; change in control.

Mr. Evans. Under his amended and restated letter agreement, if Mr. Evans's employment is terminated by us without cause or by him for good reason, he will be entitled to receive (i) continued payment of his base salary for a period of 12 months, (ii) an amount equal to his target annual bonus for the year of termination, pro-rated to reflect the portion of the calendar year during which he was employed, (iii) continued vesting for 12 months of any unvested equity awards, (iv) extended exercisability of the options granted to him on March 8, 2018 and July 13, 2018 until the earlier of the expiration of the original term and the date that is 24 months following his termination, and (v) payment of his full COBRA premiums for 12 months following his termination (or, if earlier, until the date on which Mr. Evans becomes eligible for coverage under a subsequent employer's medical plan), subject to his eligibility for, and timely election of, COBRA coverage.

In the event of a change in control, any unvested equity awards held by Mr. Evans, other than the portion of such equity awards that would otherwise have vested during the six-month period following such change in control (referred to as the "carved-out equity"), will become fully vested and exercisable. The carved-out equity will remain outstanding and eligible to vest in accordance with its terms. Under his amended and restated letter agreement, if Mr. Evans's employment is terminated by us without cause or by him for good reason within 12 months following or within 30 days immediately prior to the change in control, he will be entitled to receive (i) continued payment of his base salary for a period of 18 months following termination, (ii) an amount equal to 1.5 multiplied by his target annual bonus for the year of termination, (iii) immediate vesting of any unvested equity awards, (iv) extended exercisability of the options granted to him on March 8, 2018 and July 13, 2018 until the earlier of the expiration of the original term and the date that is 24 months following his termination, and (v) payment of his full COBRA premiums for 18 months following his termination (or, if earlier, until the date on which Mr. Evans becomes eligible for coverage under a subsequent employer's medical plan), subject to his eligibility for, and timely election of, COBRA coverage.

Dr. Ciaramella. Under his amended and restated employment agreement, if Dr. Ciaramella's employment is terminated by us without cause or by him for good reason, he will be entitled to receive (i) continued payment of his base salary for a period of 12 months, (ii) an amount equal to his target annual bonus for the year of termination, pro-rated to reflect the portion of the calendar year during which he was employed, (iii) continued vesting for 12 months of any unvested equity awards, and (iv) payment of his full COBRA premiums for 12 months following his termination (or, if earlier, until the date on which Dr. Ciaramella becomes eligible for coverage under a subsequent employer's medical plan), subject to his eligibility for, and timely election of, COBRA coverage.

In the event of a change in control, 50% of the unvested equity awards held by Dr. Ciaramella, other than the portion of such equity awards that would otherwise have vested during the six-month period following such change in control (referred to as the "carved-out equity"), will become fully vested and exercisable. The carved-out equity will remain outstanding and eligible to vest in accordance with its terms. Under his amended and restated employment agreement, if Dr. Ciaramella's employment is terminated by us without cause or by him for good reason within 12 months following or within 30 days immediately prior to the change in control, he will be entitled to receive (i) continued payment of his base salary for a period of 12 months, (ii) an amount equal to his target annual bonus for the year of termination, (iii) immediate vesting of any unvested equity awards, and (iv) payment of his full COBRA premiums for 12 months following his termination (or, if earlier, until the date on which Dr. Ciaramella becomes eligible for coverage under a subsequent employer's medical plan), subject to his eligibility for, and timely election of, COBRA coverage.

Ms. Burrell. Under her amended and restated letter agreement, if Ms. Burrell's employment is terminated by us without cause or by her for good reason, she will be entitled to receive (i) continued payment of her base salary for a period of 12 months and (ii) payment of a portion of her COBRA premiums for 12 months following her termination (or, if earlier, until the date on which Ms. Burrell becomes eligible for coverage under a subsequent employer's medical plan) in an amount equal to the employer portion of such premiums for active employees, subject to her eligibility for, and timely election of, COBRA coverage.

Under her amended and restated letter agreement, if Ms. Burrell's employment is terminated by us without cause or by her for good reason within 12 months following or within 30 days immediately prior to a change in control, she will be entitled to receive (i) continued payment of her base salary for a period of 12 months following termination, (ii) an amount equal to her target annual bonus for the year of termination, (iii) immediate vesting of any unvested equity awards, and (iv) payment of a portion of her COBRA premiums for 12 months (or, if earlier, until the date on which Ms. Burrell becomes eligible for coverage under a subsequent employer's medical plan) in an amount equal to the employer portion of such premiums for active employees, subject to her eligibility for, and timely election of, COBRA coverage.

Severance Subject to Release of Claims. Our obligation to provide an executive with severance payments and other benefits under the executive's amended and restated employment or letter agreement is conditioned on the executive signing a release of claims in favor of us. In addition, our obligation to provide Mr. Evans with severance payments and other benefits under his letter agreement is conditioned on his remaining available to provide consulting services to us as reasonably requested by our board of directors.

Employee and retirement benefits

We currently provide broad-based health and welfare benefits that are available to all of our employees, including our named executive officers, including health, life, disability, vision, and dental insurance. In addition, we maintain a 401(k) retirement plan for our full-time employees. The 401(k) plan also permits us to make discretionary employer contributions. We did not make any employer contributions to the 401(k) plan in 2019. Other than the 401(k) plan, we do not provide any qualified or non-qualified retirement or deferred compensation benefits to our employees, including our named executive officers.

Outstanding awards at fiscal year-end table

The following table sets forth information concerning outstanding equity awards held by each of our named executive officers as of December 31, 2019:

	Option awards					Stock awards		
Name	Number of securities underlying unexercised options exercisable (#)	Number of securities underlying unexercised options unexercisable (#)	Equity incentive plan awards: Number of securities underlying unexercised unearned options (#)	Option exercise price ($/share)	Option expiration date	Number of shares of stock that have not vested (#)		Market value of shares of stock that have not vested ($)(1)
John Evans	—	—	—	—	—	74,205	(2)	$ 1,014,918
	—	—	—	—	—	443,171	(3)	$ 6,061,314
	—	—	198,672	$ 0.67	5/8/2028(4)	—		—
	236,280	281,065	—	$ 1.03	7/13/2028(5)	—		—
	—	—	107,929	$ 4.22	2/13/2029(6)	—		—
	—	223,000	—	$ 7.22	5/17/2029(7)	—		—
Giuseppe Ciaramella, Ph.D.	—	—	54,635	$ 0.67	5/8/2028(8)	—		—
	125,205	147,970	—	$ 0.67	5/8/2028(9)	—		—
	59,486	70,302	—	$ 1.03	7/13/2028(10)	—		—
	—	—	25,957	$ 4.22	2/13/2029(11)	—		—
	—	121,646	—	$ 7.22	5/17/2029(12)	—		—
	—	23,303	—	$ 7.22	5/31/2029(13)	—		—
Terry-Ann Burrell	—	390,250	—	$ 13.68	8/31/2029(14)	—		—

(1) Based on the most recent estimated fair market value of a share of our common stock ($13.68), as determined by our board of directors on August 31, 2019.

(2) Represents 228,068 restricted shares of our common stock granted on August 17, 2017, of which 85,594 restricted shares vested in equal monthly installments through January 3, 2018, and, after giving effect to an amendment to the grant, the remaining 142,474 restricted shares vest in 48 equal monthly installments following January 8, 2018, generally subject to Mr. Evans's continued employment with us through the applicable vesting date.

(3) Represents 850,889 restricted shares of our common stock granted on January 8, 2018, which, after giving effect to an amendment to the grant, vest in 48 equal monthly installments following the grant date, generally subject to Mr. Evans's continued employment with us through the applicable vesting date.

(4) Represents an option to purchase 198,672 shares of our common stock granted on May 8, 2018, which vests as to 50% of the underlying shares upon the achievement of certain development milestones related to editing applications and as to 50% of the underlying shares upon the achievement of a closing price hurdle following our IPO, in each case, generally subject to Mr. Evans's continued employment with us through December 31, 2022.

(5) Represents an option to purchase 539,645 shares of our common stock granted on July 13, 2018, which vested as to 25% of the underlying shares on January 8, 2019 and vests in 36 equal monthly installments thereafter, generally subject to Mr. Evans's continued employment with us through the applicable vesting date.

(6) Represents an option to purchase 107,929 shares of our common stock granted on February 13, 2019, which vests as to 50% of the underlying shares upon the achievement of certain development milestones related to editing applications and as to 50% of the underlying shares upon the achievement of a closing price hurdle following our IPO, in each case generally subject to Mr. Evans's continued employment with us through December 31, 2022.

(7) Represents an option to purchase 223,000 shares of our common stock granted on May 17, 2019, which vests as to 25% of the underlying shares on October 1, 2020 and vests in 36 equal monthly installments thereafter, generally subject to Mr. Evans's continued employment with us through the applicable vesting date.

(8) Represents an option to purchase 54,635 shares of our common stock granted on May 8, 2018, which vests as to 50% of the underlying shares upon the achievement of certain development milestones related to editing applications and as to 50% of the underlying shares upon the achievement of a closing price hurdle following our IPO, in each case, generally subject to Dr. Ciaramella's continued employment with us through December 31, 2022.

(9) Represents an option to purchase 273,175 shares of our common stock granted on May 8, 2018, which vested as to 25% of the underlying shares on February 26, 2019 and vests in 36 equal monthly installments thereafter, generally subject to Dr. Ciaramella's continued employment with us through the applicable vesting date.

(10) Represents an option to purchase 129,788 shares of our common stock granted on July 13, 2018, which vested as to 25% of the underlying shares on February 26, 2019 and vests in 36 equal monthly installments thereafter, generally subject to Dr. Ciaramella's continued employment with us through the applicable vesting date.

(11) Represents an option to purchase 25,957 shares of our common stock granted on February 13, 2019, which vests as to 50% of the underlying shares upon the achievement of certain development milestones related to editing applications and as to 50% of the underlying shares upon the achievement of a closing price hurdle following our IPO, in each case generally subject to Dr. Ciaramella's continued employment with us through December 31, 2022.

(12) Represents an option to purchase 121,646 shares of our common stock granted on May 17, 2019, which vests as to 25% of the underlying shares on October 1, 2020 and vests in 36 equal monthly installments thereafter, generally subject to Dr. Ciaramella's continued employment with us through the applicable vesting date.

(13) Represents an option to purchase 23,303 shares of our common stock granted on May 31, 2019, which vests as to 25% of the underlying shares on October 1, 2020 and vests in 36 equal monthly installments thereafter, generally subject to Dr. Ciaramella's continued employment with us through the applicable vesting date.

(14) Represents an option to purchase 390,250 shares of our common stock granted on August 31, 2019, which vests as to 25% of the underlying shares on August 20, 2020 and vests in 36 equal monthly installments thereafter, generally subject to Ms. Burrell's continued employment with us through the applicable vesting date.

Director compensation

The following table sets forth information concerning the compensation awarded to, earned by or paid to our non-employee directors during the fiscal year ended December 31, 2019. Mr. Evans's compensation for 2019 is included with that of our other named executive officers above.

Name	Fees earned or paid in cash ($)(1)	Option awards ($)(2)	Total ($)
Kristina Burow(3)	$ —	$ —	$ —
Mark Fishman, M.D.	50,000	—	50,000
Carole Ho, M.D.	50,000	331,293	381,293
Stephen Knight, M.D.(3)	—	—	—
Robert Nelsen(3)	—	—	—
Michael Yi(3)(4)	—	—	—
Feng Zhang, Ph.D.(5)	—	—	—
Graham Cooper(6)	12,500	—	12,500

(1) Amount represents cash fees earned in fiscal year 2019, pro-rated for the director's service during the year.

(2) The amounts reported in this column represent the aggregate grant date fair value of options to purchase our common stock granted to Dr. Ho in fiscal year 2019 computed in accordance with FASB ASC 718, excluding the effect of estimated forfeitures. The assumptions used to value the options for this purpose are set forth in Note 13, *Stock option and grant plan*, to our consolidated financial statements included in this Annual Report on Form 10-K. As of December 31, 2019, Dr. Fishman held options to purchase 260,241 shares of our common stock and Dr. Ho held options to purchase 64,670 shares of our common stock.

(3) Directors who are affiliated with our investors do not receive compensation in respect of their service as members of our board of directors.

(4) Mr. Yi resigned from our board of directors effective July 16, 2019.

(5) Dr. Zhang resigned from our board of directors effective February 21, 2019.

(6) Mr. Cooper joined our board of directors on October 8, 2019.

Director compensation

In respect of their service on our board of directors in fiscal year 2019, Dr. Fishman, Dr. Ho and Mr. Cooper were each entitled to receive a $50,000 cash retainer, pro-rated, as applicable, for the director's service during the year, and stock option grants as determined by our board of directors.

On April 30, 2018, we entered into a consulting agreement with Dr. Fishman pursuant to which he agreed to provide certain advisory services to our Chief Executive Officer and us in exchange for certain stock option grants, which were made in 2018. We and Dr. Fishman agreed to terminate the consulting agreement effective September 23, 2019.

On February 13, 2019, Dr. Ho received a grant of an option to purchase 64,670 shares of our common stock, which vested as to 25% of the underlying shares on October 19, 2019, with the remainder vesting in 36 equal monthly installments thereafter subject to her continued service with us through the applicable vesting date.

Director compensation policy

In connection with our IPO, our board of directors adopted a non-employee director compensation policy, which became effective upon the completion of our IPO. Under the non-employee director compensation policy, our non-employee directors, other than our non-employee directors affiliated with ARCH Venture Partners or F Prime Capital, will be compensated as follows:

- each non-employee director will receive an annual cash fee of $35,000 ($65,000 for the chairman of our board of directors);
- each non-employee director who is a member of the audit committee will receive an additional annual cash fee of $7,500 ($15,000 for the audit committee chairman);
- each non-employee director who is a member of our compensation committee will receive an additional annual cash fee of $5,000 ($10,000 for our compensation committee chairman);
- each non-employee director who is a member of the nominating and corporate governance committee will receive an additional annual cash fee of $4,000 ($8,000 for the nominating and corporate governance committee chairman);
- each non-employee director who is first elected or appointed to our board of directors after the completion of our IPO will be granted an option under the 2019 Plan to purchase shares of common stock having a grant date fair value, determined in accordance with FASB ASC 718, of approximately $375,000 upon his or her initial election to our board of directors;
- each non-employee director who is not first elected or appointed to our board of directors in the calendar year in which an annual meeting occurs (or, for the avoidance of doubt, at the time of the annual meeting) will annually be granted an option under the 2019 Plan to purchase shares of common stock having a grant date fair value, determined in accordance with FASB ASC 718, of approximately $187,500 on the date of the first meeting of our board of directors held after such annual meeting of our stockholders; and
- in connection with our IPO, Mr. Cooper was granted an option to purchase 31,220 shares of our common stock, with an exercise price equal to $17.00, our IPO price.

The stock options granted to our non-employee directors will have a per share exercise price equal to the fair market value of a share of our common stock on the date of grant and will expire not later than ten years after the date of grant. The stock options granted to non-employee directors upon the non-employee director’s initial election to our board of directors will vest as to one-third of the underlying shares on the first anniversary of the date of grant and in equal monthly installments as to the remainder of the shares for two years thereafter, subject to such director’s continued service on our board of directors. The annual stock options granted to our non-employee directors will vest in full on the first anniversary of the date of grant, subject to the director’s continued service on our board of directors.

All cash fees will be paid quarterly, in arrears, or upon the earlier resignation or removal of the non-employee director. The amount of each payment will be prorated for any portion of a calendar quarter that a non-employee director is not serving on our board of directors, based on the number of calendar days served by such non-employee director.

Each non-employee director, including each director affiliated with ARCH Venture Partners or F-Prime Capital, is entitled to reimbursement for reasonable travel and other expenses incurred in connection with attending meetings of our board of directors and any committee on which he or she serves.

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

The following table sets forth certain information with respect to the beneficial ownership of our common stock at March 13, 2020, as adjusted to reflect the sale of common stock offered by us in our IPO, for:

- each person who we know beneficially owns more than 5% of our common stock;
- each of our directors;
- each of our named executive officers; and
- all of our directors and executive officers as a group.

The number of shares beneficially owned by each stockholder is determined under rules issued by the SEC. Under these rules, a person is deemed to be a "beneficial" owner of a security if that person has or shares voting power or investment power, which includes the power to dispose of or to direct the disposition of such security. Except as indicated in the footnotes below, we believe, based on the information furnished to us, that the individuals and entities named in the table below have sole voting and investment power with respect to all shares of common stock beneficially owned by them, subject to any applicable community property laws.

Percentage ownership of our common stock before this offering is based on 51,327,657 shares of our common stock outstanding as of March 13, 2020. Outstanding common stock as of March 13, 2020 includes 2,310,400 shares of unvested restricted stock, which are not included as outstanding for accounting purposes and are not included as outstanding shares in our consolidated financial statements. In computing the number of shares beneficially owned by an individual or entity and the percentage ownership of that person, shares of common stock subject to options, warrants or other rights held by such person that are currently exercisable or that will become exercisable within 60 days after March 13, 2020 are considered outstanding, although these shares are not considered outstanding for purposes of computing the percentage ownership of any other person. Unless noted otherwise, the address of all listed stockholders is 26 Landsdowne Street, 2nd Floor, Cambridge, MA 02139.

Name of beneficial owner	Number of shares beneficially owned	Percentage of shares beneficially owned
5% or greater stockholders:		
Funds affiliated with ARCH Venture Partners(1)	8,243,039	16.1%
F-Prime Capital Partners Healthcare Fund V LP(2)	6,971,912	13.6%
David Liu	3,282,287	6.4%
HH Beam Holdings LLC(3)	2,671,403	5.2%
Feng Zhang	2,588,762	5.0%
TLS Beta Pte. Ltd.(4)	2,509,641	4.9%
Directors and Named Executive Officers:		
John Evans(5)	1,393,749	2.7%
Giuseppe Ciaramella(6)	218,270	*
Terry-Ann Burrell	—	—
Kristina Burow	—	—
Graham Cooper	—	—
Mark Fishman, M.D.(7)	147,127	*
Stephen Knight, M.D.	—	—
Carole Ho, M.D.(8)	24,251	*
Robert Nelsen	—	—
All executive officers and directors as a group (9 persons)(9)	1,783,397	3.5%

* Less than 1%

(1) Represents (a) 4,121,519 shares of common stock issuable upon exercise of convertible preferred stock held by ARCH Venture Fund IX Overage, L.P., or ARCH IX Overage, and (b) 4,121,520 shares of common stock issuable upon exercise of convertible preferred stock held by ARCH Venture Fund IX, L.P., or ARCH IX. ARCH Venture Partners IX Overage, L.P., or the GPLP, as the sole general partner of ARCH IX Overage, has the power to vote and dispose of the shares held of record by ARCH IX Overage and may be deemed to beneficially own certain of the shares held of record by ARCH IX Overage. ARCH Venture Partners IX, L.P., or AVP IX LP, has the power top vote and dispose of the shares held of record by ARCH IX and may be deemed to beneficially own certain of the shares held of record by ARCH IX. GPLP and AVP IX LP disclaim beneficial ownership of all shares held of record by ARCH IX Overage and ARCH IX, respectively, in which the GPLP or AVP IX LP does not have an actual pecuniary interest. ARCH Venture Partners IX, LLC, or the GPLLC, as the sole general partner of the

GPLP and AVP IX LP, has the power to vote and dispose of the shares held of record by ARCH IX Overage and ARCH IX and may be deemed to beneficially own certain of the shares held of record by ARCH IX Overage and ARCH IX. The GPLLC disclaims beneficial ownership of all shares held of record by ARCH IX Overage and ARCH IX in which it does not have an actual pecuniary interest. Keith Crandell, Clinton Bybee, and Robert Nelsen are the managing directors of the GPLLC, share the power to vote and dispose of the shares held of record by ARCH IX Overage and ARCH IX and may be deemed to beneficially own certain of the shares held of record by ARCH IX Overage and ARCH IX. The managing directors disclaim beneficial ownership of all shares held of record by ARCH IX Overage and ARCH IX in which they do not have an actual pecuniary interest. The address of all filing persons is 8755 W. Higgins Road, Suite 1025, Chicago, IL 60631.

(2) Consists of 66,369 shares of common stock issuable upon conversion of shares of Series B Preferred Stock, 4,715,723 shares of common stock issuable upon conversion of shares of Series A2 Preferred Stock and 2,189,820 shares of common stock issuable upon conversion of shares of Series A1 Preferred Stock held by F-Prime Capital Partners Healthcare Fund V LP. F-Prime Capital Partners Healthcare Advisors Fund V LP is the general partner of F-Prime Capital Partners Healthcare Fund V LP. F-Prime Capital Partners Healthcare Advisors Fund V LP is solely managed by Impresa Management LLC, the managing member of its general partner and its investment manager. Impresa Management LLC is owned, directly or indirectly, by various shareholders and employees of FMR LLC. Each of the entities listed above expressly disclaims beneficial ownership of the securities listed above except to the extent of any pecuniary interest therein. The address of these entities is 245 Summer Street, Boston, MA 02210.

(3) Consists of 1,991,072 shares of common stock issuable upon conversion of shares of Series B Preferred Stock, 630,776 shares of common stock issuable upon conversion of shares of Series A2 Preferred Stock and 49,555 shares of common stock issuable upon conversion of shares of Series A1 Preferred Stock held by HH Beam Holdings LLC. HH Beam Holdings LLC is beneficially owned and controlled by Hillhouse Fund IV, L.P. Hillhouse Capital Management, Ltd. acts as the sole management company of Hillhouse Fund IV, L.P., which is in turn ultimately controlled by Mr. Lei Zhang. The registered address of HH Beam Holdings LLC is Citco Trustees (Cayman) Limited, 89 Nexus Way, Camana Bay, PO Box 31106, Grand Cayman KY1-1205, Cayman Islands.

(4) TLS Beta Pte. Ltd. is a wholly owned subsidiary of Temasek Life Sciences Private Limited, which is a wholly owned subsidiary of Fullerton Management Pte. Ltd., which is a wholly owned subsidiary of Temasek Holdings (Private) Limited. The address of these entities is 60B Orchard Road, #06-18 Tower 2, The Atrium@Orchard, Singapore 238891.

(5) Includes 455,292 shares of unvested restricted stock as of March 13, 2020 that Mr. Evans has the ability to vote. Includes options to purchase 292,492 shares of common stock that are exercisable within 60 days of March 13, 2020.

(6) Includes options to purchase 218,270 shares of common stock that are exercisable within 60 days of March 13, 2020.

(7) Includes options to purchase 130,120 shares of common stock that are exercisable within 60 days of March 13, 2020.

(8) Includes options to purchase 24,251 shares of common stock that are exercisable within 60 days of December 31, 2019.

(9) Includes 455,292 shares of unvested restricted stock as of March 13, 2020 that Mr. Evans has the ability to vote. Includes options to purchase 665,133 shares of common stock that are exercisable within 60 days of March 13, 2020.

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

The following is a summary of transactions since January 1, 2019 to which we have been a party in which the amount involved exceeded $120,000 and in which any of our executive officers, directors, promoters or beneficial holders of more than 5% of our capital stock had or will have a direct or indirect material interest. We believe that all of the transactions described below were made on terms no less favorable to us than could have been obtained from unaffiliated third parties

Private placements

Series B convertible preferred stock

In November 2018, December 2018, January 2019 and February 2019 we completed the sale of an aggregate of 40,178,574 shares of our Series B convertible preferred stock at a purchase price of $3.36 per share for an aggregate purchase price of $135.0 million. Each share of our Series B convertible preferred stock was converted into shares of our common stock immediately prior to the closing of our IPO, including adjustments in connection with the 1-for-4.4843 reverse stock split of our common stock effected on January 24, 2020. The following table summarizes purchases of shares of our Series B convertible preferred stock by holders of more than 5% of our capital stock and entities affiliated with a member of our board of directors.

Name of stockholder	Director	Number of series B preferred stock	Approximate purchase price
Funds affiliated with ARCH Venture Partners	Kristina Burow Robert Nelsen	297,620	$ 1,000,003
F-Prime Capital Partners Healthcare Fund V LP	Stephen Knight	297,620	1,000,003
HH Beam Holdings LLC		8,928,573	30,000,002
TLS Beta Pte. Ltd.		7,440,476	24,999,999

Founder academic consulting agreements

On March 1, 2017, we entered into Academic Consulting Agreements with each of David Liu, Feng Zhang and Keith Joung, or the Founders, pursuant to which the Founders provide advisory services as mutually determined by us and the Founders from time to time. The initial term of the Academic Consulting Agreements is for four years, and the agreements continue in effect thereafter until terminated by either party. Under the terms of the agreements, we pay each of the Founders a consulting fee of $150,000 per year, payable in monthly installments in arrears beginning with the initial closing of our Series A-1 convertible preferred stock on June 28, 2017. Additionally, we agreed to reimburse each of the Founders for reasonable business expenses incurred in connection with the performance of their services under the agreements. To date, we have paid each of the Founders $200,000 for consulting services pursuant to these agreements.

License and collaboration agreement

In September 2019, we entered into a collaboration and license agreement with Prime Medicine, Inc., or Prime Medicine, to research and develop a novel gene editing technology recently developed by David Liu and his group at Broad Institute. David Liu is a Founder and beneficially owns 5% or more of our common stock. Under the terms of this agreement, we granted Prime Medicine a non-exclusive license to certain of our CRISPR technology (including Cas12b) and delivery technology, and certain other technology controlled by us, to develop and commercialize gene-editing products for the treatment of human diseases. Prime Medicine granted us an exclusive license under certain gene editing technology controlled by Prime Medicine in certain fields and for certain applications similar to those we are already pursuing with base editing (specifically, the creation and correction of single-base transition mutations as well as the treatment of sickle cell disease). Our exclusive rights from Prime Medicine are also subject to Broad Institute's inclusive innovation model. We are not currently using the intellectual property licensed from Prime Medicine in any of our current programs, however, we are required to use commercially reasonable efforts to develop new product candidates using the intellectual property licensed from Prime Medicine and therefore intend to evaluate this gene editing technology in accordance with our agreement with Prime Medicine and may in the future use this technology in future product candidates. Each party granted to the other party certain exclusive and non-exclusive licenses to certain technology developed after the effective date of the agreement and controlled by the granting party or jointly owned by the parties. Each party has an obligation to assign rights in certain technology developed under the collaboration to the other party.

We are required to use commercially reasonable efforts to develop and seek regulatory approval for two products that use licensed technology from Prime Medicine in certain specified countries and to commercialize licensed products for which regulatory approval has been obtained in certain specified countries. Prime Medicine and we are each required to use commercially reasonable efforts to conduct the activities for which we are responsible under any development plan(s) under the agreement. Prime Medicine has an option to jointly develop and commercialize, and share expenses and revenue for, certain products that use technology licensed from Prime Medicine in the United States.

For products that use technology licensed from Prime Medicine, we may be required to make milestone payments to Prime Medicine upon the achievement of certain clinical, regulatory and commercial events. The aggregate potential milestone payments per product for the achievement of such clinical and regulatory events ranges from the low- to mid-eight figures. The aggregate potential milestone payments per product for the achievement of such commercial events ranges from the mid- to high-eight figures. We may also be obligated to pay a high-single digit royalty to a royalty rate between 10% and 15% on net sales of products that are covered by the technology licensed to us or by certain technology developed under the agreement, subject to certain reductions. We may be entitled to receive from Prime Medicine a low-single digit royalty on net sales of products developed by Prime Medicine that are covered by the technology licensed from us, subject to certain reductions. In addition, certain of the rights licensed under the agreement are sublicensed from third parties, and we or Prime Medicine may be required to make certain payments to such third parties to the extent we or Prime Medicine develop and commercialize products under such rights.

We have an obligation to issue $5,000,000 in shares of our common stock to Prime Medicine, and Prime Medicine has an obligation to issue 5,000,000 shares of its common stock to us, should the collaboration extend beyond one year. We are also obligated to provide management services to Prime Medicine for up to one year. We have the right to designate one member of Prime Medicine's board of directors.

Director affiliations

Some of our directors are affiliated with and serve on our board of directors as representatives of entities which beneficially own or owned 5% or more of our common stock, as indicated below:

Director	Principal stockholder
Kristina Burow	Funds affiliated with ARCH Venture Partners
Robert Nelsen	Funds affiliated with ARCH Venture Partners
Stephen Knight	F-Prime Capital Partners Healthcare Fund V LP

Investor rights agreement

We are party to an amended and restated investor rights agreement, or the Investor Rights Agreement, with each holder of our convertible preferred stock, which includes each holder of more than 5% of our capital stock and certain of our directors (or, in some cases, entities affiliated therewith). The Investor Rights Agreement imposes certain affirmative obligations on us, and also grants certain rights to the holders, including certain registration rights with respect to the registrable securities held by them. Other provisions of the Investor Rights Agreement were terminated upon completion of our IPO.

Employment or offer letter agreements

We have entered into employment or offer letter agreements with certain of our executive officers. See Item 11., *Executive Compensation*, in this Annual Report on Form 10-K.

We have granted stock options and/or restricted stock to our named executive officers, other executive officers and certain of our directors. See the Item 11, Executive Compensation, in this Annual Report on Form 10-K.

Director and officer indemnification and insurance

We have agreed to indemnify each of our directors and executive officers against certain liabilities, costs and expenses, and have purchased directors' and officers' liability insurance. We also maintain a general liability insurance policy which covers certain liabilities of directors and officers arising out of claims based on acts or omissions in their capacities as directors or officers.

Related person transaction policy

Our board of directors has adopted a written related person transaction policy setting forth the policies and procedures for the review and approval or ratification of related person transactions. This policy covers, with certain exceptions set forth in Item 404 of Regulation S-K under the Securities Act of 1933, as amended, any transaction, arrangement or relationship, or any series of similar transactions, arrangements or relationships, in which we were or are to be a participant, where the amount involved exceeds $120,000 in any fiscal year and a related person had, has or will have a direct or indirect material interest, including without limitation, purchases of goods or services by or from the related person or entities in which the related person has a material interest, indebtedness, guarantees of indebtedness and employment by us of a related person. In reviewing and approving any such transactions, our audit committee is tasked to consider all relevant facts and circumstances, including, but not limited to, whether the transaction is on terms comparable to those that could be obtained in an arm's length transaction and the extent of the related person's interest in the transaction. All of the transactions described in this section occurred prior to the adoption of this policy.

Director independence

Under the rules of the Nasdaq Stock Market, independent directors must comprise a majority of a listed company's board of directors within one year of the completion of its initial public offering. In addition, the rules of the Nasdaq Stock Market require that, subject to specified exceptions, each member of a listed company's audit and compensation committees be independent and that director

nominees be selected or recommended for the board's selection by independent directors constituting a majority of the independent directors or by a nominating and corporate governance committee comprised solely of independent directors. Under the rules of the Nasdaq Stock Market, a director will only qualify as "independent" if, in the opinion of that company's board of directors, that person does not have a relationship that would interfere with the exercise of independent judgment in carrying out the responsibilities of a director and that such person is "independent" as defined under Nasdaq Stock Market and the Exchange Act rules.

Audit committee members must also satisfy the independence criteria set forth in Rule 10A-3 under the Exchange Act. In order to be considered independent for purposes of Rule 10A-3, a member of an audit committee of a listed company may not, other than in his or her capacity as a member of the audit committee, the board of directors or any other board committee: (1) accept, directly or indirectly, any consulting, advisory or other compensatory fee from the listed company or any of its subsidiaries or (2) be an affiliated person of the listed company or any of its subsidiaries.

Based upon information requested from and provided by each director concerning his or her background, employment and affiliations, including family relationships, our board of directors has determined that each of our directors, with the exception of Mr. Evans, is an "independent director" as defined under applicable rules of the Nasdaq Stock Market, including, in the case of Mr. Cooper and Mr. Fishman, the independence criteria set forth in Rule 10A-3 under the Exchange Act, and in the case of all the members of our compensation committee, the independence criteria set forth in Rule 10C-1 under the Exchange Act and are "non-employee directors" as defined in Section 16b-3 of the Exchange Act. In making such determination, our board of directors considered the relationships that each such non-employee director has with us and all other facts and circumstances that our board of directors deemed relevant in determining his or her independence, including the beneficial ownership of our capital stock by each non-employee director. Mr. Evans is not an independent director under these rules because he is our Chief Executive Officer.

Item 14. Principal Accounting Fees and Services.

Our audit committee has appointed Deloitte and Touch LLP, or Deloitte, as our independent registered public accounting firm for the fiscal year ending December 31, 2019. Deloitte has served as our registered public accountant since 2017.

The following table represents aggregate fees billed to us for services related to the fiscal years ended December 31, 2019 and 2018, by Deloitte.

	2019	2018
Audit fees	$ 1,684,546	$ 229,693
Audit-related fees	—	—
Tax fees	15,225	14,500
All other fees	1,895	—
Total	$ 1,701,666	$ 244,193

(1) Audit fees consist of fees billed for professional services performed by Deloitte for the audit of our annual consolidated financial statements, the review of interim consolidated financial statements, and review of the registration statement on Form S-1 for our IPO, and related services that are normally provided in connection with statutory and regulatory filings or engagements.
(2) Audit related fees consist of fees billed for assurance and related services that are reasonably related to the performance of the audit or review of our consolidated financial statements, such as fees for the adoption of new accounting standards.
(3) Tax fees consist of fees for professional services, including tax consulting, compliance, and transfer pricing services.
(4) All other fees consist of database subscription fees paid to Deloitte.

The audit committee has considered whether the provision of non-audit services is compatible with maintaining the independence of Deloitte and has concluded that the provision of such services is compatible with maintaining such independence.

Pre-Approval Policies and Procedures

Our audit committee has adopted policies and procedures relating to the approval of all audit and non-audit services that are to be performed by our registered public accounting firm. These policies and procedures generally provide that we will not engage our registered public accounting firm to render audit or non-audit services unless the service is specifically approved in advance by our audit committee or the engagement is entered into pursuant to one of the pre-approval procedures described below.

From time to time, our audit committee may pre-approve specified types of services that are expected to be provided to us by our registered public accounting firm during the next 12 months. Any such pre-approval is detailed as to the particular service or type of services to be provided and is also generally subject to a maximum dollar amount.

Our audit committee may also delegate to one or more subcommittees or an individual member of our audit committee the authority to approve any audit or non-audit services to be provided to us by our registered public accounting firm. Any approval of services by a subcommittee or member of our audit committee pursuant to this delegated authority is reported on at the next meeting of our audit committee. During our 2019 and 2018 fiscal years, all services provided by Deloitte were pre-approved by our audit committee.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

1. Financial Statements

For a list of the financial statements included herein, see *Index to the Consolidated Financial Statements* on page F-1 of this Annual Report on Form 10-K, incorporated into this Item by reference.

2. Financial Statement Schedules

Financial statement schedules have been omitted because they are either not required or not applicable or the information is included in the consolidated financial statements or the notes thereto.

3. Exhibits

Exhibit Number	Description of Exhibit	Form	File Number	Date of Filing	Exhibit Number	Filed Herewith
3.1	Fourth Amended Certificate of Incorporation of Beam Therapeutics Inc.	8-K	001-39208	02/11/2020	3.1	
3.2	Amended and Restated By-laws of Beam Therapeutics Inc.	8-K	001-39208	02/11/2020	3.2	
4.1	Specimen stock certificate evidencing shares of common stock	S-1	333-233985	09/27/2019	4.1	
4.2	Amended and Restated Investors' Rights Agreement, by and among Beam Therapeutics Inc. and the investors party thereto, dated as of November 8, 2018	S-1	333-233985	09/27/2019	4.2	
4.3	Description of Registered Securities					X
10.1	Lease, by and between UP 26 Landsdowne, LLC and Beam Therapeutics Inc., dated February 21, 2018	S-1	333-233985	09/27/2019	10.1	
10.2	Indenture of Lease, by and between Massachusetts Institute of Technology and Beam Therapeutics Inc., dated as of April 24, 2019	S-1	333-233985	09/27/2019	10.2	
10.3	License Agreement, by and between MIL 21E, LLC and Beam Therapeutics Inc., dated as of June 25, 2019	S-1	333-233985	09/27/2019	10.3	
10.4#	License Agreement, by and between the President and Fellows of Harvard College and Beam Therapeutics Inc., dated as of June 27, 2017	S-1	333-233985	09/27/2019	10.4	
10.5#	License Agreement, by and between The Broad Institute, Inc. and Blink Therapeutics Inc., dated as of May 9, 2018	S-1	333-233985	09/27/2019	10.5	
10.6#	License Agreement, by and between Editas Medicine, Inc. and Beam Therapeutics Inc., dated as of May 9, 2018	S-1	333-233985	09/27/2019	10.6	
10.7#	License Agreement, by and between Bio Palette Co., Ltd. and Beam Therapeutics Inc., dated as of March 27, 2019	S-1	333-233985	09/27/2019	10.7	
10.8	Beam Therapeutics Inc. 2017 Stock Option and Grant Plan	S-1/A	333-233985	01/27/2020	10.8	
10.9	Form of Restricted Stock Agreement under the Beam Therapeutics Inc. 2017 Stock Option and Grant Plan	S-1	333-233985	09/27/2019	10.9	
10.10	Form of Incentive Stock Option Grant Notice under the Beam Therapeutics Inc. 2017 Stock Option and Grant Plan	S-1	333-233985	09/27/2019	10.10	
10.11	Form of Non-Qualified Stock Option Grant Notice under the Beam Therapeutics Inc. 2017 Stock Option and Grant Plan	S-1	333-233985	09/27/2019	10.11	
10.12	Form of Indemnification Agreement between Beam Therapeutics Inc. and its directors and officers	S-1	333-233985	09/27/2019	10.12	

Exhibit Number	Description of Exhibit	Form	File Number	Date of Filing	Exhibit Number	Filed Herewith
10.13+	Letter Agreement between Beam Therapeutics Inc. and John Evans, dated January 24, 2020	S-1/A	333-233985	01/27/2020	10.13	
10.14+	Amended and Restated Employment Agreement between Beam Therapeutics Inc. and Giuseppe Ciaramella, dated January 24, 2020	S-1/A	333-233985	01/27/2020	10.13	
10.15+	Letter Agreement between Beam Therapeutics Inc. and Terry-Ann Burrell, dated January 24, 2020	S-1/A	333-233985	01/27/2020	10.15	
10.16+	Beam Therapeutics Inc. 2019 Equity Incentive Plan	S-1/A	333-233985	01/27/2020	10.16	
10.17+	Form of Incentive Stock Option Agreement under the Beam Therapeutics Inc. 2019 Equity Incentive Plan	S-1/A	333-233985	01/27/2020	10.17	
10.18+	Form of Non-Statutory Stock Option Agreement under the Beam Therapeutics Inc. 2019 Equity Incentive Plan	S-1/A	333-233985	01/27/2020	10.18	
10.19+	Form of Non-Statutory Stock Option Agreement (Non-Employee Directors) under the Beam Therapeutics Inc. 2019 Equity Incentive Plan	S-1/A	333-233985	01/27/2020	10.19	
10.20+	Beam Therapeutics Inc. 2019 Employee Stock Purchase Plan	S-1/A	333-233985	01/27/2020	10.20	
10.21+	Beam Therapeutics Inc. 2019 Cash Incentive Plan	S-1/A	333-233985	01/27/2020	10.21	
10.22+	Beam Therapeutics Inc. Non-Employee Director Compensation Policy	S-1/A	333-233985	01/27/2020	10.22	
21.1	List of Subsidiaries of Beam Therapeutics Inc.					X
23.1	Consent of Deloitte & Touche LLP					X
31.1	Certification of Principal Executive Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under 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 Rules 13a-14(a) and 15d-14(a) under 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 Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.					X
32.2*	Certification of Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.					X

Portions of this exhibit have been omitted because the Registrant has determined they are not material and would likely cause competitive harm to the Registrant if publicly disclosed

\+ Indicates management contract or compensatory plan

* This certification will not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or the Exchange Act, or otherwise subject to the liability of that section. Such certification will not be deemed to be incorporated by reference into any filing under the Securities Act of 1933, as amended, or the Exchange Act, except to the extent specifically incorporated by reference into such filing.

Item 16. Form 10-K Summary

None.

SIGNATURES

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

BEAM THERAPEUTICS, INC.

Date: March 30, 2020

By: /s/ John Evans
John Evans
Chief Executive Officer

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

Name	Title	Date
/s/ John Evans **John Evans**	Chief Executive Officer and Director (Principal Executive Officer)	March 30, 2020
/s/ Terry-Ann Burrell **Terry-Ann Burrell**	Chief Financial Officer and Treasurer (Principal Financial Officer and Principal Accounting Officer)	March 30, 2020
/s/ Kristina Burow **Kristina Burow**	Director	March 30, 2020
/s/ Graham Cooper **Graham Cooper**	Director	March 30, 2020
/s/ Mark Fishman **Mark Fishman, M.D.**	Director	March 30, 2020
/s/ Stephen Knight **Stephen Knight, M.D.**	Director	March 30, 2020
/s/ Carole Ho **Carole Ho, M.D.**	Director	March 30, 2020
/s/ Robert Nelsen **Robert Nelsen**	Director	March 30, 2020

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the stockholders and the Board of Directors of Beam Therapeutics Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Beam Therapeutics Inc. and subsidiaries (the "Company") as of December 31, 2019 and 2018, the related consolidated statements of operations and other comprehensive loss, redeemable convertible preferred stock and stockholders' deficit, and cash flows, for each of the two years in the period ended December 31, 2019, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2019, in conformity with accounting principles generally accepted in the United States of America.

Change in Accounting Principle

As discussed in Note 2 to the financial statements, effective January 1, 2019, the Company adopted FASB Accounting Standards Codification Topic 842, Leases, using the modified retrospective approach and utilizing the effective date as its date of adoption.

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 Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

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

Our audits included performing procedures to assess the risks of material misstatement of the 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.

/s/ Deloitte & Touche LLP

Boston, Massachusetts

March 30, 2020

We have served as the Company’s auditor since 2017.

Beam Therapeutics Inc.
Consolidated balance sheets
(in thousands, except share and per share amounts)

	December 31, 2019	December 31, 2018
Assets		
Current assets:		
Cash and cash equivalents	$ 37,221	$ 146,443
Marketable securities	54,627	—
Prepaid expenses and other current assets	2,696	1,832
Total current assets	94,544	148,275
Property and equipment, net	24,290	16,944
Restricted cash	13,332	1,493
Operating lease right-of-use assets	18,957	—
Other assets	4,976	300
Total assets	$ 156,099	$ 167,012
Liabilities, redeemable convertible preferred stock, and stockholders' deficit		
Current liabilities:		
Accounts payable	$ 7,846	$ 7,351
Accrued expenses and other current liabilities	7,852	1,734
Derivative liabilities	7,800	2,400
Current portion of lease liability	4,337	—
Current portion of equipment financing liability	1,303	—
Financing milestone liabilities payable	—	13,750
Deferred rent, current portion	—	352
Total current liabilities	29,138	25,587
Long-term lease liability	21,187	—
Long-term equipment financing liability	4,411	—
Deferred rent, net of current portion	—	7,224
Other liabilities	418	173
Total liabilities	55,154	32,984
Commitments and contingencies (See Note 7, *Leases*, and Note 8, *License agreements*)		
Redeemable convertible preferred stock (See Note 11, *Redeemable convertible preferred stock*)	302,049	251,434
Stockholders' deficit:		
Common stock, $0.01 par value; 205,000,000 and 190,000,000 shares authorized, 9,981,991 and 9,780,300 issued, and 7,326,185 and 5,565,368 outstanding at December 31, 2019 and 2018, respectively	73	56
Additional paid-in capital	1,851	7,256
Accumulated other comprehensive income	16	—
Accumulated deficit	(203,044)	(124,718)
Total stockholders' deficit	(201,104)	(117,406)
Total liabilities, redeemable convertible preferred stock, and stockholders' deficit	$ 156,099	$ 167,012

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

Beam Therapeutics Inc.
Consolidated statements of operations and other comprehensive loss
(in thousands, except share and per share amounts)

	Years ended December 31,	
	2019	2018
License revenue	$ 18	$ —
Operating expenses:		
Research and development	54,619	33,873
General and administrative	20,553	11,868
Total operating expenses	75,172	45,741
Loss from operations	(75,154)	(45,741)
Other income (expense):		
Change in fair value of derivative liabilities	(5,400)	(11,749)
Loss on issuance of preferred stock in connection with Blink Merger (see Note 10, *Blink Therapeutics*)	—	(49,500)
Loss on issuance of preferred stock to investors	—	(5,715)
Change in fair value of preferred stock tranche liabilities	—	(4,325)
Interest income	2,486	292
Interest expense	(187)	—
Other expense	(71)	—
Total other income (expense)	(3,172)	(70,997)
Net loss	$ (78,326)	$ (116,738)
Unrealized gain on marketable securities	16	—
Comprehensive loss	$ (78,310)	$ (116,738)
Reconciliation of net loss to net loss attributable to common stockholders:		
Net loss	(78,326)	(116,738)
Net loss attributable to noncontrolling interest in Blink	—	1,481
Accretion of redeemable convertible preferred stock to redemption value, including dividends on preferred stock	(12,714)	(2,068)
Net loss attributable to common stockholders	$ (91,040)	$ (117,325)
Net loss per common share attributable to common stockholders, basic and diluted	$ (14.05)	$ (40.54)
Weighted-average common shares used in net loss per share attributable to common stockholders, basic and diluted	6,479,591	2,893,978

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

Beam Therapeutics Inc.
Consolidated statements of redeemable convertible preferred stock and stockholders' deficit
(in thousands, except share amounts)

	Redeemable Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Other Comprehensive Income	Accumulated Deficit	Noncontrolling Interest	Total Stockholders' Deficit	Redeemable Noncontrolling Interest
	Shares	Amount	Shares	Amount						
Balance at December 31, 2017	5,050,000	$ 5,256	486,986	$ 5	$ 17	$ —	$ (9,461)	$ —	$ (9,439)	$ —
Issuance of Series A-1 redeemable convertible preferred stock, net of issuance costs of $108 and including derecognition of preferred stock tranche liability of $769	21,783,324	22,659	—	—	—	—	—	—	—	—
Issuance of Series A-2 redeemable convertible preferred stock, net of issuance costs of $57 and including derecognition of preferred stock tranche liability of $4,567	33,604,886	60,467	—	—	—	—	—	—	—	—
Issuance of Series B redeemable convertible preferred stock, net of issuance costs of $519	28,870,177	96,484	—	—	—	—	—	—	—	—
Issuance of Blink Series A redeemable convertible preferred stock	—	—	—	—	—	—	—	—	—	15,000
Issuance of series A-2 redeemable convertible preferred stock in connection with Blink Merger and redemption of redeemable noncontrolling interest	30,000,000	64,500	—	—	—	—	—	—	—	(15,000)
Issuance of Blink common stock	—	—	—	—	—	—	—	1,481	1,481	—
Issuance of common stock in connection with Blink Merger	—	—	865,240	9	3,483	—	—	—	3,492	—
Issuance of common stock to scientific founders in connection with Blink Merger	—	—	934,132	9	3,761	—	—	—	3,770	—
Redemption of noncontrolling interest in Blink upon Blink Merger	—	—	—	—	(1,481)	—	—	—	(1,481)	—
Accretion of redeemable convertible preferred stock to redemption value	—	2,068	—	—	(2,068)	—	—	—	(2,068)	—
Vesting of restricted common stock	—	—	2,496,383	25	(25)	—	—	—	—	—
Issuance of common stock related to anti-dilution rights, including derecognition of anti-dilution derivative liability of $300	—	—	765,549	8	507	—	—	—	515	—
Stock-based compensation	—	—	—	—	3,052	—	—	—	3,052	—
Exercise of common stock options	—	—	17,078	—	10	—	—	—	10	—
Net loss	—	—	—	—	—	—	(115,257)	(1,481)	(116,738)	—
Balance at December 31, 2018	119,308,387	$ 251,434	5,565,368	$ 56	$ 7,256	$ —	$ (124,718)	$ —	$ (117,406)	$ —
Issuance of Series B redeemable convertible preferred stock, net of issuance costs of $95	11,308,397	37,901	—	—	—	—	—	—	—	—
Accretion of redeemable convertible preferred stock to redemption value	—	12,714	—	—	(12,714)	—	—	—	(12,714)	—
Vesting of restricted common stock	—	—	1,559,126	15	(15)	—	—	—	—	—
Issuance of common stock related to license agreement	—	—	16,725	—	113	—	—	—	113	—
Stock-based compensation	—	—	—	—	7,028	—	—	—	7,028	—
Exercise of common stock options	—	—	184,966	2	183	—	—	—	185	—
Other comprehensive income	—	—	—	—	—	16	—	—	16	—
Net loss	—	—	—	—	—	—	(78,326)	—	(78,326)	—
Balance at December 31, 2019	130,616,784	$ 302,049	7,326,185	$ 73	$ 1,851	$ 16	$ (203,044)	$ —	$ (201,104)	$ —

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

Beam Therapeutics Inc.
Consolidated statements of cash flows
(in thousands)

	Years ended December 31,	
	2019	**2018**
Operating activities		
Net loss	$ (78,326)	$ (116,738)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation	3,503	650
Loss on issuance of preferred stock in connection with Blink Merger (See Note 10, *Blink Therapeutics*)	—	49,500
Loss on issuance of preferred stock to investors	—	5,715
Amortization of investment premiums	(920)	—
Stock-based compensation expense	7,028	7,002
Change in operating lease right-of-use assets	1,904	—
Non-cash research and development license expense	113	7,424
Change in fair value of derivative liabilities	5,400	11,749
Change in fair value of preferred stock tranche liabilities	—	4,325
Changes in operating assets and liabilities:		
Prepaid expenses and other current assets	(1,258)	(1,696)
Other long-term assets	(634)	—
Accounts payable	4,092	2,436
Accrued expenses and other liabilities	3,571	1,606
Deferred rent liabilities	—	7,556
Operating lease liabilities	(2,535)	—
Financing milestone liabilities	(13,750)	—
Other long-term liabilities	(191)	173
Net cash used in operating activities	(72,003)	(20,298)
Investing activities		
Purchases of property and equipment	(12,518)	(13,124)
Purchases of marketable securities	(129,760)	—
Maturities of marketable securities	76,069	—
Purchase of long-term investment	(450)	(300)
Net cash used in investing activities	(66,659)	(13,424)
Financing activities		
Proceeds from issuance of Series A-1 Preferred Stock, net	—	19,842
Proceeds from issuance of Series A-2 Preferred Stock, net	—	48,517
Proceeds from issuance of Series B Preferred Stock, net	37,901	96,484
Proceeds from issuance of Blink Series A Preferred Stock, net	—	14,874
Proceeds from equipment financings	6,178	—
Repayment of equipment financings	(464)	—
Equity issuance costs	(2,521)	—
Proceeds from exercise of stock options	185	10
Net cash provided by financing activities	41,279	179,727
Net (decrease) increase in in cash, cash equivalents and restricted cash	(97,383)	146,005
Cash, cash equivalents and restricted cash—beginning of period	147,936	1,931
Cash, cash equivalents and restricted cash—end of period	$ 50,553	$ 147,936
Supplemental disclosure of noncash investing and financing activities:		
Property and equipment additions in accounts payable and accrued expenses	$ 2,465	$ 4,135
Receipt of common stock in exchange for technology license	$ 460	$ —
Operating lease liabilities arising from obtaining right-of-use assets	$ 6,221	$ —
Issuance of common stock in connection with Blink Merger	$ —	$ 3,492
Issuance of common stock to founders in connection with Blink Merger	$ —	$ 3,770
Issuance of Series A-2 Preferred Stock in connection with Blink Merger	$ —	$ 64,500
Issuance of Series A-1 and A-2 Preferred Stock for research and development license	$ —	$ 3,716
Recognition and derecognition of preferred stock tranche liabilities	$ —	$ 5,335
Issuance of common stock for research and development license	$ 113	$ 515
Equity issuance costs in accounts payable and accrued expenses	$ 593	$ —
Accretion of redeemable convertible preferred stock to redemption value, including dividends on preferred stock	$ 12,714	$ 2,068

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

1. Nature of the business and basis of presentation

Organization

Beam Therapeutics Inc. (the "Company" or "Beam") is a research stage biotechnology company committed to creating a new class of precision genetic medicines, based on the Company's proprietary base editing technology, with a vision of providing life-long cures to patients suffering from serious diseases. The Company was incorporated on January 25, 2017 (Inception) as a Delaware corporation and began operations in July 2017. Its principal offices are in Cambridge, Massachusetts.

Liquidity and capital resources

Since its inception, the Company has devoted substantially all of our resources to building our base editing platform and advancing development of our portfolio of programs, establishing and protecting our intellectual property, conducting research and development activities, organizing and staffing our company, business planning, raising capital and providing general and administrative support for these operations. The Company is subject to risks and uncertainties common to early-stage companies in the biotechnology industry including, but not limited to, technical risks associated with the successful research, development and manufacturing of product candidates, development by competitors of new technological innovations, dependence on key personnel, protection of proprietary technology, compliance with government regulations and the ability to secure additional capital to fund operations. Current and future programs will require significant research and development efforts, including extensive preclinical and clinical testing and regulatory approval prior to commercialization. These efforts require significant amounts of additional capital, adequate personnel and infrastructure. Even if the Company's drug development efforts are successful, it is uncertain when, if ever, the Company will realize significant revenue from product sales.

Since its inception, the Company has incurred substantial losses and had a net loss of $78.3 million for the year ended December 31, 2019. As of December 31, 2019, the Company had an accumulated deficit of $203.0 million. The Company expects to generate operating losses and negative operating cash flows for the foreseeable future.

On February 11, 2020, the Company completed its initial public offering, or IPO, in which the Company issued and sold 12,176,471 shares of its common stock, including 1,588,235 shares pursuant to the full exercise of the underwriters' option to purchase additional shares, at a public offering price of $17.00 per share, for aggregate gross proceeds of $207.0 million. The Company received approximately $188.3 million in net proceeds after deducting underwriting discounts and estimated offering expenses payable by the Company.

The Company expects that its cash, cash equivalents and marketable securities as of December 31, 2019 of $91.8 million, along with $188.3 million in net IPO proceeds, will be sufficient to fund its operations for at least the next twelve months from the date of issuance of these financial statements. The Company will need additional financing to support its continuing operations and pursue its growth strategy. Until such time as the Company can generate significant revenue from product sales, if ever, it expects to finance its operations through a combination of equity offerings, debt financings, collaborations, strategic alliances and licensing arrangements. The Company may be unable to raise additional funds or enter into such other agreements when needed on favorable terms or at all. The inability to raise capital as and when needed would have a negative impact on the Company's financial condition and its ability to pursue its business strategy. The Company will need to generate significant revenue to achieve profitability, and it may never do so.

As further discussed in Note 11, *Redeemable convertible preferred stock*, upon the completion of the IPO of its common stock in February 2020, all outstanding redeemable convertible preferred stock converted into shares of common stock.

Basis of presentation

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

2. Summary of significant accounting policies

Principles of consolidation

The accompanying consolidated financial statements include the accounts of Beam Therapeutics, Inc. and its wholly owned subsidiaries, Blink Therapeutics Inc., or Blink, which is a Delaware subsidiary that holds certain intellectual property related to RNA base editing, and Beam Therapeutics Securities Corporation, which is a Massachusetts subsidiary. All intercompany transactions and balances have been eliminated in consolidation.

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, liabilities and expenses, and the disclosure of contingent assets and liabilities as of and during the reporting period. The Company bases its estimates and assumptions on historical experience when available and on various factors that it believes to be reasonable under the circumstances. Significant estimates and assumptions reflected in these consolidated financial statements include, but are not limited to, incremental borrowing rate used in the calculation of lease liabilities, the fair values of common stock, redeemable convertible preferred stock, redeemable convertible preferred stock tranche liabilities, stock-based compensation, financing milestone payments and success payments. Actual results could differ from these estimates.

Cash and cash equivalents

Cash and cash equivalents consist of standard checking accounts, money market accounts and commercial paper. The Company considers all highly liquid investments with an original maturity of three months or less at the date of purchase to be cash equivalents.

Marketable securities

The Company classifies marketable securities with a remaining maturity when purchased of greater than three months as available-for-sale. Available-for-sale securities are maintained by the Company's investment managers and consist of commercial paper and high-grade corporate notes. Available-for-sale securities are carried at fair value with the unrealized gains and losses included in accumulated other comprehensive income as a component of stockholders' equity until realized. Any premium or discount arising at purchase is amortized and/or accreted to interest income and/or expense over the life of the instrument. Realized gains and losses are determined using the specific identification method and are included in other income (expense).

Restricted cash

Restricted cash represents collateral provided for letters of credit issued as security deposits in connection with the Company's lease of its corporate facilities. As of December 31, 2019 and 2018, restricted cash was $13.3 million and $1.5 million, respectively.

Concentrations of credit risk

Financial instruments that are potentially subject to significant concentration of credit risk consist primarily of cash, cash equivalents, marketable securities, and restricted cash. The Company attempts to minimize the risk related to marketable securities by working with highly rated financial institutions that invest in a broad and diverse range of financial instruments as defined the Company. The Company has established guidelines relative to credit ratings and maturities intended to safeguard principal balances and maintain liquidity. The Company maintains its funds in accordance with its investment policy, which defines allowable investments, specifies credit quality standards and is designed to limit credit exposure to any single issuer.

Guarantees and indemnifications

As permitted under Delaware law, the Company indemnifies its officers, directors, consultants, and employees for certain events or occurrences that happen by reason of the relationship with, or position held at, the Company. Through December 31, 2019 and 2018, the Company had not experienced any losses related to these indemnification obligations, and no claims were outstanding. The Company does not expect significant claims related to these indemnification obligations and, consequently, concluded that the fair value of these obligations is negligible, and no related reserves were established.

Equity issuance costs

The Company capitalized incremental legal, professional, accounting and other third-party fees that were directly associated with the IPO as other non-current assets until the IPO was consummated. After consummation of the IPO in February 2020, these costs were recorded in stockholders' deficit as a reduction of additional paid-in-capital generated as a result of the offering. As of December 31, 2019, equity issuance costs of $3.1 million were included in other assets in the accompanying consolidated balance sheets. As of December 31, 2018, there were no deferred offering costs.

Fair Value of financial instruments

ASC Topic 820, *Fair Value Measurement*, or 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 independent sources. Unobservable inputs are inputs that reflect the Company's assumptions about the inputs that market participants would use in pricing the assets or liability and are developed based on the best information available in the circumstances. ASC 820 identifies fair value as the price that would be received to sell an asset or paid to transfer a liability, in an orderly transaction between market participants at the measurement date. As a basis for considering market participant assumptions in fair value measurements, ASC 820 establishes a three-tiered 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 for the asset or liability (i.e. supported by little or no market activity). Level 3 inputs include management's own assumptions about the assumptions that market participants would use in pricing the asset or liability (including assumptions about risk).

To the extent the valuation is based on models or inputs that are less observable or unobservable in the market, the determination of fair values requires more judgement. Accordingly, the degree of judgement exercised by the Company in determining fair value is greatest for instruments categorized as 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.

There have been no changes to the valuation methods utilized during the years ended December 31, 2019 and 2018. The Company evaluates transfers between levels at the end of each reporting period. There were no transfers of financial instruments between levels during the years ended December 31, 2019 and 2018.

Property and equipment

Property and equipment are stated at cost less accumulated depreciation. Depreciation expense is recognized using the straight-line method over the estimated useful life of each assets as follows:

Asset category	Estimated useful life
Computer equipment and software	3 years
Laboratory equipment and office furniture	5 years
Leasehold improvements	Shorter of useful life or remaining term

Upon retirement or sale, the cost of assets disposed of and the related accumulated depreciation are removed from the accounts and any resulting gain or loss is included in loss from operations. Expenditures for repairs and maintenance are charged to expense as incurred.

Impairment of long-lived assets

The Company evaluates its long-lived assets, which consist primarily of property and equipment and operating lease right-of-use assets, and our investment in Verve Therapeutics, Inc., or Verve, for impairment whenever events or changes in circumstances indicate that the carrying amount of such assets may not be recoverable. Recoverability of assets to be held and used is measured by a comparison of the carrying amount of an asset to the future undiscounted net cash flows expected to be generated by the asset. If such assets are considered to be impaired, the impairment to be recognized is measured by the amount by which the carrying amount of the asset exceeds the fair value of the asset. There were no impairment losses recognized during the years ended December 31, 2019 and 2018.

Freestanding financial instruments and derivatives

The Company has identified the following financial instruments, which are recorded as liabilities on the consolidated balance sheet and separately accounted for at fair value.

Preferred Stock Tranche Liabilities – The Company has determined that its obligation to issue, and the Company's investors' right to purchase, additional shares of redeemable convertible Series A-1 Preferred Stock, or Series A-1 Preferred, pursuant to the second closing and redeemable convertible Series A-2 Preferred Stock, or Series A-2 Preferred, and together with the Series A-1 Preferred, the Series A Preferred, pursuant to the third closing (see Note 11, *Redeemable convertible preferred stock*) represent a freestanding instrument. The freestanding preferred stock tranche liability, or the tranche liability, was initially recorded at fair value, with gains and losses arising from changes in fair value recognized in other income (expense) in the consolidated statement of operations and other comprehensive loss. The tranche liabilities were remeasured at each reporting period and upon the modification, exercise or expiration of the obligation. The liabilities were valued using an option pricing model. In 2018, all Series A-1 Preferred and Series A-2 Preferred closings occurred, and all tranche liabilities have been derecognized.

The following financial instruments were issued pursuant to a license agreement between the President and Fellows of Harvard College, or Harvard, and the Company, or the Harvard License Agreement, and a license agreement with the Broad Institute of MIT and Harvard, or Broad Institute, and the Company, or the Broad License Agreement, (see Note 8, *License Agreements*):

- Financing Milestone Payments – The Company was required to make future cash payments to Harvard and Broad Institute upon the achievement of future financing milestones tied to the closing of additional rounds of Series A Preferred and Series B Preferred Stock. The financing milestone payments were accounted for under ASC Topic 815, *Derivatives and Hedging*, or ASC 815, and were initially recorded at fair value with a corresponding charge to research and development expense. The liabilities were marked to market at each balance sheet date with all changes in value recognized in other income (expense) in the consolidated statement of operations and other comprehensive loss. The Company adjusted the liability for changes in fair value until the achievement of the financing milestones. To determine the estimated fair value of the financing milestone

payments, the Company used a Monte Carlo simulation model, which models the value of the liability based on the change of several key variables, including time to capital raise, probabilities to capital raise, cost of debt, as well as the projected price per share upon issuance. As of December 31, 2018, all financing milestone payments have been achieved and were either paid in cash or are recorded in accrued expenses for actual amounts due. All outstanding financing milestone payment liabilities have been paid in 2019.

- Success Payments –The Company is required to make success payments to Harvard and Broad Institute based on increases in the per share fair market value of the Company's Series A Preferred, payable in cash. Subsequent to the February 2020 IPO, the amount of success payments will be based on market value of Beam's common stock. The success payments are accounted for under ASC 815 and are initially recorded at fair value with a corresponding charge to research and development expense. The liabilities are marked to market at each balance sheet date with all changes in value recognized in other income (expense) in the consolidated statement of operations and other comprehensive loss. The Company will continue to adjust the liability for changes in fair value until the earlier of the achievement or expiration of the success payment obligation. To determine the estimated fair value of the success payments, the Company used a Monte Carlo simulation model, which models the value of the liability based on several key variables, including probability of event occurrence, timing of event occurrence, as well as the value of the Series A Preferred.

- Anti-Dilution Issuance Rights – Additional shares of common stock were issued to Harvard and Broad Institute upon equity financings allowing Harvard and Broad Institute to maintain a defined ownership percentage in the Company on a fully diluted basis until the Company achieved a defined aggregate level of preferred stock financing. These anti-dilution issuance rights were accounted for under ASC 815 and are initially recorded at fair value with a corresponding charge to research and development expense. As such, the Company recorded this instrument as a liability at its fair value with a corresponding amount recorded as research and development expense and marked it to market at each reporting period, with changes in fair value recognized in other income (expense) in the consolidated statement of operations and other comprehensive loss at each period-end while this instrument was outstanding. The liability was valued using a Monte Carlo simulation model, which models the value of the liability based on the change of several key variables, including the time to the capital raise, the probability of the capital raise, as well as the fair value of the Company's common stock. During 2018, the anti-dilution issuance rights were satisfied and there is no additional derivative liability accounting.

Redeemable convertible preferred stock

The Company has classified redeemable convertible preferred stock as temporary equity on the accompanying consolidated balance sheet because it becomes redeemable due to the passage of time or could become redeemable due to certain change in control clauses that are outside of the Company's control. As a result of becoming redeemable due to the passage of time, the Company records changes in the redemption value and accretes the redeemable convertible preferred stock immediately to redemption value as they occur. These increases are recorded as charges against retained earnings, if any, and then to additional paid-in capital. Then, in the absence of additional paid-in capital, the accretion is charged to the accumulated deficit. As discussed in Note 11, *Redeemable convertible preferred stock*, all of the Company's outstanding redeemable convertible preferred stock converted into the Company's common stock upon the closing of the IPO in February 2020.

Research and development costs

Research and development costs are charged to expense as incurred. Research and development costs consist of costs incurred in performing research and development activities, including salaries and bonuses, stock-based compensation, employee benefits, facilities costs, laboratory supplies, depreciation, manufacturing expenses, preclinical expenses, consulting and other contracted services. Additionally, under the terms of the Harvard License Agreement and the Broad License Agreement, the Company is obligated to make future payments should certain financing, development and regulatory milestones be achieved. The Company has included such costs as research and development as the costs incurred related to the license agreements had no alternative future use. Costs for certain research and development activities are recognized based on the terms of the individual arrangements, which may differ from the pattern of costs incurred, and are reflected in the financial statements as prepaid or accrued research and development costs.

Stock-based compensation

The Company's stock-based compensation program allows for grants of stock options and restricted stock awards. Grants are awarded to employees and non-employees, including directors.

The Company accounts for stock-based compensation in accordance with ASC Topic 718, *Compensation-Stock Compensation*, or ASC 718. ASC 718 requires all stock-based payments to employees, non-employees and directors, to be recognized as expense in the consolidated statements of operations and comprehensive loss based on their fair values. The Company estimates the fair value of options granted using the Black-Scholes option pricing model, or Black-Scholes, for stock option grants to both employees and non-employees. The fair value of the Company's common stock is used to determine the fair value of restricted stock awards.

Stock-based compensation awards are subject to either service- or performance-based vesting conditions. Compensation expense related to awards to employees, directors and non-employees with service-based vesting conditions is recognized on a straight-line

basis based on the grant date fair value over the associated service period of the award, which is generally the vesting term. Compensation expense related to awards to employees with performance-based vesting conditions is recognized based on grant date fair value over the requisite service period using the accelerated attribution method to the extent achievement of the of performance condition is probable.

The Black-Scholes option pricing model requires inputs based on certain subjective assumptions, including (i) the expected stock price volatility, (ii) the expected term of the award, (iii) the risk-free interest rate, and (iv) expected dividends. Due to the lack of a public market for the Company's common stock and lack of company-specific historical and implied volatility data, the Company has based its computation of expected volatility on the historical volatility of a representative group of public companies with similar characteristics to the Company, including stage of product development and life science industry focus. The historical volatility is calculated based on a period of time commensurate with expected term assumption. The Company uses the simplified method as prescribed by the SEC Staff Accounting Bulletin No. 107, *Share-Based Payment*, to calculate the expected term for options granted to employees and non-employees, whereby, the expected term equals the arithmetic average of the vesting term and the original contractual term of the options due to its lack of sufficient historical data. The risk-free interest rate is based on U.S. Treasury securities with a maturity date commensurate with the expected term of the associated award. The expected dividend yield is assumed to be zero as the Company has never paid dividends and has no current plans to pay any dividends on its common stock. The Company recognizes forfeitures as they occur.

Due to the absence of an active market during the years ended December 31, 2019 and 2018 for the Company's common stock, the Company utilized methodologies in accordance with the framework of the American Institute of Certified Public Accountants Technical Practice Aid, *Valuation of Privately-Held Company Equity Securities Issued as Compensation*, to estimate the fair value of its common stock. In determining the exercise prices for options granted, the Company has considered the estimated fair value of the common stock as of the measurement date. The estimated fair value of the common stock has been determined at each grant date based upon a variety of factors, including the illiquid nature of the common stock, arm's-length sales of the Company's capital stock (including redeemable convertible preferred stock), the effect of the rights and preferences of the preferred shareholders, and the prospects of a liquidity event. Among other factors are the Company's financial position and historical financial performance, the status of technological developments within the Company's research, the composition and ability of the current research and management team, an evaluation or benchmark of the Company's competition, and the current business climate in the marketplace. Significant changes to the key assumptions underlying the factors used could result in different fair values of common stock at each valuation date.

Patent costs

All patent-related costs incurred in connection with filing and prosecuting patent applications are expensed as incurred. Due to the uncertainty about the recovery of the expenditure, amounts incurred are classified as general and administrative expenses in the accompanying consolidated statements of operations and other comprehensive loss.

Rent expense

The Company's real estate operating leases provide for scheduled annual rent increases throughout the lease terms. The Company recognizes the effects of the scheduled rent increases on a straight-line basis over the full terms of the lease. Prior to the adoption of ASU 2016-02, *Leases*, or ASC 842, tenant improvement allowances, if any, provided by a landlord are recorded as deferred rent and amortized as reduction to rent expense over the lease terms. Subsequent to the adoption of ASC 842, tenant improvement allowances, if any, provided by a landlord are recorded as a reduction of the right-of-use, or ROU, asset related to that lease.

Variable interest entities

The Company reviews each legal entity formed by related parties to determine whether or not the entity is a variable interest entity, or VIE. If the entity is a VIE, the Company assesses whether or not it is the primary beneficiary of that VIE based on a number of factors, including (i) which party has the power to direct the activities that most significantly affect the VIE's economic performance, (ii) the parties' contractual rights and responsibilities pursuant to any contractual agreements and (iii) which party has the obligation to absorb losses or the right to receive benefits from the VIE. If the Company determines that it is the primary beneficiary of a VIE, it consolidates the financial statements of the VIE into its consolidated financial statements at the time that determination is made. On a quarterly basis, the Company evaluates whether it continues to be the primary beneficiary of any consolidated VIEs. If the Company determines that it is no longer the primary beneficiary of a consolidated VIE, or no longer has a variable interest in the VIE, the Company deconsolidates the VIE in the period that the determination is made.

Income taxes

The Company recognizes deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the Company's financial statements and tax returns. Deferred tax assets and liabilities are determined based upon the differences between the financial statement carrying amounts and the tax bases of existing assets and liabilities and for loss and credit carryforwards, using enacted tax rates expected to be in effect in the year in which the differences are expected to reverse. Deferred tax assets are reduced by a valuation allowance if it is more likely than not that these assets may not be realized. The Company determines whether it is more likely than not that a tax position will be sustained upon examination. If it is not more likely than not

that a position will be sustained, none of the benefit attributable to the position is recognized. The tax benefit to be recognized for any tax position that meets the more-likely-than-not recognition threshold is calculated as the largest amount that is more than 50% likely of being realized upon resolution of the contingency. The Company accounts for interest and penalties related to uncertain tax positions as part of its provision for income taxes.

Comprehensive loss

Comprehensive loss is defined as the change in stockholders' equity of a business enterprise during a period from transactions and other events and circumstances from non-owner sources. Comprehensive loss includes net loss as well as other changes in stockholders' deficit which includes certain changes in equity that are excluded from net loss. The Company's only element of other comprehensive income is unrealized gains and losses on marketable securities.

Net loss per share

The Company follows the two-class method when computing net loss per share, as the Company has issued shares that meet the definition of participating securities. The two-class method determines net loss per share for each class of common and participating securities according to dividends declared or accumulated and participation rights in undistributed earnings. The two-class method requires income available to common stockholders for the period to be allocated between common and participating securities based upon their respective rights to receive dividends as if all income for the period had been distributed.

Basic net loss per share attributable to common stockholders is computed by dividing the net loss attributable to common stockholders by the weighted average number of common shares outstanding for the period. Diluted net loss attributable to common stockholders is computed by adjusting net loss attributable to common stockholders to reallocate undistributed earnings based on the potential impact of dilutive securities. Diluted net loss per share attributable to common stockholders is computed by dividing the diluted net loss attributable to common stockholders by the weighted average number of common shares outstanding for the period, including potential dilutive common shares assuming the dilutive effect of common stock equivalents.

For purposes of the dilutive net loss per share calculation, stock options and stock units for which the performance and market vesting conditions have been deemed probable, potential dilutive securities, which include redeemable convertible preferred stock, unvested restricted stock, common stock options and shares issuable under anti-dilution rights are considered to be common stock equivalents, while stock options and stock units with performance- or market-based vesting conditions that were not deemed probable as of December 31, 2019 are not considered to be common stock equivalents.

The Company's redeemable convertible preferred stock contractually entitles the holders of such shares to participate in dividends but does not contractually require the holders of such shares to participate in losses of the Company. Accordingly, in periods in which the Company reports a net loss, such losses are not allocated to such participating securities. In periods in which the Company reports a net loss attributable to common stockholders, diluted net loss per share attributable to common stockholders is the same as basic net loss per share attributable to common stockholders, since dilutive common shares are not assumed to have been issued if their effect is anti-dilutive. The Company reported a net loss attributable to common stockholders for the years ended December 31, 2019 and 2018.

Segment and geographic information

Operating segments are defined as components of an entity about which separate discrete information is available for evaluation by the chief operating decision maker, or CODM, or decision-making group, in deciding how to allocate resources and in assessing performance. The CODM is the Company's Chief Executive Officer. The Company views its operations as and manages its business in one operating segment operating exclusively in the United States.

Recently adopted accounting pronouncements

Leases

In February 2016, the FASB issued ASC 842. The new lease standard requires leases to be accounted for using a right-of-use model, which recognizes that, at the date of commencement, a lessee has a financial obligation to make lease payments to the lessor for the right to use the underlying asset during the lease term. The lessee recognizes a corresponding right-of-use asset related to this right. Effective January 1, 2019, the Company early adopted ASC 842 using the modified retrospective approach, which provides a method for recording existing leases at adoption using the effective date as its date of initial application, for which prior periods are presented in accordance with the previous guidance in ASC 840, *Leases*, or ASC 840. The Company made the following practical expedients elections: (1) elected the short-term lease exception, (2) did not elect hindsight and (3) elected to not separate non-lease components from lease components. It also adopted the transitional practical expedients, which allowed the Company to carry forward its historical assessment of whether existing agreements contained a lease and the classification of its existing operating leases. As of January 1, 2019, the Company did not have any financing leases or obligations. For financing obligations as of December 31, 2019, refer to Note 7, *Leases*.

At the inception of an arrangement, the Company determines whether the arrangement is or contains a lease based on the unique facts and circumstances present in the arrangement. Leases with a term greater than one year are recognized on the balance sheet as ROU assets and short-term and long-term lease liabilities, as applicable. ROU assets represent the Company's right to use an underlying

asset for the lease term and lease liabilities represent its obligation to make lease payments arising from the lease. The Company typically only includes an initial lease term in its assessment of a lease arrangement. It also considers termination options and factors those into the determination of lease payments. Options to renew a lease are not included in the assessment unless there is reasonable certainty that the Company will renew.

Operating lease liabilities and their corresponding ROU assets are recorded based on the present value of lease payments over the expected remaining lease term. Certain adjustments to the ROU asset may be required for items such as incentives received. The interest rate implicit in lease contracts is typically not readily determinable. As a result, the Company utilizes its incremental borrowing rate, which reflects the fixed rate at which it could borrow on a collateralized basis the amount of the lease payments in the same currency, for a similar term, in a similar economic environment. In transition to ASC 842, the Company utilized the remaining lease term of its leases in determining the appropriate incremental borrowing rates. Lease expense for lease payments is recognized on a straight-line basis over the lease term.

Impact of Adoption ASC 842 on the Consolidated Financial Statements

	January 1, 2019 (Prior to ASC 842 Adoption)	ASC 842 Adjustment	January 1, 2019 (As adjusted)
Operating lease assets (1)	$ —	$ 14,218	$ 14,218
Deferred rent, current portion (2)	352	(352)	—
Deferred rent, net of current portion (2)	7,224	(7,224)	—
Current portion of operating lease liability (3)	—	1,168	1,168
Long-term operating lease liability (3)	—	20,495	20,495

(1) Represents recognition of operating lease right-of-use assets.
(2) Represents reclassification of deferred rent to operating lease.
(3) Represents recognition of operating lease liabilities.

The adoption of ASC 842 did not have a material effect on the Company's consolidated statements of operations and other comprehensive loss, consolidated statements of redeemable convertible preferred stock and stockholders' deficit or consolidated statements of cash flows. The Company will continue to report financial information for fiscal years ended before December 31, 2018 under ASC 840.

Revenue recognition

The Company recognizes revenue in accordance with ASU 2014-09, *Revenue from Contracts with Customers (Topic 606)* and its related amendments, or, collectively, ASC 606.

At inception, the Company determines whether contracts are within the scope of ASC 606 or other topics. For contracts that are determined to be within the scope of ASC 606, revenue is recognized when a customer obtains control of promised goods or services. The amount of revenue recognized reflects the consideration to which the Company expects to be entitled to receive in exchange for these goods and services. To achieve this core principle, the Company applies the following five steps (i) identify the contract 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 performance obligation is satisfied. The Company only applies the five-step model to contracts when it determines that collection of substantially all consideration for goods and services that are transferred is probable based on the customer's intent and ability to pay the promised consideration.

Performance obligations promised in a contract are identified based on the goods and services that will be transferred to the customer that are both capable of being distinct and are distinct in the context of the contract. To the extent a contract includes multiple promised goods and services, the Company applies judgment to determine whether promised goods and services are both capable of being distinct and distinct in the context of the contract. If these criteria are not met, the promised goods and services are accounted for as a combined performance obligation.

The transaction price is determined based on the consideration to which the Company will be entitled in exchange for transferring goods and services to the customer. To the extent the transaction price includes variable consideration, the Company estimates the amount of variable consideration that should be included in the transaction price utilizing either the expected value method or the most likely amount method, depending on the nature of the variable consideration. Variable consideration is included in the transaction price if, in management's judgment, it is probable that a significant future reversal of cumulative revenue under the contract will not occur. Any estimates, including the effect of the constraint on variable consideration, are evaluated at each reporting period for any changes. Determining the transaction price requires significant judgment.

If the contract contains a single performance obligation, the entire transaction price is allocated to the single performance obligation. Contracts that contain multiple performance obligations require an allocation of the transaction price to each performance obligation on a relative standalone selling price basis unless the transaction price is variable and meets the criteria to be allocated entirely to a

performance obligation or to a distinct service that forms part of a single performance obligation. The consideration to be received is allocated among the separate performance obligations based on relative standalone selling prices. The Company typically determines standalone selling prices using an adjusted market assessment approach model.

The Company satisfies performance obligations either over time or at a point in time. Revenue is recognized over time if either (i) the customer simultaneously receives and consumes the benefits provided by the entity's performance, (ii) the entity's performance creates or enhances an asset that the customer controls as the asset is created or enhanced, or (iii) the entity's performance does not create an asset with an alternative use to the entity and the entity has an enforceable right to payment for performance completed to date. If the entity does not satisfy a performance obligation over time, the related performance obligation is satisfied at a point in time by transferring the control of a promised good or service to a customer.

Licenses of intellectual property, or IP: If the license to the Company's IP is determined to be distinct from the other performance obligations identified in the arrangement, the Company recognizes revenues from consideration allocated to the license when the license is transferred to the customer and the customer can use and benefit from the licenses. For licenses that are combined with other promises, the Company utilizes judgment to assess the nature of the combined performance obligation to determine whether the combined performance obligation is satisfied over time or at a point in time and, if over time, the appropriate method of measuring progress for purposes of recognizing revenue. The Company evaluates the measure of progress each reporting period and, if necessary, adjusts the measure of performance and related revenue recognition. See Note 9, *Collaboration and license agreements*, for a discussion of Beam's license agreement with Verve Therapeutics, Inc., or Verve.

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

Commercial Milestone Payments and Royalties: For arrangements that include sales-based royalties, including milestone payments based on levels of sales, if 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 not recognized any royalty revenue resulting from any of its agreements.

When no performance obligations are required of the Company, or following the completion of the performance obligation period, such amounts are recognized as revenue upon transfer of control of the goods or services to the customer. Generally, all amounts received or due other than sales-based milestones and royalties are classified as license fees. Sales-based milestones and royalties will be recognized as royalty revenue at the later of when the related sales occur or when the performance obligation to which some or all of the royalty has been allocated has been satisfied (or partially satisfied).

Deferred revenue arises from amounts received in advance of the culmination of the earnings process and is recognized as revenue in future periods as performance obligations are satisfied. Deferred revenue expected to be recognized within the next twelve months is classified as a current liability. Upfront payment contract liabilities resulting from the Company's license agreements do not represent a financing component as the payment is not financing the transfer of goods or services, and the technology underlying the licenses granted reflects research and development expenses already incurred by the Company.

Recent accounting pronouncements

The Jumpstart Our Business Startups Act of 2012 permits an emerging growth company to take advantage of an extended transition period to comply with new or revised accounting standards applicable to public companies until those standards would otherwise apply to private companies. As an emerging growth company, the Company has elected to not to "opt out" of such extended transition period.

In June 2016, the FASB issued ASU 2016-13, *Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments*, or ASU 2016-13. The FASB has subsequently issued amendments to ASU 2016-13, which will be effective for the Company on January 1, 2022. This guidance requires that credit losses be reported using an expected losses model rather than the incurred losses model that is currently used, and establishes additional disclosures related to credit risks. For available-for-sale securities with unrealized losses, these standards now require allowances to be recorded instead of reducing the amortized cost of the

investment. The adoption of ASU 2016-13 is not expected to have a material effect on the Company's consolidated financial statements or disclosures.

In November 2018, the FASB issued ASU 2018-18, *Collaborative Arrangements*, or ASC 808, which clarifies certain transactions between collaborative arrangement participants should be accounted for as revenue when the collaborative arrangement participant is a customer in the context of a unit of account and precludes recognizing as revenue consideration received from a collaborative arrangement participant if the participant is not a customer. ASC 808 will be effective for the Company in the first quarter of fiscal 2021, with early adoption permitted. A retrospective adoption to the date the Company adopted ASC 606 is required by recognizing a cumulative-effect adjustment to the opening balance or retained earnings of the earliest period presented. The Company is currently evaluating the impact of the adoption of this standard on its financial statements.

3. Property and equipment, net

Property and equipment consist of the following at December 31 (in thousands):

	2019	2018
Leasehold improvements	$ 12,653	$ 10,262
Lab equipment	12,029	6,313
Furniture and fixtures	1,040	575
Computer equipment	547	455
Construction in process	2,185	—
Total property and equipment	28,454	17,605
Less accumulated depreciation	(4,164)	(661)
Property and equipment, net	$ 24,290	$ 16,944

Depreciation expense for the years ended December 31, 2019 and 2018 was $3.5 million, and $0.7 million, respectively.

4. Fair Value of financial instruments

The Company's financial instruments that are measured at fair value on a recurring basis consist of cash equivalents, marketable securities and success payment derivative liabilities pursuant to the Harvard License Agreement and the Broad License Agreement.

The following tables set forth the fair value of the Company's financial assets and liabilities by level within the fair value hierarchy at December 31, 2019 (in thousands):

	Carrying amount	Fair value	Level 1	Level 2	Level 3
Assets					
Cash equivalents:					
Money market funds	$ 6,172	$ 6,172	$ 6,172	$ —	$ —
Commercial paper	3,986	3,986	—	3,986	—
Marketable securities:					
Commercial paper	36,889	36,889	—	36,889	—
Corporate notes	17,738	17,738	—	17,738	—
Total Assets	$ 64,785	$ 64,785	$ 6,172	$ 58,613	$ —
Liabilities					
Success payment liability	7,800	7,800			7,800
Total liabilities	$ 7,800	$ 7,800	$ —	$ —	$ 7,800

The following tables set forth the fair value of the Company's financial assets and liabilities by level within the fair value hierarchy at December 31, 2018 (in thousands):

	Carrying amount	Fair value	Level 1	Level 2	Level 3
Assets					
Money market funds	$ 80,093	$ 80,093	$ 80,093	$ —	$ —
Total assets	$ 80,093	$ 80,093	$ 80,093	$ —	$ —
Liabilities					
Success payment liabilities	2,400	2,400	—	—	2,400
Total liabilities	$ 2,400	$ 2,400	$ —	$ —	$ 2,400

Cash equivalents – Cash equivalents as of December 31, 2019 and 2018 includes $6.2 and $80.1 million of money market funds, which are classified within Level 1 of the fair value hierarchy because they are valued using quoted market prices in active markets. In addition to money market funds, cash equivalents as of December 31, 2019 included $4.0 million of commercial paper, which are classified within Level 2 of the fair value hierarchy because pricing inputs are other than quoted prices in active markets, which are either directly or indirectly observable as of the reporting date, and fair value is determined through the use of models or other valuation methodologies.

Marketable securities – The Company measures its marketable securities at fair value on a recurring basis and classify those instruments within Level 2 of the fair value hierarchy. Marketable securities are classified within Level 2 of the fair value hierarchy because pricing inputs are other than quoted prices in active markets, which are either directly or indirectly observable as of the reporting date, and fair value is determined using models or other valuation methodologies.

Success Payment Liability – The Company is required to make payments to Harvard and Broad Institute based upon increases in the per share fair market value of the Company's Series A Preferred at specified future dates, which is further discussed in Note 8, *License agreements*. The Company's liability for the share-based success payments under the Harvard and Broad License Agreements are carried at fair value. To determine the estimated fair value of the success payment liability, the Company uses a Monte Carlo simulation methodology, which models the future movement of stock prices based on several key variables.

The following variables were incorporated in the calculation of the estimated fair value of the Harvard success payment liability at December 31:

	2019	2018
Fair value of Series A Preferred (per share)	$ 3.60	$ 2.34
Expected volatility	72%	73%
Expected term (years)	0.10–8.01	1.20–9.00

The fair value of the Harvard success payment liability at December 31, 2019 and 2018 was $3.9 million and $1.2 million, respectively.

The following variables were incorporated in the calculation of the estimated fair value of the Broad Institute success payment liability at December 31:

	2019	2018
Fair value of Series A Preferred (per share)	$ 3.60	$ 2.34
Expected volatility	72%	73%
Expected term (years)	0.10–8.01	1.20–9.00

The fair value of the Broad Institute success payment liability at December 31, 2019 and 2018 was $3.9 million and $1.2 million, respectively.

The fair value of the Series A Preferred was determined by management with the assistance of an independent third-party specialist. The computation of expected volatility was estimated using available information about the historical volatility of stocks of similar publicly traded companies for a period matching the expected term assumption. In addition, the Company incorporated the estimated number, timing, and probability of valuation measurement dates in the calculation of the success payment liability.

The reconciliations of changes in the fair value of financial instruments based on Level 3 inputs for years ended December 31, 2019 and 2018 (in thousands):

	Tranche liabilities	Anti-dilution issuance right liability	Financial milestone payment liabilities	Success payment liability	Total
Balance at December 31, 2017	$ 1,010	$ 300	$ 3,500	$ 900	$ 5,710
Fair value at issuance	—	70	4,300	800	5,170
Issuance of Series A Preferred	(5,335)	—	—	—	(5,335)
Issuance of common stock	—	(1,719)	—	—	(1,719)
Payments	—	—	(3,750)	—	(3,750)
Reclassification to financing milestone liabilities payable	—	—	(13,750)	—	(13,750)
Change in fair value	4,325	1,349	9,700	700	16,074
Balance at December 31, 2018	$ —	$ —	$ —	$ 2,400	$ 2,400
Change in fair value	—	—	—	5,400	5,400
Balance at December 31, 2019	$ —	$ —	$ —	$ 7,800	$ 7,800

5. Marketable securities

The following table summarizes the Company's marketable securities held at December 31, 2019 (in thousands):

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
Commercial paper	$ 36,875	$ 14	$ —	$ 36,889
Corporate notes	17,736	2	—	17,738
Total	$ 54,611	$ 16	$ —	$ 54,627

The Company held no marketable securities at December 31, 2018.

The amortized cost of marketable securities is adjusted for amortization of premiums and accretion of discounts to maturity. At December 31, 2019, the balance in accumulated other comprehensive income was comprised solely of activity related to marketable securities. There were no realized gains or losses recognized on the sale or maturity of marketable securities for the year ended December 31, 2019 and, as a result, the Company did not reclassify any amounts out of accumulated other comprehensive income for the same period.

The Company determined it did not hold any investments with any other-than-temporary impairment as of December 31, 2019. The contractual maturity date of all the investments are less than one year.

6. Accrued expenses and other current liabilities

Accrued expenses and other current liabilities consist of the following at December 31 (in thousands):

	2019	2018
Employee compensation and related benefits	$ 3,531	$ 954
Professional fees	1,541	673
Research costs	1,548	66
Other	1,232	41
Total	$ 7,852	$ 1,734

7. Leases

Operating leases

In February 2018, the Company signed a noncancelable lease for 38,203 square feet of office and laboratory space in Cambridge, Massachusetts. The lease commenced in March 2018 and has a 10.6-year term. The Company has an option to extend the lease for one five-year term. The lease is subject to fixed rate escalation increases and the landlord waived the Company's rent obligation for the first seven months of the lease, having an initial value of $1.7 million. The landlord also agreed to fund up to $6.1 million in tenant improvements. The Company recorded the tenant improvements as leasehold improvements and deferred rent on the December 31, 2018 consolidated balance sheet. With the adoption of ASC 842, the Company has recorded an operating lease right-of-use asset and corresponding lease liability. The operating lease right-of-use asset and corresponding lease liability do not include the additional five-year period under the option as management does not believe there is reasonable certainty the Company will exercise the option.

In October 2018, the Company entered into a lease agreement for laboratory space in Cambridge, Massachusetts. The agreement is subject to fixed rate escalations. The lease commenced on April 1, 2019 and has a two-year term. The Company recognized an operating lease right-of-use asset and corresponding lease liability of $2.1 million upon commencement of this lease.

In June and July 2019, the Company entered into lease agreements for additional laboratory and office space in Cambridge, Massachusetts. The leases commenced in October 2019 and expire on December 31, 2021. The leases are subject to fixed rate escalations. The Company recognized an operating lease right-of-use asset of $4.1 million and a lease liability of $3.7 million upon commencement of these leases.

The Company identified and assessed the following estimates in recognizing the operating lease right-of-use asset and corresponding liability:

- Expected lease term: The expected lease term for those leases commencing prior to January 1, 2019 did not change with the adoption of ASC 842. The expected lease term for leases commencing after the adoption of ASC 842 includes noncancelable lease periods and, when applicable, periods covered by an option to extend the lease if the Company is reasonably certain to exercise that option, as well as periods covered by an option to terminate the lease if Beam is reasonably certain not to exercise that option.

- Incremental borrowing rate: As the discount rates in the Company's lease are not implicit, management estimated the incremental borrowing rate based on the rate of interest the Company would have to pay to borrow a similar amount on a collateralized basis over a similar term.

- Lease and non-lease components: The Company is required to pay fees for operating expenses in addition to monthly base rent for certain operating leases (non-lease components). The Company has elected the practical expedient which allows non-lease components to be combined with lease components for all asset classes. Variable non-lease components are not included within the lease right-of-use asset and lease liability on the consolidated balance sheet, and instead are reflected as expense in the period they are paid.

The following table summarizes operating lease costs included in research and development and general and administrative expense, as well as sublease income for the year ended December 31, 2019 (in thousands):

Operating lease costs	$	4,078
Variable lease costs		811
Short-term lease costs		116
Sublease income		(51)
Net lease cost	$	4,954

The following table summarizes the lease term and discount rate at December 31, 2019:

Weighted-average remaining lease term (years)	
Operating leases	7.4 years
Weighted-average discount rate	
Operating leases	9.8%

The following table summarizes the cash paid for amounts included in the measurement of lease liabilities for the year ended December 31, 2019 (in thousands):

Operating cash flows used for operating leases	$	4,950
Operating lease liabilities arising from obtaining right-of-use assets		6,221

At December 31, 2019, the future minimum lease payments for the Company's facility operating leases for each of the years ending December 31 were as follows (in thousands):

2020	$	6,528
2021		5,306
2022		3,296
2023		3,379
2024		3,480
Thereafter		13,996
Undiscounted lease payments		35,985
Less: imputed interest		(10,461)
Total operating lease liabilities	$	25,524

At December 31, 2018, prior to the adoption of ASC 842, the future minimum lease payments for Beam's facility operating leases for each of the years ending December 31 were as follows (in thousands):

2019	$	3,699
2020		3,954
2021		3,413
2022		3,281
2023		3,379
Thereafter		17,476
Total minimum lease payments	$	35,202

Rent expense for the years ended December 31, 2019 and 2018, was $4.1 million, and $3.1 million, respectively.

In April 2019, the Company entered into a noncancelable lease agreement with Massachusetts Institute of Technology, or MIT, for 123,209 square feet of laboratory and office space to be built in Cambridge, Massachusetts. The leased space will be divided into two phases; phase one consisting of 92,554 square feet, and phase two consisting of 30,655 square feet. Monthly rent of $0.7 million for phase one will commence on the date which the phase one space is delivered to the Company, which is currently estimated to occur at the earliest in late 2021. Monthly rent of $0.3 million for phase two will commence four months after the date which the phase two

space is delivered to the Company, which is currently estimated to occur at the earliest in first half of 2023. The lease is subject to fixed rate escalation increases over the term of the lease. The lease expires 12 years from the phase two commencement date, and the Company has the option to extend the lease for two terms of 5 years each. The landlord has agreed to fund up to $23.4 million of tenant improvements. Upon executing the lease, the Company made a security deposit of $11.8 million in the form of a letter of credit, which is included in restricted cash as of December 31, 2019. As the commencement date of this lease has not occurred as of December 31, 2019, no operating lease ROU asset or lease liability has been recorded in the accompanying consolidated balance sheets. The total amount of anticipated undiscounted lease payments due under the MIT lease is $168.7 million.

In March 2020, the Company entered into an amendment of its October 2018 lease agreement for laboratory space in Cambridge, Massachusetts. The amended lease commenced in March 2020 and will expire on March 31, 2023. The lease provides an option to extend the lease for an additional year through March 31, 2024, which was determined by the Company to be probable of being exercised. As the commencement date of the leases has not occurred at December 31, 2019, no operating lease ROU asset or lease liability has been recorded in the accompanying condensed consolidated balance sheets for this amendment. The incremental increase in total amount of undiscounted lease payments as a result of the amended lease is approximately $4.8 million, which includes lease payments for the additional year under the option provided within the lease.

Financing obligations

In July 2019, the Company sold certain equipment to a leasing company for a total of $3.8 million. Contemporaneous with the closing of the sale, the Company entered into a lease agreement with the leasing company with a term of four years pursuant to which the Company leased back the equipment for annual rent of $1.0 million.

In October 2019, the Company sold additional equipment to the leasing company for a total of $2.4 million and, concurrently, entered into a lease agreement with the leasing company with a term of four years to lease back the equipment. The annual rent for the additional leased back equipment is $0.7 million.

The equipment leases are being accounted for as financings as the lease terms are for substantially all the remaining economic life of the underlying equipment. Management concluded that control, including the significant risks and rewards of ownership, did not effectively transfer to the buyer-lessor at the inception of the sale and leaseback transactions. As a result, the transactions are accounted for as failed sale and leasebacks and result in the recognition of a financing liabilities.

The future minimum payments related to the equipment financing obligations at December 31, 2019, for each of the years ending December 31 were as follows (in thousands):

2020	$	1,742
2021		1,742
2022		1,742
2023		1,092
Total		6,318
Less: amounts representing interest at 8.56%		(1,011)
Plus: residual values		407
Financing obligations	$	5,714

Total paydown of principal and interest expense related to the equipment financing obligations were $0.5 million and $0.1 million, respectively for the year ended December 31, 2019.

8. License agreements

Harvard license agreement

In June 2017, the Company entered into a license agreement with Harvard for certain base editing technology pursuant to which the Company received an exclusive, worldwide, sublicensable, royalty-bearing license under specified patent rights to develop and commercialize licensed products and a nonexclusive, worldwide, sublicensable, royalty-bearing license under certain patent rights to research and develop licensed products. The Company agreed to use commercially reasonable efforts to develop licensed products in accordance with the development plan, to introduce any licensed products that gain regulatory approval into the commercial market, to market licensed products that have gained regulatory approval following such introduction into the market, and to make licensed products that have gained regulatory approval reasonably available to the public. The license term extends until the later of the expiration of (i) the last to expire licensed patent covering a licensed product, (ii) the period of exclusivity associated with a licensed product or (iii) a certain period after the first commercial sale of a licensed product, unless terminated earlier by either party under certain provisions.

As partial consideration for the rights granted under the Harvard License Agreement, the Company issued to Harvard 101,363 shares of the Company’s common stock. Additional consideration under the Harvard License Agreement is as follows:

Anti-Dilution Issuance Right – The initial consideration for the license included shares of common stock, with a fair value of $50,000, subject to anti-dilution provisions until the achievement by the Company of a specified level of equity financing and recorded the cost in research and development expense. In 2018, the equity financing was achieved, and the Company issued 765,549 shares of common stock to Harvard under the anti-dilution provision with a fair value of $0.5 million and recorded other expense of $0.2 million for the remeasurement of the liability upon issuance of the shares.

Financing Milestone Payments – Financing milestone payments were due to Harvard based on the size of additional rounds of financing, including the sales of Series A and Series B Preferred. To the extent the Company raised a minimum of $5.0 million of Series A Preferred and a maximum of $50.0 million of Series A Preferred, the Company was obligated to pay Harvard between $0.5 million and $3.0 million depending upon the total level of Series A Preferred issued. At inception, the Company recorded $2.4 million of research and development expense related to these payments. In the year ended December 31, 2018, the Company recorded other expense of $0.4 million, for the remeasurement of the liability. At December 31, 2018, all payments related to Series A Preferred financing milestones, which totaled $3.0 million, had been paid to Harvard.

The Company was also obligated to pay Harvard a milestone payment of up to $6.0 million that was determined based upon a defined formula in the Harvard License Agreement and was dependent upon the issuance price, shares, and proceeds from Series B Preferred raised, among other factors. In 2018, the Company achieved the Series B Preferred financing milestone and recorded the liability at the actual amount due of $6.0 million, which is included in the financing milestone liabilities payable in the consolidated balance sheets at December 31, 2018 and recorded $4.6 million of other expense related to the remeasurement of the liability. During the year ended December 31, 2019, the Company settled the liability in cash.

Success Payments – Under the Harvard License Agreement, Harvard is entitled to receive success payments, in cash, determined based upon the achievement of specified multiples of the initial weighted average value of the Company's Series A Preferred at specified valuation dates. Subsequent to the February 2020 IPO, the amount of success payments will be based on market value of Beam's common stock. The success payments range from $5.0 million to a maximum of $105.0 million and have valuation multiples that range from 5 times to 40 times the initial weighted average value of the Series A Preferred. The Company shall make success payments to Harvard during a period of time, or the Harvard Success Payment Period, which has been determined to be the later of (1) the ninth anniversary of the Harvard License Agreement or (2) the earlier of (a) the 12th anniversary of the Harvard License Agreement and (b) the third anniversary of the first date on which a licensed product receives regulatory approval in the United States. During the Harvard Success Payment Period, the Company will perform a valuation on specified dates, as defined in the agreement, with the first measurement occurring in February 2021, one year from the Company's IPO. In years ended December 31, 2019 and 2018, the Company recorded $2.7 million and $0.3 million, respectively, of other expense related to the remeasurement of the liability. As of December 31, 2019 and 2018, the Company has recorded $3.9 million and $1.2 million, respectively, for the estimated fair value of the success fee derivative liability. As of and for the years ended December 31, 2019 and 2018, no success payments were paid or due.

Other Payments – The Company agreed to pay Harvard an annual license maintenance fee ranging from low-to-mid five figures to low six figures, depending on the calendar year. The Company is responsible for the payment of certain patent prosecution and maintenance costs incurred by Harvard related to licensed patents. To the extent achieved, the Company is obligated to pay up to an aggregate of $75.9 million in product development and regulatory approval milestones ("Harvard Product Milestones"). If the Company completes a change of control during the term of the Harvard License Agreement, then certain of the milestone payments would be increased. To the extent there are sales of a licensed product, the Company is required to pay low single digit royalties on net sales. The Company is entitled to certain reductions and offsets on these royalties with respect to a licensed product in a given country. If the Company sublicenses its rights to develop or commercialize a licensed product under the Harvard License Agreement to a third party and the Company receives non-royalty sublicense income, then Harvard is entitled to a percentage of such consideration, ranging from the high single digits to low double digits depending on the date in which such sublicense agreement is executed and the stage of development of the Company's licensed products at such time.

The Company concluded that the assets acquired from Harvard did not meet the accounting definition of a business as inputs, but no processes or outputs were acquired with the license. As the inputs that were acquired along with the license do not constitute a "business," the transaction has been accounted for as an asset acquisition. As of the date of the Harvard License Agreement, the assets acquired had no alternative future use and the assets had not reached a stage of technological feasibility. As a result, all share-based and cash payment obligations have been recorded as research and development expense in the consolidated statement of operations and other comprehensive loss.

The anti-dilution issuance right, financing milestone payments, and success payments are remeasured at fair value each reporting period with subsequent changes recognized in other income (expense). For the years ended December 31, 2019 and 2018, the Company recorded $2.7 million and $5.5 million, respectively, in other expense for changes in the value of the derivative liabilities. The annual maintenance fees will be recorded as an expense on an annual basis based on the stated amount for the applicable year. Annual patent costs will be expensed as incurred. Upon determination that a Harvard Product Milestone is probable to occur, the amount due will be recorded as research and development expense. The Company will monitor the Harvard Product Milestone payments for this arrangement on an ongoing basis. The achievement of these milestone payments was not considered probable as of the acquisition date, and no expense has been recorded for these milestones in years ended December 31, 2019 and 2018. Lastly, to the

extent products are commercialized under the Harvard License Agreement, the Company will accrue royalty expense and sublicense nonroyalty payments, as applicable, for the amount it is obligated to pay, with adjustments as sales are made.

Broad license agreement

In May 2018, Blink entered into a license agreement with Broad Institute for certain RNA base editing technology including an RNA editor platform. As discussed in Note 10, *Blink Therapeutics*, on the same date that Blink entered into the Broad License Agreement, the Company entered into an option agreement to merge with Blink. The Company has consolidated the operations of Blink from May 2018 and through the merger of Blink with Beam in September 2018. The initial Broad License Agreement contemplated the eventual merger of Blink with Beam and the terms and conditions of the Broad License Agreement have been retained by Blink.

Under the Broad License Agreement, Broad Institute granted Blink exclusive and non-exclusive worldwide, sublicensable, royalty-bearing licenses under specified patent rights to develop and commercialize licensed product and a nonexclusive, worldwide, sublicensable, royalty-bearing license under certain patent rights to research and develop licensed products. Blink agreed to use commercially reasonable efforts to develop licensed products in accordance with the development plan, to introduce any licensed products that gain regulatory approval into the commercial market, to market licensed products that have gained regulatory approval following such introduction into the market, and to make licensed products that have gained regulatory approval reasonably available to the public. The license term extends until the later of the expiration of (i) the last to expire licensed patent covering a licensed product, (ii) the period of regulatory exclusivity associated with a licensed product or (iii) a certain period after the first commercial sale of a licensed product unless terminated earlier by either party under certain provisions.

As partial consideration for the rights granted under the Broad License Agreement, Broad Institute received 1,020,000 shares of Blink's common stock. These shares issued to Broad Institute were exchanged into 454,920 shares of common stock of Beam in connection with the Blink Merger in September 2018, along with additional shares issued to Broad Institute under the anti-dilution issuance right discussed below. Additional consideration under the Broad License Agreement is as follows:

Anti-Dilution Issuance Right – The initial consideration in exchange for the license included 1,020,000 shares of Blink common stock, with a fair value of $0.1 million, subject to anti-dilution provisions until the achievement of a specified level of equity financing in Blink or a merger of Blink with Beam. At inception, the Company recorded $0.1 million of research and development expense related to these anti-dilution rights. In 2018, upon the closing of additional Blink Series A Preferred financing, Blink issued Broad Institute an additional 920,000 shares of Blink common stock having a fair value of $1.2 million and recorded $1.1 million of other expense related to the remeasurement of the liability. Upon the Blink Merger, Beam issued Broad Institute 865,240 shares of common stock in exchange for 1,940,000 shares of Blink common stock and recorded research and development expense of $2.2 million (see Note 10, *Blink Therapeutics*).

Financing Milestone Payments – Financing milestone payments are due to Broad Institute based on the size of additional rounds of Blink Series A Preferred and Series B Preferred or upon the merger of Blink with Beam. To the extent Blink raised a minimum of $5.0 million of Series A Preferred and a maximum of $50.0 million of Series A Preferred, the Company was obligated to pay Broad Institute between $0.5 million and $3.0 million depending upon the total level of Series A Preferred issued. Pursuant to the Broad License Agreement, if the Blink Merger occurred prior to the achievement of any Series A Preferred financing milestone events, then all unpaid Series A Preferred financing milestone payments would be due to Broad Institute. At inception, the Company recorded $2.9 million of research and development expense related to these payments. As described in Note 10, *Blink Therapeutics*, Blink raised $15.0 million of from the issuance of series A Preferred and upon the Blink Merger in September 2018 the full $3.0 million Series A financing milestone was due to Broad Institute. As of December 31, 2018, the Company had recorded $0.1 million of other expense related to the remeasurement of the liability and had accrued $1.8 million for the remaining unpaid financing milestone liability, which was paid during the year ended December 31, 2019.

Under the Broad License Agreement, Blink was obligated to pay Broad Institute a milestone payment of up to $6.0 million determined based upon a defined formula in the Broad License Agreement and was dependent upon the issuance price, shares, and proceeds from Series B Preferred raised, among other factors. At inception, the Company recorded $1.4 million of research and development expense related to this payment. Additionally, following the Blink Merger, Blink remained responsible for the Series B Preferred milestone payments based on proceeds received from a Beam issuance of Series B Preferred, up until aggregate payments of $6.0 million are made to Broad Institute. In 2018, the Company achieved the Series B Preferred financing milestones and recorded the liability at the actual amount due of $6.0 million, which is included in the financing milestones liability payable in the consolidated balance sheets at December 31, 2018. In 2018, the Company recorded $4.6 million of other expense related to the remeasurement of the liability. During the year ended December 31, 2019, the Company settled the liability in cash.

Success Payments – Under the Broad License Agreement, Broad Institute is entitled to receive success payments, in cash, determined based upon the achievement of specified multiples of the initial weighted average value of the Blink Series A Preferred at specified valuation dates. As contemplated in the original Broad License Agreement, the success payment obligation is retained by Beam upon completion of the Blink Merger. Subsequent to the February 2020 IPO, the amount of success payments will be based on market value of Beam's common stock. The success payments range from $5.0 million to a maximum of $105.0 million and have valuation multiples that range from 5 times to 40 times the initial weighted average value of the Blink Series A Preferred. The Company is required to make success payments to Broad Institute during a period of time, or the Broad Success Payment Period, which has been determined to be the earliest of (1) the twelfth anniversary of the Broad License Agreement or (2) the third anniversary of the first date

on which a licensed product receives regulatory approval in the United States. During the Broad Success Payment Period, the Company will perform a valuation on specified dates, as defined in the agreement, with the first measurement occurring in February 2021, one year from the Company's IPO. At inception, the Company recorded $0.8 million of research and development expense related to these payments. During the years ended December 31, 2019 and 2018, the Company recorded $2.7 million and $0.4 million of other expense related to the remeasurement of this liability. As of December 31, 2019 and 2018, the Company has recorded $3.9 million and $1.2 million, respectively, for the estimated fair value of a success fee derivative liability. As of and for the period ended December 31, 2019 and 2018, no success payments were paid or payable to Broad Institute.

Other Payments – The Company agreed to pay Broad Institute an annual license maintenance fee ranging from low-to-mid five figures to low six figures, depending on the particular calendar year. The Company is responsible for the payment of certain patent prosecution and maintenance costs incurred by Broad Institute related to licensed patents. To the extent achieved, the Company is obligated to pay up to an aggregate of $75.9 million in product development and regulatory approval milestones ("Broad Product Milestones"). Excluding the Blink merger, if the Company completes a change of control during the term of the Broad License Agreement, then certain of the milestone payments would be increased. To the extent there are commercial sales of a licensed product, the Company is required to pay low single digit royalties on net sales. the Company is entitled to certain reductions and offsets on these royalties with respect to a licensed product in a given country. If the Company sublicenses its rights to develop or commercialize a licensed product under the Broad License Agreement to a third party and the Company receives non-royalty sublicense income, then Broad Institute is entitled to a percentage of such consideration, ranging from the high single digits to low double digits depending on the date in which such sublicense agreement is executed and the stage of development of the Company's licensed products at such time.

The Company concluded that the assets acquired from Broad Institute did not meet the accounting definition of a business as inputs, but no processes or outputs were acquired with the license. As the inputs that were acquired along with the license do not constitute a "business," the transaction has been accounted for as an asset acquisition. As of the date of the Broad License Agreement, the assets acquired had no alternative future use and the assets had not reached a stage of technological feasibility. As a result, all share-based and cash payment obligations have been recorded as research and development expense in the consolidated statement of operations and other comprehensive loss.

At inception of the agreement, the Company recognized approximately $5.3 million as research and development expense which includes the fair value of Blink common stock issued to Broad Institute, along with the initial fair values of the anti-dilution issuance right, financing milestone payments (including the achievement of the first Series A financing milestone payment), and success payments. The anti-dilution issuance right, financing milestone payments, and success payments are remeasured at fair value at each reporting period with subsequent changes recognized in other income (expense). For the years ended December 31, 2019 and 2018, the Company recorded $2.7 million and $6.2 million, respectively, in other expense for changes in the value of the derivative liabilities. The annual maintenance fees will be recorded as an expense on an annual basis based on the stated amount for the applicable year. Annual patent costs will be expensed as incurred. Upon determination that a Product Milestone is probable to occur, the amount due will be recorded as research and development expense. The Company will monitor the Product Milestone payments for this arrangement on an ongoing basis. The triggering of these milestone payments was not considered probable as of the acquisition date, and no expense has been recorded for these milestones during the years ended December 31, 2019 and 2018. Lastly, to the extent products are commercialized under the Broad License Agreement, the Company will accrue royalty expense and sublicense nonroyalty payments, as applicable, for the amount it is obligated to pay, with adjustments as sales are made.

Editas license agreement

In May 2018, the Company entered into a license agreement, or the Editas License Agreement, with Editas Medicine, Inc., or Editas. Pursuant to the Editas License Agreement, Editas granted to the Company licenses and options to acquire licenses to certain intellectual property rights owned or controlled by Editas, for specified uses. More specifically, Editas granted to the Company a worldwide, exclusive, sublicensable, license (subject to certain exceptions and conditions) under certain intellectual property controlled by Editas for the use of base editing therapies for the treatment of any field of human diseases and conditions, subject to certain exceptions, or the Beam Field, and the licenses granted or to be granted under the Editas License Agreement, or the Editas Development and Commercialization License). Additionally, Editas granted to the Company a royalty-free, non-exclusive license under certain intellectual property owned or controlled by Editas to perform research activities in the Beam Field, or the Editas Research License. Editas provided the Company with an exclusive option to obtain an Editas Development and Commercialization License to three additional groups of intellectual property owned or controlled by Editas, on a group by group basis, during the specified option period, subject to certain exceptions. Pursuant to the Editas License Agreement, the Company will use commercially reasonable efforts to develop a product that includes the rights licensed to the Company within a specified period of time and to commercialize any such products that have received regulatory approval in certain specified countries.

As consideration for the license and option rights granted by Editas, the Company paid a nominal one-time, nonrefundable, non-creditable upfront cash payment of $180,000. The Company also issued non-cash consideration, consisting of 1,833,333 shares of the Company's Series A-1 Preferred and 1,222,222 shares of the Company's A-2 Preferred, having an aggregate fair value of approximately $3.7 million. Both the one-time cash payment and the fair value of the preferred stock issued to Editas were recorded as research and development expense in the consolidated statements of operations. Additional consideration will be due to Editas if the

Company elects to exercise its option to obtain an Editas Development and Commercialization License to any of the three categories of intellectual property underlying the Editas Research License, for a fee ranging from a mid-teen million dollar amount to a low to mid-eight digit dollar amount per group, depending on the timing of the option exercise. Additionally, the Company is required to reimburse Editas for certain payments Editas may be obligated to make under existing Editas license agreements related to the intellectual property being licensed to the Company, including (i) development, regulatory and commercial milestone payments and certain sublicense income payments due as a result of the Editas License Agreement and (ii) a percentage of the annual maintenance fees and patent fees due to certain of the Editas' licensors. In addition, to the extent any products are commercialized under an Editas Development and Commercialization License, the Company would be required to make royalty payments equivalent to the royalties that would be due from Editas to any applicable licensors of Editas related to the sales of such licensed products, plus an additional tiered low- to mid-single digit royalty, depending on whether such licensed product is covered by an Editas-owned patent.

The license rights and option rights granted by Editas to the Company are subject to the terms and conditions of the underlying license agreements that Editas is a party to and under which Editas licensed rights or option rights to the Company and the termination of such in-licenses, as applicable. Unless earlier terminated by either party pursuant to the terms of the agreement, the Editas License Agreement will continue in full force and effect and will expire on a licensed product-by licensed product and country-by-country basis upon the later of (i) the last-to-expire royalty term under any applicable institutional license to Editas and (ii) the date at which such product is no longer covered by a valid claim of a licensed Editas-owned patent in such country. The Company has the right, at its sole discretion, at any time to terminate Editas License Agreement in its entirety or on a group-by-group of intellectual property basis, upon ninety days written notice to Editas. Upon termination of the Editas License Agreement, all rights and licenses granted by the Editas to the Company (including the rights to exercise options and obtain such licenses) will immediately terminate and patents within a group of patents will no longer be deemed licensed patents. Expiration or termination of the Editas License Agreement for any reason does not release either party of any obligation or liability which had accrued, or which is attributable to a period prior to such expiration or termination.

The Company concluded that the assets acquired from Editas did not meet the accounting definition of a business as inputs, but no processes or outputs were acquired with the license, and the licensed technology had not achieved technological feasibility. As the inputs that were acquired along with the license do not constitute a "business," the transaction has been accounted for as an asset acquisition. As of the date of the Editas License Agreement, the assets acquired had no alternative future use and the assets had not reached a stage of technological feasibility. As a result, all share-based and cash payment obligations have been recorded as research and development expense in the consolidated statements of operations.

The option exercise fees under the agreement will be recorded as research and development expense, if and when the Company exercises such options. To date, no options have been exercised. The annual maintenance fees will be recorded as an expense on an annual basis based on the stated amount for the applicable year. Annual patent costs will be expensed as incurred. In addition, the Company is required to make certain development, regulatory and commercial milestone payments to Editas upon the achievement of specified milestone. The triggering of these milestone payments was not considered probable as of the acquisition date, and no expense has been recorded for these milestones during the years ended December 31, 2019 and 2018. To the extent applicable, sublicense income payments will be accrued for the amount the Company is obligated to pay under each applicable in-license as amounts are due Editas. Lastly, to the extent products are commercialized under the Editas License agreement, the Company will accrue royalty expense for the amount it is obligated to pay, with adjustments as sales are made.

Bio Palette

In March 2019, the Company entered into a license agreement with Bio Palette Co., Ltd., or Bio Palette, pursuant to which Beam received an exclusive (even as to Bio Palette), sublicensable license under certain patent rights related to base editing owned or controlled by Bio Palette to exploit products for the treatment of human disease throughout the world, but excluding products in the microbiome field in Asia (the "Bio Palette License Agreement"). In addition, the Company granted Bio Palette an exclusive (even as to Beam) license under certain patent rights related to base editing and gene editing owned or controlled by the Company to exploit products in the microbiome field in Asia. Each party to the agreement retains non-exclusive rights to develop and manufacture products in the microbiome field worldwide for the sole purpose of exploiting those products in its own territory. Each party agrees to certain coordination obligations in the microbiome field if either party determines not to exploit their rights in such field.

Upon the execution of the Bio Palette License Agreement, the Company paid Bio Palette an upfront fee of $0.5 million and issued to Bio Palette 16,725 shares of its common stock valued at $0.1 million. If a certain Bio Palette patent is issued in the United States, the Company will pay an additional amount in the low seven figures and will issue to Bio Palette an additional number of shares of its common stock in the five figures. The Company has recorded the $0.6 million of initial consideration within research and development expense. The Company also agreed to pay a royalty at a fraction of a percent on net sales of products that are covered by the patents licensed by Bio Palette to Beam, and Bio Palette agreed to pay a royalty at a fraction of a percent on net sales of products that are covered by the patents licensed by Beam to Bio Palette. The royalty term for a product in a country will terminate on the later of the expiration of (i) patent-based exclusivity with respect to such licensed product in such country or (ii) regulatory exclusivity with respect to such licensed product in such country.

Unless earlier terminated, the Bio Palette License Agreement will expire on a licensed product-by-licensed product and country-by-country basis upon the expiration of the applicable royalty term for each such licensed product and country. Each party has the right to

terminate the Bio Palette License Agreement for convenience with respect to the license granted to such party subject to a specified notice period. Either party may terminate the Bio Palette License Agreement with respect to the license granted to the other party for a material breach by the other party, subject to a specified notice and cure period. Additionally, either party may also terminate the Bio Palette License Agreement in the event of the other party's bankruptcy or insolvency or if the other party, its affiliates or sublicensees brings a patent challenge relating to any licensed patents (but, in the case of such a patent challenge by a sublicensee, subject to a cure period for such party to terminate its agreement with the sublicensee that has taken the applicable action).

Management concluded that the licenses acquired from Bio Palette did not meet the accounting definition of a business as inputs, but no processes or outputs were acquired with the licenses, and the licensed technology had not achieved technological feasibility. As the inputs that were acquired along with the license do not constitute a "business," the transaction has been accounted as an asset acquisition. As of the date of the Bio Palette License Agreement, the assets acquired had no alternative future use and the assets had not reached a stage of technological feasibility. As a result, all share-based and cash payment obligations have been recorded as research and development expense in the consolidated financial statements.

To the extent achieved, the Company is required to make a certain milestone payment to Bio Palette. The triggering of this milestone was not considered probable at the inception of the Bio Palette License Agreement, and no expense has been recorded as of December 31, 2019. To the extent products are commercialized under the Bio Palette License Agreement, the Company will accrue royalty expense for the amount it is obligated to pay, with adjustments as sales are made.

9. Collaboration and license agreements

Prime Medicine

In September 2019, the Company entered into a Collaboration and License Agreement with Prime Medicine, Inc., or Prime Medicine, to research and develop a novel gene editing technology developed by one of Beam's founders. Under the terms of the agreement, the Company granted Prime Medicine a non-exclusive license to certain of its CRISPR technology (including Cas12b), delivery technology and certain other technology controlled by Beam to develop and commercialize gene editing products for the treatment of human diseases. Prime Medicine granted the Company an exclusive license to certain gene editing technology controlled by Prime Medicine in certain fields and for certain applications like those the Company was already pursuing with base editing (specifically, the creation and correction of single-base transition mutations as well as the treatment of sickle cell disease). The Company is not currently using the intellectual property licensed from Prime Medicine in any of its current programs, but it is required to use commercially reasonable effort to develop new product candidates using the intellectual property licensed from Prime Medicine. The Company intends to evaluate this gene editing technology in accordance with the agreement and may use this technology in future product candidates. Additionally, each party granted to the other party certain exclusive and non-exclusive licenses to certain technology developed after the effective date of the agreement and controlled by the granting party or jointly owned by the parties. Each party has an obligation to assign rights in certain technology developed under the collaboration to the other party.

For products that use technology licensed from Prime Medicine, the Company is required to make milestone payments to Prime Medicine upon the achievement of certain clinical, regulatory and commercial events. It is also required to use commercially reasonable efforts to develop and seek regulatory approval for two products that use licensed technology from Prime Medicine in certain specified countries and to commercialize any such product(s) for which approval has been obtained in certain specified countries. Prime Medicine and Beam are each required to use commercially reasonable efforts to conduct the activities for which they are responsible under any development plan(s) under the agreement. Prime Medicine has an option to jointly develop and commercialize, and share expenses and revenue for, certain products that use technology licensed from Prime Medicine in the United States. Royalty payments may become due by either party to the other based on the net sales of commercialized products under the agreement. In addition, certain of the rights licensed under the agreement are sublicensed from third parties, and Beam or Prime Medicine may be required to make certain payments to such third parties to the extent the Beam or Prime Medicine develop and commercialize products under such rights.

The Company may terminate the Prime Medicine agreement upon notice to Prime Medicine at any time prior to the one-year anniversary of the agreement and under certain other circumstances. Beam has an obligation to issue $5.0 million in shares of its common stock to Prime Medicine, and Prime Medicine has an obligation to issue 5.0 million shares of its common stock to Beam, should the collaboration extend beyond one year. The Company will record the expense and associated obligation for its share issuance when it determines that the share issuance is probable. Beam will record the financial statement impact of the Prime Medicine shares upon the receipt of the shares from Prime Medicine. The Company is also obligated to provide certain management services, which are expected to be immaterial, to Prime Medicine for up to one year.

Verve

In April 2019, Beam entered into a Collaboration and License Agreement with Verve, or the Verve License Agreement, to investigate gene editing strategies to modify genes associated with an increased risk of coronary diseases. Under the terms of the agreement, the Company granted Verve an exclusive license to certain base editor technology and certain delivery technology, and improvements and Verve granted Beam a non-exclusive license under certain know-how and patents controlled by Verve, an interest in joint collaboration technology and an exclusive license (except as to Verve) under certain delivery technology. Verve is responsible for all

costs associated with the research and development activities under the Verve License agreement. The Company has the option to share in the future development of certain products, with no associated fee at the time the right is exercised. Upon exercise of the Company's option, the profits and expenses of such product will be shared, as defined in the agreement. To date, Beam has not exercised its option.

In connection with the Verve License Agreement, Verve issued Beam 2.6 million shares of its common stock as partial consideration for the licenses granted, having a fair value of $0.5 million. The fair value of the Verve common stock was determined by management with the assistance of a third-party valuation specialist. In addition, to the extent certain clinical, regulatory, and commercial milestones are met with respect to licensed products, Verve will be required to pay to Beam certain amounts, as defined in the agreement. Either party may owe the other party other milestone payments for certain clinical and regulatory events related to the delivery technology products. Royalty payments may become due by either party to the other based on the net sales of any delivery technology products under the agreement. Lastly, to the extent there are sales of a licensed product, Verve is obligated to pay Beam royalties, as defined in the agreement. The term of the agreement commenced in April 2019 and, unless earlier terminated in accordance with the terms of the agreement, will continue until the last to expire royalty term for any licensed product.

Management determined that the performance obligations associated with the Verve License Agreement are the combined licenses and improvements related to the licensed technology. All other items promised to Verve are immaterial in the context of the agreement. The fair value of the shares issued by Verve to Beam were considered a fixed upfront payment of $0.5 million in the form of noncash consideration. The Company determined that its performance obligations associated with the Verve License Agreement at contract inception were not distinct and represented a single performance obligation, and that the obligations would be completed over the performance period of the agreement. Accordingly, the upfront payment will be recognized as revenue using a time-based proportional performance model over the contract term (April 2019 through 2038) of the collaboration, as license revenue. For the year ended December 31, 2019, the Company recognized $18 thousand of license revenue and has recorded $0.4 million of deferred revenue. To date, no commercial milestone payments or royalties are due. The remaining fees that may be paid under the agreement are considered variable consideration and will be constrained until it is probable that a significant revenue reversal would not occur. To date, the Company has not exercised its option to opt-in to a licensed product and no milestones or royalties have been achieved.

10. Blink Therapeutics

On March 22, 2018, certain of Beam's investors, or the Primary Investors, formed Blink to hold certain intellectual property related to RNA base editing.

On May 9, 2018, the Company entered into a merger option agreement ("Option Agreement") with Blink. On the same date, Blink entered into the Broad License Agreement (see Note 8, *License agreements*), issued 5,000,000 shares of Blink Series A Preferred to its investors ("Initial Closing") at $1.00 per share, and issued restricted common stock to certain scientific founders. Also, on the same date, Beam and Blink were both owned by members of the same group of Primary Investors, having over 75% ownership in each entity, which consisted primarily of the Beam's initial investors and scientific founders.

Under the Option Agreement, Blink granted Beam an option, exercisable on the date that Blink issued an aggregate of 10,000,000 additional shares of Blink Series A Preferred and ending on the second anniversary of such date to enter into the Blink Merger, in exchange for a $121,000 option premium. In connection with the Blink Merger, Beam would issue two shares of Beam Series A-2 Preferred for each share of Blink Series A Preferred and issue 0.446 shares of Beam common stock for each share of Blink common stock.

In August 2018, Blink issued 10,000,000 shares of Blink Series A Preferred at $1.00 per share to the Primary Investors and Beam paid the $121,000 option premium to exercise its option to merge with Blink. On September 25, 2018 (the "Merger Date"), the merger was consummated, and Blink became a wholly owned subsidiary of Beam.

As of May 9, 2018, as a result of the design and purpose of Blink and the Option Agreement, the Company determined that Blink was a VIE and that the Company was the primary beneficiary, because Beam had both (1) the power to direct the activities of Blink that most significantly impacted Blink's economic performance and (2) the right to receive benefits from Blink that could be significant to Blink. As a result, the Company began consolidating Blink on May 9, 2018. The operating activity of Blink from its formation on March 22, 2018 to May 9, 2018 was immaterial.

On the Merger Date, Beam exercised its option to acquire the Blink common and preferred shares in exchange for equity shares in Beam as follows:

- For each share of Blink Series A Preferred held, Blink shareholders received two shares of Beam Series A-2 Preferred or 30,000,000 shares;
- for each share of Blink common stock held by Broad Institute, Broad Institute received 0.446 shares of Beam common stock or 865,240 shares; and

- for each vested and unvested share of Blink common stock issued to certain scientific founders of Blink, each founder received 0.446 shares of Beam common stock or 2,717,478 shares (of which 934,132 shares were vested and 1,783,346 will vest over time).

The Company recognized expense for the excess in value of the Beam Series A-2 Preferred and common stock exchanged for the Blink Series A Preferred and common stock, respectively, because the excess value was only transferred to certain investors of Beam and there were no other rights or privileges identified that require separate accounting as an asset. Accordingly, the Company recorded a $49.5 million loss in other expense representing the difference in value of the 30,000,000 shares of Series A-2 Preferred issued to Blink shareholders ($64.5 million) and the value of the Blink Series A Preferred ($15.0 million) exchanged by the Blink shareholders.

The Company recorded additional research and development expense of $2.2 million, which represented the difference in value of the 865,240 shares of Beam common stock issued to Broad Institute ($3.5 million) and the value of the Blink common stock exchanged by Broad Institute ($1.3 million).

The Company recorded additional stock-based compensation of $3.6 million, which represented the difference in value of the fully vested 934,132 shares issued to the scientific founders ($3.8 million) and the value of the Blink common stock exchanged ($0.2 million) by the Blink shareholders. Compensation expense of $7.2 million relating to the 1,783,346 unvested Blink common shares will be recorded over the remaining weighted average vesting period of 3.5 years from the date of the Blink Merger.

11. Redeemable convertible preferred stock

In June 2017, the Company authorized the sale and issuance of up to 37,500,000 shares of Series A Preferred. The Series A Preferred financing was structured to close in three tranches: 5,000,000 shares of Series A-1 Preferred in the first tranche closing at $1.00 per share, up to 20,000,000 shares of Series A-1 Preferred at $1.00 per share in the second tranche closing, and up to 12,500,000 shares of Series A-2 Preferred at $2.00 per share in the third tranche closing. The Company determined that the right of certain committed investors to purchase 18,000,000 shares of Series A-1 Preferred in the second tranche closing and 5,000,000 shares of Series A-2 Preferred in the third tranche closing met the definition of a freestanding financial instrument and should be recognized a liability on the consolidated balance sheet at fair value at inception and remeasured at each reporting period until settlement.

In the period from January 25, 2017 (Inception) to December 31, 2017, the Company issued 5,050,000 shares of Series A-1 Preferred at $1.00 per share for gross cash proceeds of $5.1 million, and incurred issuance costs of $0.1 million.

In February and May 2018, in an effort to raise additional funding, the Company amended the terms of the Series A-1 Preferred second tranche closing and the Series A-2 Preferred third tranche closing. The Company increased the shares to be issued to committed investors in Series A-1 Preferred second tranche closing from 18,000,000 shares to 19,111,111 shares. The Company also authorized 888,880 shares of Series A-1 Preferred as available to be issued to additional investors. The issuance price for the Series A-1 Preferred remained at $1.00 per share. The Company increased the shares to be issued to committed investors in the Series A-2 Preferred second tranche closing from 5,000,000 shares to 22,515,071 shares, of which 15,488,824 were designated for a Series A-2 third tranche closing and 7,026,247 designated for a Series A-2 fourth tranche closing. The Company also authorized 8,951,577 shares of Series A-2 Preferred as available to be issued to additional investors, of which 1,177,836 were designated as available for a Series A-2 Preferred third tranche closing and 7,773,741 designated as available for a Series A-2 Preferred fourth tranche closing. The Series A-2 Preferred issuance price was reduced from $2.00 to $1.50, per share. As a result of the amendments to the tranche rights to the committed investors, the Company remeasured the tranche liabilities at fair value and recognized the excess fair value upon modification of $0.1 million as other income (expense) in consolidated statements of operations.

The Company adjusted the carrying value of the tranche liabilities to their estimated fair value at each reporting date and upon issuance of the Series A-1 Preferred and Series A-2 Preferred tranche closings in 2018 and 2017, recognizing the changes in fair value in other income (expense) in the consolidated statement of operations and other comprehensive loss. During year ended December 31, 2018, the Company recognized total other expense of $4.3 million related to changes in the fair value of the tranche liabilities, which were satisfied during the year ended December 31, 2018.

In February and May 2018, the Company closed on the second tranche of the Series A-1 Preferred and issued 19,999,991 shares of Series A-1 Preferred at $1.00 per share for gross cash proceeds of $20.0 million, and incurred issuance costs of $0.1 million. The tranche liability associated with the committed financing was re-measured at fair value of $0.8 million at closing with the fair value of the liability reclassified to the carrying value of the Series A-1 Preferred.

In May 2018, the Company entered into a license agreement with Editas (see Note 8, *License agreements*), and issued 1,833,333 shares of Series A-1 Preferred and 1,222,222 shares of Series A-2 Preferred having an aggregate fair value of $2.0 million and $1.7 million, respectively, as partial consideration for the license.

In September 2018, upon the closing of the merger with Blink (see Note 10, *Blink Therapeutics*), the Company exchanged two shares of Beam Series A-2 Preferred for one share of Blink Series A Preferred. The exchange resulted in the issuance of 30,000,000 shares of Beam Series A-2 Preferred to the Blink preferred shareholders, having a fair value of $64.5 million. The Company recorded a loss of $49.5 million for the excess of the fair value of Beam shares exchanged for the Blink shares as other expense in the consolidated statements of operations and other comprehensive loss.

In June and October 2018, the Company closed on the Series A-2 third and fourth tranches and issued 22,515,087 shares of Series A-2 Preferred to committed investors and 9,867,577 to additional investors at $1.50 per share for gross cash proceeds of $33.8 million and $14.8 million, respectively. The Company incurred issuance costs of $0.1 million. The tranche liability associated with the committed financing was re-measured at fair value of $4.6 million at closing with the fair value of the liability reclassified to the carrying value of the Series A-2 Preferred. The fair value of Series A-2 Preferred issued to the additional investors was $18.7 million, resulting in the recognition of other expense of $5.7 million in the consolidated statements of operations and other comprehensive loss for the excess of the fair value of the shares issued over the cash proceeds received.

As of December 31, 2018, all tranche rights have been satisfied.

In November 2018, the Company authorized the sale of up to 37,250,000 shares of Series B Preferred. In November and December 2018, the Company issued 28,870,177 shares of Series B Preferred at $3.36 per share for gross cash proceeds of approximately $97.0 million, and incurred issuance costs of $0.5 million.

In February 2019, the Company authorized the sale of an additional 2,980,000 shares of Series B Preferred. In January and February 2019, the Company issued an additional 11,308,397 shares of Series B Preferred stock at a price of $3.36 per share, resulting in gross cash proceeds of $38.0 million, and incurred issuance costs of $0.1 million.

In February 2020, upon the closing of the Company's IPO, all outstanding shares of Preferred Stock converted into 29,127,523 shares of the Company's common stock.

At December 31, 2019, the Series A Preferred and Series B Preferred ("Preferred Stock") consisted of the following (in thousands, except for share data):

	Preferred stock authorized	Preferred stock issued and outstanding	Carrying value	Liquidation preference	Common stock issuable upon conversion
Series A-1 Preferred	26,833,324	26,833,324	$ 30,877	$ 30,877	5,983,826
Series A-2 Preferred	63,604,886	63,604,886	125,647	105,620	14,183,880
Series B Preferred	40,230,000	40,178,574	145,525	145,525	8,959,817
	130,668,210	130,616,784	$ 302,049	$ 282,022	29,127,523

At December 31, 2018, Preferred Stock consisted of the following (in thousands, except for share data):

	Preferred stock authorized	Preferred stock issued and outstanding	Carrying value	Liquidation preference	Common stock issuable upon conversion
Series A-1 Preferred	26,833,324	26,833,324	$ 28,734	$ 28,734	5,983,826
Series A-2 Preferred	63,604,886	63,604,886	125,647	97,986	14,183,880
Series B Preferred	37,250,000	28,870,177	97,053	97,053	6,438,047
	127,688,210	119,308,387	$ 251,434	$ 223,773	26,605,753

The following is a summary of the rights and preferences of the Preferred Stock as of December 31, 2019:

Conversion—Each share of Preferred Stock may be converted at any time, at the option of the holder, into shares of common stock, subject to the applicable conversion rate as determined by dividing the original issue price by the conversion price. The initial conversion price for each of the Series A-1 Preferred, Series A-2 Preferred and Series B Preferred (each as may be adjusted for certain dilutive events) is $1.00, $1.50 and $3.36 per share, respectively. Upon the Company's IPO in February 2020, each series of Preferred Stock automatically converted into shares of common stock on a 1:1 conversion ratio.

Dividends—Holders are entitled to dividends of $0.08 per share with respect to Series A-1 Preferred, $0.12 per share with respect to Series A-2 Preferred, and $0.27 per share with respect to the Series B Preferred, when, as, and if declared by the board of directors. No dividends have been declared through December 31, 2019 and the closing of the Company's IPO in February 2020.

Voting Rights—Preferred Stock and common stock generally vote together as one class on an as-converted basis; however, common stock voting rights on certain matters are subject to the powers, preferences, and rights of the Preferred Stock. The holders of Series B Preferred, voting together as a single class, are entitled to elect one director to the Company's board of directors, the holders of Series A Preferred, voting together as a single class, are entitled to elect four directors to the Company's board of directors, and the holders of common stock, voting together as a single class, are entitled to elect the one director to the Company's board of directors. Certain actions, such as mergers, acquisition, liquidation, dissolution, wind up of business, and deemed liquidation events, must be approved by the holders of at least 60% of the then-outstanding shares of Preferred Stock and at least one of the four largest holders of Series B Preferred, unless such dissolution, wind up or liquidation would result in the pricing or payment of less than $2.52 per share of Series B Preferred to the Series B Preferred holders, in which case a certain Series B investor would need to approve.

Liquidation Preference—Upon liquidation, dissolution, or winding up of business, the holders of the Preferred Stock are entitled to receive a liquidation preference in priority over the holders of common stock, at an amount per share equal to the greater of i) the original Series A Preferred and Series B Preferred issue price plus any declared but unpaid dividends, or ii) the amount per share payable had all shares of Series A Preferred and Series B Preferred been converted to common stock immediately prior to such liquidation. If assets available for distribution are insufficient to satisfy the liquidation payment to holders in full, assets available for distribution will be allocated among holders based on their pro rata shareholdings. When holders are satisfied in full, any excess assets available for distribution will be allocated ratably among common stockholders based on their pro rata shareholdings. Upon a deemed liquidation event, as defined, holders have the option to redeem their shareholding at the liquidation payment amounts summarized above.

Redemption—The Preferred Stock is redeemable any time on or after the fifth anniversary of the initial closing of the Series B Preferred, and upon the election of the holders of at least 60% of the then-outstanding shares of Series B Preferred. After the redemption of all shares of Series B Preferred, the Series A Preferred shall be redeemed. The redemption price of the Preferred Stock is equal to their respective original issue price per share plus any declared but unpaid dividends.

12. Common stock

The Company was authorized to issue up to 190,000,000 shares of common stock with a $0.01 par value per share as of December 31, 2018. In February 2019, the Company increased the authorized common stock shares issuable to 205,000,000.

The holders of common stock are entitled to one vote for each share of common stock. Subject to the payment in full of all preferential dividends to which the holders of the Preferred Stock are entitled, the holders of common stock shall be entitled to receive dividends out of funds legally available. In the event of any voluntary or involuntary liquidation, dissolution, or winding up of the Company, after the payment or provision for payment of all debts and liabilities of the Company and all preferential amounts to which the holders of Preferred Stock are entitled with respect to the distribution of assets in liquidation, the holders of common stock shall be entitled to share ratably in the remaining assets of the Company available for distribution.

In 2018, the Company issued 765,549 shares of common stock to Harvard pursuant to anti-dilution rights under the Harvard License Agreement. In the period from January 25, 2017 (Inception) to December 31, 2017, the Company issued to Harvard 101,363 shares of common stock upon signing the Harvard License Agreement.

In 2018, the Company issued Broad Institute 865,240 shares of common stock in connection with the Blink Merger. Additionally, in connection with the Blink Merger, the Company issued certain scientific founders of Blink 934,132 shares of Beam common stock for their Blink vested restricted common stock.

As of December 31, 2019, the Company has reserved 29,127,523 shares of common stock for the potential conversion of Preferred Stock and 4,791,047 shares of common stock for the potential exercise of outstanding stock options under the 2017 Stock Option and Grant Plan, or the 2017 Plan.

In February 2020, the Company completed its IPO in which the Company issued and sold 12,176,471 shares of its common stock, including 1,588,235 shares pursuant to the full exercise of the underwriters' option to purchase additional shares, at a public offering price of $17.00 per share, for aggregate gross proceeds of $207.0 million. The Company received approximately $188.3 million in net proceeds after deducting underwriting discounts and estimated offering expenses payable by the Company. In connection with this financing, all outstanding shares of Preferred Stock converted into 29,127,523 shares of the Company's common stock.

13. Stock option and grant plan

2017 stock option and grant plan

In June 2017, the board of directors adopted the 2017 Plan, which provided for the grant of qualified incentive stock options and nonqualified stock options, restricted stock or other awards to the Company's employees, officers, directors, advisors, and outside consultants for the issuance or purchase of shares of the Company's common stock. In May 2019, the 2017 Plan was amended to provide up to 8,078,681 shares of common stock for the issuance of stock options and restricted stock. At December 31, 2019 there were 1,573,109 shares available for future grant under the 2017 Plan. During the year ended December 31, 2018 1,783,346 shares were issued to scientific founders outside of the 2017 Plan. The Company did not have any issuances outside of the 2017 Plan during the year ended December 31, 2019.

The 2017 Plan is administered by the board of directors. The exercise prices, vesting and other restrictions are determined at the discretion of the board of directors, except that the exercise price per share of stock options may not be less than 100% of the fair market value of the common stock on the date of grant. Stock options awarded under the 2017 Plan expire 10 years after the grant date, unless the board of directors sets a shorter term. Vesting periods for awards under the 2017 Plan are determined at the discretion of the board of directors. Incentive stock options granted to employees and shares of restricted stock granted to officers, founders and consultants of the Company typically vest over four years. Certain options provide for accelerated vesting if there is a change in control, as defined in the 2017 Plan. Non-statutory options granted to employees, officers, members of the board of directors and consultants of the Company typically vest over four years.

For the years ended December 31, 2019 and 2018, the Company recorded stock-based compensation expense of $7.0 million and $7.0 million, respectively.

Stock-based compensation expense recorded as research and development and general and administrative expenses in the consolidated statements of operations and other comprehensive loss for each of the years ended December 31 is as follows (in thousands):

	2019	2018
Research and development	$ 4,236	$ 5,893
General and administrative	2,792	1,109
Total stock-based compensation expense	$ 7,028	$ 7,002

Stock options

The assumptions used in the Black-Scholes option-pricing model for stock options granted for each of the years ended December 31 were:

	2019	2018
Expected volatility	86.4-87.6%	79.4-83.1%
Weighted-average risk-free interest rate	2.17%	2.83%
Expected dividend yield	0.00%	0.00%
Expected term (in years)	6.25	6.25

A summary of option activity under the 2017 Plan during the year ended December 31, 2019 was as follows:

	Number of options	Weighted average exercise price	Weighted average remaining contractual life (years)	Aggregate intrinsic value (1) (in thousands)
Outstanding at December 31, 2018	2,485,327	$ 0.85	9.6	$ 13,804
Granted	2,671,871	7.66		
Exercised	(184,966)	1.00		
Forfeitures	(181,185)	1.87		
Outstanding at December 31, 2019	4,791,047	4.72	9.0	43,394
Vested and expected to vest as of December 31, 2018	4,791,047	4.72	9.0	43,394
Exercisable as of December 31, 2019	919,758	1.48	8.6	11,210

(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 as of December 31, 2019 and 2018.

During the years ended December 31, 2019 and 2018, the Company granted 133,886 and 253,307 stock options to certain employees to purchase shares of common stock that contain certain performance-based vesting criteria, primarily related to the achievement of certain development milestones related to editing applications, and the closing price of the Company's common stock following an IPO. Recognition of stock-based compensation expense associated with these performance-based stock options commences when the performance condition is considered probable of achievement, using management's best estimates, which consider the inherent risk and uncertainty regarding the future outcomes of the milestones. The achievement of the performance milestones was not considered probable, nor met, and therefore no expense has been recognized related to these awards for the year-ended December 31, 2019.

The weighted-average grant date fair value per share of stock options granted during the years ended December 31, 2019 and 2018, was $6.64 and $1.12, respectively. The aggregate intrinsic value of stock options exercised during the years ended December 31, 2019 and 2018 was $1.6 million and $0.1 million.

The aggregate grant date fair value of stock options vested during the years ended December 31, 2019 and 2018 were $1.5 million and $0.1 million, respectively.

As of December 31, 2019, there was $16.1 million of unrecognized compensation cost related to unvested stock options, which is expected to be recognized over a weighted-average period of approximately 2.71 years.

Restricted stock

In 2018, the Company issued 1,783,346 shares of restricted common stock to certain scientific founders of Blink upon the Blink Merger (see Note 10, *Blink Therapeutics*), having a fair value of $7.2 million, and subject to vesting over a period of 3.5 years. In 2018, the Company granted 422,345 shares of restricted common stock to certain of the Company's scientific founders, having a grant date fair value of $0.4 million. A portion of these shares are subject to vesting over a period of four years, with the commencement of vesting of the remaining shares upon the achievement of certain financing milestones, and in certain instances continued service after

the milestones are achieved. In 2018, the Company issued 850,889 shares of restricted common stock to an employee, having a fair value of $3.4 million, that vest over a period of four years.

If the holders of restricted common stock cease to have a business relationship with the Company, the Company may reacquire any unvested shares of common stock held by these individuals for the original purchase price, and in certain instances for no consideration. The amounts received to date for the purchase price of restricted stock are immaterial. The unvested shares of restricted common stock are not considered outstanding shares for accounting purposes until the shares vest.

A summary of the status of and change in unvested restricted stock at December 31, 2019 was as follows:

	Shares	Weighted-average grant date fair value
Unvested as of December 31, 2018	4,214,932	$ 2.56
Issued	—	—
Vested	(1,559,126)	2.26
Unvested as of December 31, 2019	2,655,806	$ 2.73

The aggregate fair value of restricted shares that vested during the years ended December 31, 2019 and 2018, was $3.6 million, and $4.6 million, respectively.

At December 31, 2019, there was approximately $7.3 million of unrecognized stock-based compensation expense related to restricted stock that is expected to vest. These costs are expected to be recognized over a weighted-average remaining vesting period of 1.8 years.

2019 incentive plan

In February 2020, the Company's board of directors adopted the Beam Therapeutics Inc. 2019 Equity Incentive Plan, or the 2019 Plan, and, subsequent to the IPO, all equity-based awards will be granted under the 2019 Plan. The 2019 Plan provides for grant of qualified and nonqualified stock options, stock appreciation rights, restricted and unrestricted stock and stock units, performance awards, and other share-based awards to the Company's employees, officers, directors, advisors, and outside consultants.

The maximum number of shares of the Company's common stock that may be issued under the 2019 Plan is 3,700,000 shares, or the Share Pool, plus the number of shares of the Company's common stock underlying awards under the 2017 Plan, not to exceed 5,639,818 shares, that become available again for grant under the 2017 Plan in accordance with its terms. The Share Pool will automatically increase on January 1st of each year from 2021 to 2029 by the lesser of (i) four percent of the number of shares of our common stock outstanding as of the close of business on the immediately preceding December 31st and (ii) the number of shares determined by our board of directors on or prior to such date for such year.

14. Net loss per share attributable to common stockholders

As noted above, for periods in which the Company reports a net loss attributable to common stockholders, potentially dilutive securities have been excluded from the computation of diluted net loss per share as their effects would be anti-dilutive. Therefore, the weighted average number of common shares outstanding used to calculate both basic and diluted net loss per share attributable to common stockholders is the same. The Company excluded the following potential common shares, presented based on amounts outstanding at period end, from the computation of diluted net loss per share attributable to common stockholders for each of the years ended December 31 because including them would have had an anti-dilutive effect:

	2019	2018
Redeemable convertible preferred stock	29,127,523	26,605,753
Unvested restricted stock	2,655,806	4,214,932
Outstanding options to purchase common stock	4,791,047	2,485,327
Total	36,574,376	33,306,012

The following table summarizes the computation of basic and diluted net loss per share attributable to common stockholders of the Company for each of the years ended December 31 (in thousands except share and per share amounts):

	2019	2018
Numerator:		
Net loss attributable to common stockholders	$ (91,040)	$ (117,325)
Denominator:		
Weighted average number of common shares, basic and diluted	6,479,591	2,893,978
Net loss per common share attributable to common stockholders, basic and diluted	$ (14.05)	$ (40.54)

15. Income taxes

A reconciliation of the income tax expense computed using the federal statutory income tax rate to the Company's effective income tax rate for each of the years ended December 31 is as follows:

	2019	2018
Federal statutory rate	21.0%	21.0%
State income taxes, net of federal benefit	7.4	2.2
Research and development tax credits	3.1	0.5
Nondeductible/ nontaxable permanent items	(1.8)	(13.4)
Change in valuation allowance	(29.7)	(10.3)
Total	0.0%	0.0%

The components of the Company's deferred taxes at December 31 are as follows (in thousands):

	2019	2018
Deferred tax assets:		
Net operating loss carryforwards	$ 26,767	$ 10,971
Lease liability	6,973	—
Research and development tax credits	4,876	963
Accrued expenses	3,237	1,071
Deferred rent	—	2,070
Other	134	44
Total deferred tax assets	41,987	15,119
ROU asset	(5,179)	—
Property and equipment	(373)	(99)
Less: valuation allowance	(36,435)	(15,020)
Deferred tax assets, net	$ —	$ —

The Company had no income tax expense due to the operating loss incurred for the years ended December 31, 2019 and 2018. Management has evaluated the positive and negative evidence bearing upon the realizability of the Company's net deferred tax assets and has determined that it is more likely than not that the Company will not recognize the benefits of the net deferred tax assets. As a result, the Company has recorded a full valuation allowance at December 31, 2019 and 2018. The valuation allowance increased by $21.4 million in 2019, due to the increase in deferred tax assets, primarily due to net operating loss carryforwards, and research and development tax credits, and deductible accrued expenses. The valuation allowance increased by $12.7 million in 2018.

Realization of the future tax benefits is dependent on many factors, including the Company's ability to generate taxable income within the net operating loss carryforward period. Under the provisions of the Internal Revenue Code, certain substantial changes in the Company's ownership, including a sale of the Company or significant changes in ownership due to sales of equity, may have limited, or may limit in the future, the amount of net operating loss carryforwards, which could be used annually to offset future taxable income. The Company has not completed a study to assess whether a change of control has occurred or whether there have been multiple changes of control since the Company's formation due to the significant complexity and cost associated with such study and because there could be additional changes in control in the future. As a result, the Company is not able to estimate the effect of the change in control, if any, on the effect of the change in control, if any, on the Company's ability to utilize net operating loss and research and development credit carryforwards in the future.

As of December 31, 2019, the Company had $98.7 million of federal and $95.7 million of state net operating loss carryforwards. If not utilized, both the federal and state net operating loss carryforwards expire starting in 2037. Included in the $98.7 million federal net operating loss carryforwards is $95.3 million of net operating loss generated in 2018 and 2019 that will not expire. Additionally, as of December 31, 2019, the Company had $3.1 million of federal and $2.2 million of Massachusetts tax credits that expire starting in 2038 and 2033, respectively.

As of December 31, 2019 and 2018, the Company had no uncertain tax positions. The Company recognizes both interest and penalties associated with unrecognized tax benefits as a component of income tax expense. The Company has not recorded any interest or penalties for unrecognized tax benefits since its inception.

The Company filed income tax returns in the United States and the Commonwealth of Massachusetts in all tax years since inception. The tax years 2018 and 2017 remain open to examination by these jurisdictions, as carryforward attributes generated in past years may be adjusted in a future period. The Company is not currently under examination by the Internal Revenue Service or any other jurisdiction for these years.

16. Related party transactions

For the years ended December 31, 2019 and 2018, the Company made payments of $0.5 million and $0.7 million, respectively, and, during the year ended December 31, 2018, issued restricted shares with a grant date fair value of $0.4 million to its three founder shareholders for scientific consulting and other expenses.

See Note 9, *Collaboration and license agreements*, for a description of the Company's collaboration and license agreements with Prime Medicine and Verve. The Company and Prime Medicine have a common founder and several common board members. The Company and Verve have a common board member. During the years ended December 31, 2019 and 2018, the Company purchased shares of Verve Therapeutics, Inc. ("Verve") series A preferred stock valued at $0.4 million and $0.3 million, respectively.

In March 2018, certain of Beam's investors formed Blink to hold certain intellectual property related to base editing. In September 2018, the Company exercised its option to acquire Blink, which is now a wholly-owned subsidiary of Beam.

17. Employee benefits

In 2018, the Company established a defined-contribution plan under Section 401(k) of the Internal Revenue Code, or 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 pre-tax basis. The Company is not required to make and has not made any matching contributions to the 401(k) Plan for the year ended December 31, 2019. However, beginning January 1, 2020, the Company will make matching contributions equal to 50% of the employee's contributions, subject to a maximum of 6% of eligible compensation.

18. Subsequent events

The Company evaluated all subsequent events through March 30, 2020, the date that these consolidated financial statements were issued to determine if such events should be reflected in these consolidated financial statements.

Reverse stock split

The Company's board of directors approved a one-for-4.4843 reverse stock split of its issued and outstanding common stock and stock options and a proportional adjustment to the existing conversion ratios for the Company's redeemable convertible preferred stock effective as of January 24, 2020. Accordingly, all common stock shares, per share amounts, and additional paid in capital amounts for all periods presented in the accompanying consolidated financial statements and notes thereto have been retroactively adjusted, where applicable, to reflect the reverse stock split.

Initial public offering

In February 2020, the Company completed its IPO in which the Company issued and sold 12,176,471 shares of its common stock, including 1,588,235 shares pursuant to the full exercise of the underwriters' option to purchase additional shares, at a public offering price of $17.00 per share, for aggregate gross proceeds of $207.0 million. The Company received approximately $188.3 million in net proceeds after deducting underwriting discounts and estimated offering expenses payable by the Company. In connection with this financing, all outstanding shares of Preferred Stock converted into 29,127,523 shares of the Company's common stock.

Lease amendment

In March 2020, the Company entered into an amendment of its October 2018 lease agreement for laboratory space in Cambridge, Massachusetts. The amended lease commenced in March 2020 and will expire on March 31, 2023. The lease provides an option to extend the lease for an additional year through March 31, 2024, which was determined by the Company to be probable of being exercised. As the commencement date of the leases has not occurred at December 31, 2019, no operating lease ROU asset or lease liability has been recorded in the accompanying condensed consolidated balance sheets for this amendment. The incremental increase in total amount of undiscounted lease payments as a result of the amended lease is approximately $4.8 million, which includes lease payments for the additional year under the option provided within the lease.

COVID-19 Pandemic

In December 2019, coronavirus disease of 2019, or COVID-19, was first reported in Wuhan, China. In March 2020, the World Health Organization declared COVID-19 a pandemic and certain governments, including the Commonwealth of Massachusetts where the Company's primary offices and laboratory spaces are located, enacted shelter in place orders, and sweeping restrictions to travel were initiated by corporations and governments.

To protect the health of its employees, and their families and communities, the Company has restricted access to its offices to personnel who must perform critical activities that must be completed on-site, limited the number of such personnel that can be present at our facilities at any one time, and requested that most of our employees work remotely. The extent of COVID-19's effect on the Company's operational and financial performance will depend on future developments, including the duration, spread and intensity of the pandemic, and additional protective measures implemented by the governmental authorities or the Company to protect its employees, all of which are uncertain and difficult to predict considering the rapidly evolving landscape. As a result, it is not currently possible to ascertain the overall impact of COVID-19 on the Company's business. However, if the pandemic continues to

evolve into a severe worldwide health crisis, the disease could have a material adverse effect on the Company's business, results of operations, financial condition and cash flows.

Exhibit 4.3

DESCRIPTION OF THE REGISTRANT'S SECURITIES

REGISTERED PURSUANT TO SECTION 12 OF THE SECURITIES EXCHANGE ACT OF 1934

The following summary describes all material provisions of the common stock, par value $0.01 per share, of Beam Therapeutics Inc. The description of our common stock is qualified by reference to our certificate of incorporation, bylaws, and investor rights agreement, which are included as exhibits to the Annual Report on Form 10-K of which this Exhibit 4.3 is a part.

General

Our authorized capital stock consists of 275,000,000 shares, all with a par value of $0.01 per share, of which:

- 250,000,000 shares are designated as common stock; and
- 25,000,000 shares are designated as preferred stock.

Common stock

Holders of our common stock are entitled to one vote for each share held on all matters submitted to a vote of stockholders and do not have cumulative voting rights. An election of directors by our stockholders shall be determined by a plurality of the votes cast by the stockholders entitled to vote on the election. Holders of common stock are entitled to receive proportionately any dividends as may be declared by our board of directors, subject to any preferential dividend rights of any series of preferred stock that we may designate and issue in the future.

In the event of our liquidation or dissolution, the holders of common stock are entitled to receive proportionately our net assets available for distribution to stockholders after the payment of all debts and other liabilities and subject to the prior rights of any outstanding preferred stock. Holders of common stock have no preemptive, subscription, redemption or conversion rights. Our outstanding shares of common stock are validly issued, fully paid and nonassessable. The rights, preferences and privileges of holders of common stock are subject to and may be adversely affected by the rights of the holders of shares of any series of preferred stock that we may designate and issue in the future.

Preferred stock

Under the terms of our amended and restated certificate of incorporation, our board of directors is authorized to direct us to issue shares of preferred stock in one or more series without stockholder approval. Our board of directors has the discretion to determine the rights, preferences, privileges and restrictions, including voting rights, dividend rights, conversion rights, redemption privileges and liquidation preferences, of each series of preferred stock.

The purpose of authorizing our board of directors to issue preferred stock and determine its rights and preferences is to eliminate delays associated with a stockholder vote on specific issuances. The issuance of preferred stock, while providing flexibility in connection with possible acquisitions, future financings and other corporate purposes, could have the effect of making it more difficult for a third-party to acquire, or could discourage a third-party from seeking to acquire, a majority of our outstanding voting stock.

Anti-takeover effects of our certificate of incorporation and our by-laws

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

These provisions include:

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

Action by written consent; special meetings of stockholders. Our certificate of incorporation provides that stockholder action can be taken only at an annual or special meeting of stockholders and cannot be taken by written consent in lieu of a meeting. Our certificate of incorporation and the by-laws also provides that, except as otherwise required by law, special meetings of the stockholders can only be called pursuant to a resolution adopted by a majority of our board of directors. Except as described above, stockholders are not permitted to call a special meeting or to require our board of directors to call a special meeting.

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

Advance notice procedures. Our by-laws establish an advance notice procedure for stockholder proposals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to the board of directors. Stockholders at an annual meeting are only able to consider proposals or nominations specified in the notice of meeting or brought before the meeting by or at the direction of our board of directors or by a stockholder who was a stockholder of record on the record date for the meeting, who is entitled to vote at the meeting and who has given our Secretary timely written notice, in proper form, of the stockholder's intention to bring that business before the meeting. Although the by-laws do not give our board of directors the power to approve or disapprove stockholder nominations of candidates or proposals regarding other business to be conducted at a special or annual meeting, the by-laws may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed or may discourage or deter a potential acquirer from conducting a solicitation of proxies to elect its own slate of directors or otherwise attempting to obtain control of us.

Supermajority approval requirements. The DGCL generally provides that the affirmative vote of a majority of the shares entitled to vote on any matter is required to amend a corporation's certificate of incorporation or by-laws, unless either a corporation's certificate of incorporation or by-laws requires a greater percentage. Our certificate of incorporation and by-laws provide that the affirmative vote of holders of at least 75% of the total votes eligible to be cast in the election of directors is required to amend, alter, change or repeal specified provisions. This requirement of a supermajority vote to approve amendments to our certificate of incorporation and by-laws could enable a minority of our stockholders to exercise veto power over any such amendments.

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

Exclusive forum. Our certificate of incorporation requires, to the fullest extent permitted by law, that derivative actions brought in the name of the Company, actions against directors, officers and employees for breach of a fiduciary duty and other similar actions may be brought only in specified courts in the State of Delaware. Under our certificate of incorporation, this exclusive forum provision will not apply to claims that are vested in the exclusive jurisdiction of a court or forum other than the Court of Chancery of the State of Delaware, or for which the Court of Chancery of the State of Delaware does not have subject matter jurisdiction and explicitly does not apply to actions arising under federal securities laws, including suits brought to enforce any liability or duty created by the Securities Act, Exchange Act, or the rules and regulations thereunder. Furthermore, our amended and restated by-laws also provide that unless we consent in writing to the selection of an alternative forum, the federal district courts of the United States shall be the exclusive forum for the resolution of any compliant asserting a cause of action arising under the Securities Act. Although we believe these provisions benefit us by providing increased consistency in the

application of Delaware law in the types of lawsuits to which it applies, these provisions may have the effect of discouraging lawsuits against our directors and officers. See “Risk factors—Our amended and restated certificate of incorporation and amended and restated by-laws designates the state or federal courts 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.”

Section 203 of the DGCL

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

Under Section 203, a business combination between a corporation and an interested stockholder is prohibited unless it satisfies one of the following conditions: before the stockholder became interested, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder; upon consummation of the transaction which resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, excluding for purposes of determining the voting stock outstanding, shares owned by persons who are directors and also officers, and employee stock plans, in some instances; or at or after the time the stockholder became interested, the business combination was approved by our board of directors of the corporation and authorized at an annual or special meeting of the stockholders by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

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

Transfer agent and registrar

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

Listing

Our common stock is listed on the Nasdaq Stock Market under the symbol BEAM.

Exhibit 21.1

Subsidiaries of Beam Therapeutics, Inc.

Entity	State or other Jurisdiction of Incorporation or Organization
Blink Therapeutics, Inc.	Delaware
Beam Therapeutics Securities Corporation	Massachusetts

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in Registration Statement No. 333-236582 on Form S-8 of our report dated March 30, 2020, relating to the financial statements of Beam Therapeutics Inc. and subsidiaries appearing in this Annual Report on Form 10-K for the year ended December 31, 2019.

/s/ Deloitte & Touche LLP

Boston, Massachusetts

March 30, 2020

Exhibit 31.1

CERTIFICATION PURSUANT TO
RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, John Evans, certify that:

1. I have reviewed this Annual Report on Form 10-K of Beam Therapeutics Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) [Omitted];

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 30, 2020

By: /s/ John Evans
John Evans
Chief Executive Officer
(Principal executive officer)

Exhibit 31.2

CERTIFICATION PURSUANT TO
RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Terry-Ann Burrell, certify that:

1. I have reviewed this Annual Report on Form 10-K of Beam Therapeutics Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) [Omitted];

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 30, 2020

By: /s/ Terry-Ann Burrell
Terry-Ann Burrell
Chief Financial Officer
(Principal financial and accounting officer)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with this Annual Report of Beam Therapeutics Inc (the "Company") on Form 10-K for the period ending December 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and result of operations of the Company.

Date: March 30, 2020

By: /s/ John Evans
John Evans
Chief Executive Officer
(Principal executive officer)

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with this Annual Report of Beam Therapeutics Inc. (the "Company") on Form 10-K for the period ending December 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and result of operations of the Company.

Date: March 30, 2020

By: /s/ Terry-Ann Burrell
Terry-Ann Burrell
Chief Financial Officer
(Principal financial and accounting officer)