UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, DC 20549

FORM 10-K

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

For the fiscal year ended December 31, 2018

OR

o **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 001-38811

TCR² Therapeutics Inc.
(Exact name of Registrant as specified in its charter)

Delaware	**47-4152751**
(State or other jurisdiction of incorporation or organization)	(IRS Employer Identification No.)

100 Binney Street, Suite 710
Cambridge, Massachusetts 02142
(Address of Principal Executive Offices)

(617) 949-5200
(Registrant's telephone number, including area code)

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

Title of each class	Name of each exchange on which registered
Common Stock, $0.0001 Par Value	The Nasdaq Stock Market, LLC

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 o No x

Indicate by check if the Registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes o No x

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 x No o

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

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

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. (Check one):

Large accelerated filer o	Accelerated filer o
Non-accelerated filer x	Smaller reporting company x
	Emerging growth company x

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 7(a)(2)(B) of the Securities Act. o

Indicate by check mark whether the Registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes o No x

The registrant did not have a public float on the last business day of its most recently completed second fiscal quarter because there was no public market for the registrant's common equity as of such date.

As of March 25, 2019, there were 23,939,901 shares of the registrant's Common Stock, $0.0001 par value per share, outstanding.

TCR² Therapeutics Inc.

Table of Contents

SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K of TCR^2 Therapeutics Inc. (the "Company") contains or incorporates statements that constitute forward-looking statements within the meaning of the federal securities laws. Any statements that do not relate to historical or current facts or matters are forward looking statements. In some cases, you can identify forward-looking statements by terminology such as "may," "will," "could", "should," "expects," "intends," "plans," "anticipates," "believes," "estimates," "predicts," "projects", "potential," "continue" or the negative of these terms or other comparable terminology. Forward-looking statements appear in a number of places in this Annual Report on Form 10-K and include, but are not limited to, statements about:

- the timing of preclinical studies and clinical trials of TC-210, TC-110 and any other product candidates;
- our need to raise additional funding before we can expect to generate any revenues from product sales;
- our ability to submit our planned INDs and conduct successful clinical trials or obtain regulatory approval for TC-210, TC-110 or any other product candidates that we may identify or develop;
- the ability of our TRuC-T cell platform to generate and advance additional product candidates;
- our ability to establish an adequate safety, potency and purity profile for TC-210, TC-110 or any other product candidates that we may pursue;
- our ability to manufacture TC-210, TC-110 or any other product candidate in conformity with the U.S. Food and Drug Administration's requirements and to scale up manufacturing of our product candidates to commercial scale, if approved;
- the implementation of our strategic plans for our business, any product candidates we may develop and our technology;
- our intellectual property position, including the scope of protection we are able to establish and maintain for intellectual property rights covering our product candidates and technology;
- the rate and degree of market acceptance and clinical utility for any product candidates we may develop;
- our expectations related to the use of proceeds from our initial public offering;
- our estimates regarding our expenses, future revenues, capital requirements and our needs for additional financing;
- our ability to maintain and establish collaborations;
- our financial performance;
- our ability to effectively manage our anticipated growth;
- developments relating to our competitors and our industry, including the impact of government regulation;
- our estimates regarding the market opportunities for our product candidates;
- our ability to retain the continued service of our key professionals and to identify, hire and retain additional qualified professionals; and
- our estimates of our expenses, ongoing losses, future revenue, capital requirements and our needs for or ability to obtain additional financing;
- our expectations regarding the time during which we will be an emerging growth company under the Jumpstart Our Business Startups Act, or the JOBS Act;
- our financial performance; and
- other risks and uncertainties, including those listed under the section titled "Risk Factors."

Although we believe that the expectations reflected in these forward-looking statements are reasonable, these statements relate to our strategy, future operations, future financial position, future revenue, projected costs, prospects, plans, objectives of management and expected market growth, and involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to be materially different from any future results, levels of activity, performance or achievements expressed or implied by these forward-looking statements. You are urged to carefully review the disclosures we make concerning these risks and other factors that may affect our

business and operating results under “Item 1A. Risk Factors” in this Annual Report on Form 10-K. You are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date of this document. The Company does not intend, and undertakes no obligation, to update any forward-looking information to reflect events or circumstances after the date of this document or to reflect the occurrence of unanticipated events, unless required by law to do so.

Part I

Except where the context otherwise requires or where otherwise indicated, the terms "TCR^2," "TCRR," "we," "us," "our," "our company," "the company," and "our business" refer to TCR^2 Therapeutics Inc. and its consolidated subsidiary.

Item 1. Business

Overview

We are a clinical-stage immunotherapy company developing the next generation of novel T cell therapies for patients suffering from cancer. Our proprietary TCR Fusion Construct T cells (TRuC-T cells) specifically recognize and kill cancer cells by harnessing the entire T cell receptor (TCR) signaling complex, which we believe is essential for T cell therapies to be effective in patients with solid tumors.

We have designed our TRuC-T cells so that tumor cell recognition does not require human leukocyte antigens (HLA), which provides two important additional benefits. First, in contrast to current engineered T cell therapies that use the full TCR (TCR-T cells), our technology is designed so that it can be applied to all patients that express the cancer surface antigen irrespective of HLA subtype, which we believe will allow us to address a significantly larger patient population. Second, HLA is downregulated or lost in many tumors which can prevent their recognition by T cells and lead to diminished response rates and higher relapse rates. We therefore believe our approach will allow us to deliver the first HLA-independent TCR-T cell therapy for patients with solid tumors. We also believe that our product candidates have the potential to improve upon the efficacy and safety of currently approved chimeric antigen receptor T (CAR-T) cell therapies in CD19-positive B-cell hematological malignancies. This belief is based on preclinical studies comparing our product candidates to CAR-T cells that we engineered.

According to a 2017 press release from the FDA on the licensure of the first engineered T cell therapy for cancer, the field is "entering a new frontier in medical innovation with the ability to reprogram a patient's own cells to attack a deadly cancer." We founded our company to build on these early T cell therapy innovations while addressing their limitations and making our product candidates available to a broader patient population.

The immune system is responsible for protecting the human body against viral and bacterial infections, as well as mutated and cancerous cells. A critical component of the immune system are T cells that are able to target and kill these agents by using TCR recognition of cell surface markers known as antigens. Existing T cell therapies for cancer, including CAR-T cells and engineered TCR-T cells, attempt to replicate this mechanism. While current T cell therapies have shown encouraging efficacy data, they have limitations that we believe our TRuC-T cell product candidates can address.

In January 2019, the investigational new drug application (IND) for our lead solid tumor product candidate, TC-210, to treat patients with mesothelin-positive solid tumors was cleared by the U.S. Food and Drug Administration (FDA). We have initiated our Phase 1/2 clinical trial for TC-210 to treat patients with non-small cell lung cancer (NSCLC), ovarian cancer, malignant pleural/peritoneal mesothelioma and cholangiocarcinoma. We estimate the patient population for TC-210 in the four indications which we are exploring in our clinical trial is up to 81,000 in the United States alone. In our preclinical studies, TC-210 has demonstrated better anti-tumor activity, longer persistence, and lower cytokine release compared to CAR-T cells we engineered with the same mesothelin binder. We expect to generate our first clinical data for TC-210 in the second half of 2019.

We expect to file an IND in the second half of 2019 for our lead hematology product candidate, TC-110, to treat patients with CD19-positive B-cell hematological malignancies, including diffuse large B-cell lymphoma (DLBCL), adult acute lymphoblastic leukemia (aALL), follicular lymphoma (FL), and other non-Hodgkin lymphoma (NHL) subtypes. These are indications for which CAR-T cells have either not been

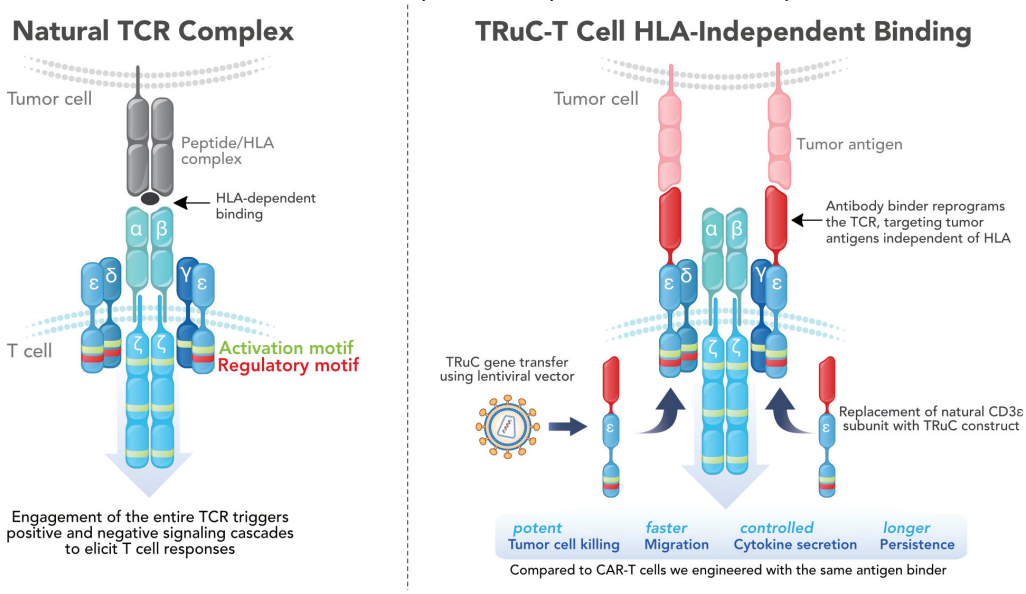
approved (FL), been too toxic (aALL) or where durable benefit is limited to a minority of patients (DLBCL). In our preclinical studies of TC-110, we have observed better anti-tumor activity and persistence compared to CAR-T cells we engineered to target CD19 while also exhibiting lower levels of cytokine release. We expect to generate our first clinical data for TC-110 in the second half of 2020. In addition, we plan to file an IND for our second solid tumor product candidate, TC-220, to treat MUC16-positive solid tumors, in the first half of 2020 and we expect to generate our first clinical data for TC-220 in the first half of 2021.

Our Novel T-Cell Receptor Fusion Construct (TRuC) Platform

We are pioneering the development of a novel, transformative T cell engineering platform which, based on its design and our preclinical studies, we believe has the potential to address the shortcomings of CAR-T cells and TCR-T cells and is fundamentally different from existing approaches. Research over more than two decades has shown that each of the TCR subunits makes distinct contributions to the activation and regulation of T cells and only the sum of the TCR subunits can adequately activate and control all functions of T cells. We believe that engaging the entire TCR signaling complex is required to fully leverage T cells in their fight against cancer.

Our T cell engineering approach relies upon natural TCR elements to produce therapeutic T cells that function independently of HLA restriction. To that end, we fuse a cancer antigen recognition domain (i.e. antibody-based binder) directly to a subunit of the TCR and use a lentiviral vector to transfer the genetic information for the TRuC construct into a patient's own T cells. This modified subunit then naturally integrates into the native TCR complex, creating an engineered T cell equipped with a new "homing device" to detect and engage a specific antigen on the surface of cancer cells. Upon antigen engagement, these T cells harness the entire TCR to produce a more powerful yet controlled T cell response against cancer. We refer to T cells engineered with our TCR fusion constructs as TRuC-T cells. In preclinical studies of both solid tumors and hematological malignancies we have observed greater anti-tumor activity, longer persistence and less cytokine release compared to CAR-T cells we have engineered to target the same cancer antigen. We believe that these properties could translate into more durable responses with potentially fewer adverse events for patients with cancer.

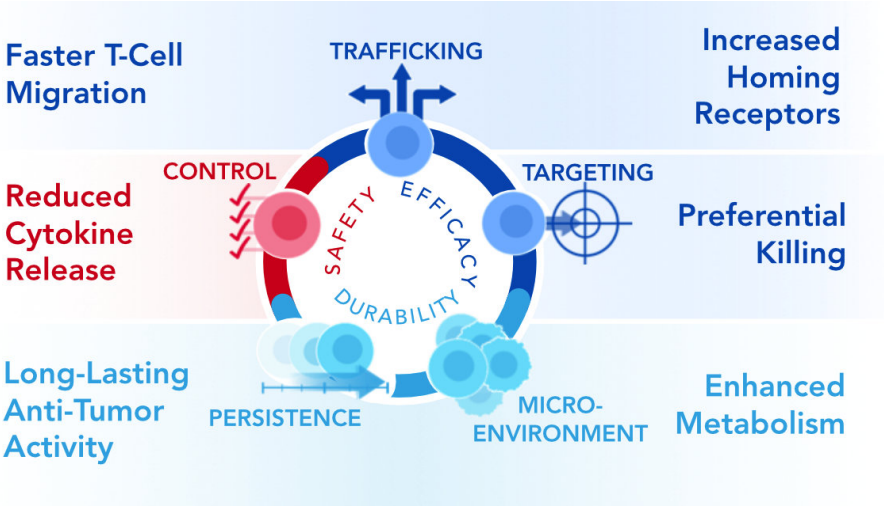
The figure below describes the natural HLA-restricted TCR complex as compared to the HLA-independent TRuC TCR.



Our platform enables the design of TRuC-T cells with a number of potential advantages, as described in the table below:

ATTRIBUTES	FEATURES	MECHANISMS	DESIRED PATIENT OUTCOME
Enhanced Signaling	TRuC construct integrates into and utilizes the entire TCR	• Naturally controlled T cell responses through TCR regulatory motifs • Lower cytokine production • No requirement for built-in costimulatory domain	• Produce a more powerful, yet controlled T cell response • Controlled T cell responses, leading to lower adverse event rates
Efficient Metabolism	Longer persistence and survival of TRuC-T cells in the hostile tumor microenvironment	• Enhanced tumor penetration and retention • Enhanced energy production, including higher spare respiratory capacity • Promotion of memory T cell phenotype	• Higher T cell tumor infiltration leading to improved response rates • Long-term persistence reducing risk of relapse
Advanced Targeting	Antibody-based tumor cell recognition	• Reprogramming of T cell specificity to recognize tumor surface antigen • HLA-independent binding to tumor	• Access to larger patient population • TRuC-T cells have the potential to improve upon existing therapies because of HLA downregulation
	Dual targeting	• Ability to attack tumors based on the recognition of two different antigens	• Reduced risk of relapse due to antigen escape • Improved response rates in tumors with heterogeneous target antigen expression
	Amenability to various tumor cell recognition modalities	• Binder formats include, but are not limited to, single-chain variable fragments, single-domain antibodies and receptors • Humanized binders	• Improved response rates and lower relapse rates

Our goal is to improve upon the efficacy and safety of T-cell therapies by enhancing trafficking of T cells into tumors, tumor antigen targeting, the ability to withstand the tumor microenvironment, long-lasting T-cell persistence, and a controlled anti-tumor response. In our preclinical studies, TRuC-T cells have shown improvements in each of these key characteristics compared to CAR-T cells we have engineered with the same binders.



We use our TRuC-T cell platform to target many different cancer antigens. Our core format, in which we target a single cancer antigen, is known as a mono TRuC-T cell. Our mono TRuC-T cell product candidates have shown promising anti-tumor activity and persistence in our preclinical studies.

We are supplementing our core format with a series of next-generation enhancements that may further improve clinical outcomes. These fall into two broad categories. First, we are developing formats that target two antigens, known as dual TRuC-T cells, which could improve tumor response in patients who express more than one cancer antigen and combat potential antigen escape, which is a leading mechanism of cancer relapse in patients receiving CAR-T cell therapy. Second, we are developing several strategies to counter the immunosuppressive microenvironment of solid tumors including mechanisms to block a key cancer defense known as the programmed cell death 1 (PD-1) pathway, which can inhibit anti-tumor responses by T cells.

Our Strategy

Our goal is to cure cancer with our TRuC-T cell therapies. We intend to make a difference in the lives of patients by building a fully integrated cancer immunotherapy company offering the first HLA-independent TCR-T cell therapies. The key components of our strategy are:

- *Rapidly advance our solid tumor pipeline.* We have initiated our Phase 1/2 clinical trial for TC-210, our lead mono TRuC-T cell targeting patients with mesothelin-expressing solid tumors. We expect to generate initial data from the Phase 1 portion of this clinical trial in the second half of 2019. Our plan is to begin the dose-escalation portion of our Phase 1/2 clinical trial in patients who have malignant pleural/peritoneal mesothelioma, cholangiocarcinoma (bile duct cancer), ovarian cancer and non-small cell lung cancer (NSCLC). TC-210 has received FDA Orphan Drug Designation for the treatment of mesothelioma. Our goal is to obtain FDA Fast Track designations for malignant pleural/peritoneal mesothelioma and cholangiocarcinoma as a means to potentially facilitate FDA Accelerated Approval based on Phase 2 data. We anticipate filing an IND for our second mono TRuC-T cell, TC-220, targeting patients with MUC16 positive solid tumors, in the first half of 2020. We are also developing product candidates targeting other cancer antigens expressed on solid tumors.

- *Rapidly advance our hematological malignancy pipeline*. We intend to file an IND for TC-110, our lead mono TRuC-T cell targeting patients with CD19-positive B-cell hematological malignancies, in the second half of 2019. We are conducting preclinical studies and have developed a clinical plan for patients with adult acute lymphoblastic leukemia (aALL), diffuse large B-cell lymphoma (DLBCL), follicular lymphoma (FL), and other non-Hodgkin lymphoma (NHL) subtypes. Our goal is to obtain FDA Fast Track designations for both ALL and DLBCL, and we believe this will provide the potential for FDA Accelerated Approval based on Phase 2 clinical data.

- *Exploit the versatility of our platform to broaden our pipeline.* We have developed several additional tools that may be incorporated into our future product candidates to overcome tumor defense mechanisms, including dual-antigen targeting TRuC-T cells to minimize potential for antigen escape and cancer relapse. Our most advanced dual-antigen targeting programs include a dual mesothelin/MUC16 TRuC-T cell for solid tumors and a dual CD19/CD22 TRuC-T cell for hematological malignancies. We are also developing several tools to counter the immunosuppressive tumor microenvironment, including interference with immune checkpoint pathways. We are also evaluating multiple proprietary designs for allogeneic, or off-the-shelf, TRuC-T cells.

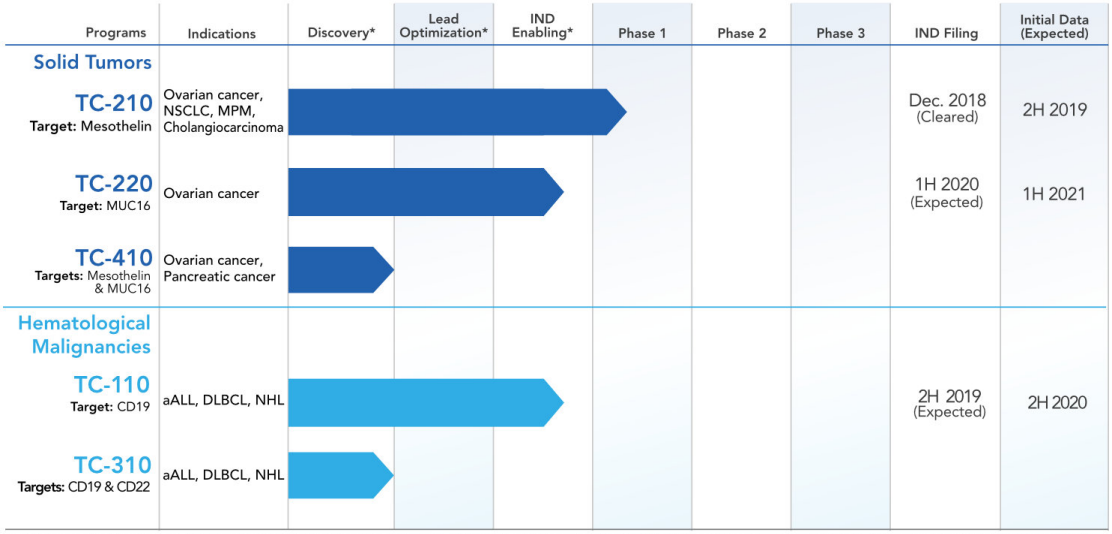
- *Scale our manufacturing capacity to match our future product needs.* We plan to develop our own manufacturing capabilities. We are currently manufacturing GMP-grade clinical lots for TC-210 through third-party contractors. We have also entered into an agreement with Cell

Therapy Catapult Limited (Catapult), which will allow us to manufacture our TRuC-T cells using our own personnel at Catapult's facility, while also expanding our capacity to supply future clinical trials. If our clinical trials are successful, given the size of the patient population that can potentially be targeted by our product candidates, we plan to build our own manufacturing plant.

- *Retain significant economic and commercial rights to our product candidates.* We currently own all rights to our product candidates and programs and intend to build a fully integrated cancer immunotherapy company. We intend to maintain product rights in key geographies, in particular for TC-210. We believe the versatility of our platform presents an opportunity for us to selectively form collaborations and strategic partnerships to expand our capabilities and product offerings into other therapeutic areas and potentially accelerate the development and maximize the commercial potential of our product candidates.

Our Pipeline

The versatility of our platform is highlighted by the multiple programs and multiple formats of the product candidates in our pipeline. We have generated a broad pipeline with assets that address both solid tumors and hematological malignancies. Our product candidates are listed in the figure below.



NSCLC: non-small cell lung cancer, MPM: malignant pleural/ peritoneal mesothelioma, aALL: adult acute lymphoblastic leukemia, DLBCL: diffuse large B-cell lymphoma, NHL: other non-Hodgkin lymphoma (NHL) subtypes including follicular lymphoma (FL), mantle cell lymphoma (MCL), primary mediastinal B-cell lymphoma (PMBCL)

*In the Discovery stage, we identify the antigen-specific binders, tether these to a TCR subunit via a linker and then, upon introduction into T cells, test the killing activity and cytokine release *in vitro*. Thereafter, the programs enter Lead Optimization stage, where we optimize the antigen binder sequence and linker length and re-test T cells expressing the enhanced TRuC sequences in cellular assays for functional activity and specificity. At this stage, we also investigate the anti-tumor activity, cytokine release, pharmacodynamics and phenotype of TRuC-T cells in mouse studies. The IND-Enabling stage is defined by the nomination of a product candidate. At this stage of drug development, we initiate the GMP production of lentiviral vector and process development of TRuC-T cells. In addition, we conduct studies addressing the specificity and toxicity to support the submission of an IND application.

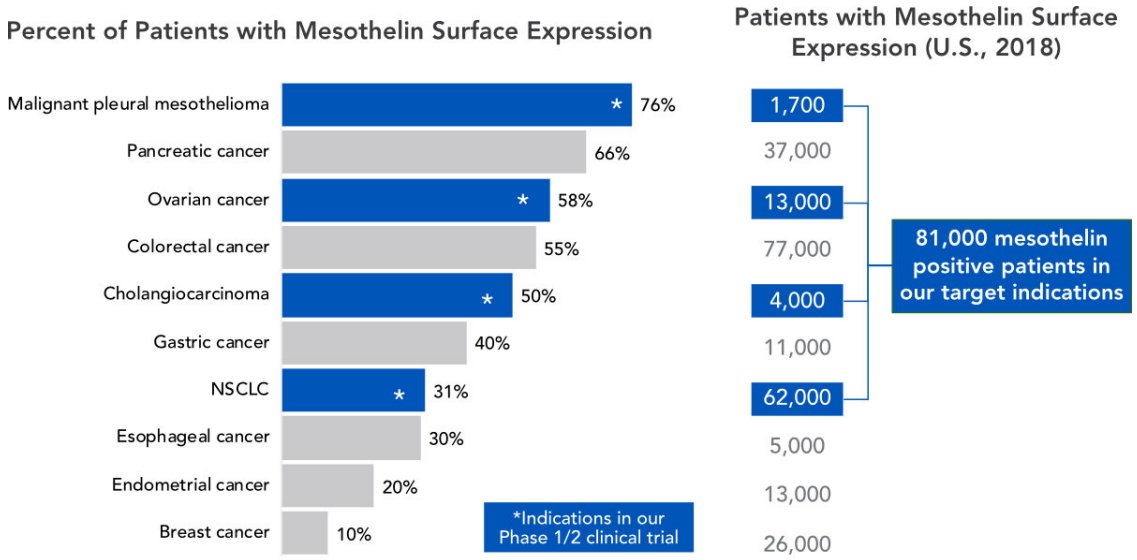
TC-210: Our Lead Mono TRuC-T Cells Targeting Mesothelin Positive Solid Tumors

Our most advanced TRuC-T cell product candidate is TC-210, which targets mesothelin-positive solid tumors. Mesothelin is a cell-surface protein whose expression is mostly restricted to mesothelial cell layers lining the pleura, pericardium and peritoneum but which is not known to be expressed on any vital organs. While its expression on normal tissues is low, mesothelin is highly expressed in many solid tumors. The cancer types that we intend to treat in our Phase 1/2 clinical trial include non-small cell lung cancer, ovarian cancer, malignant pleural/peritoneal mesothelioma and cholangiocarcinoma. These cancers represent a patient population of up to 81,000 in the United States alone. By comparison, the

addressable U.S. patient population with hematological malignancies for approved CD19-directed CAR-T therapies is estimated to be approximately 8,000.

In our preclinical studies we have observed better anti-tumor activity and persistence of TRuC-T cells compared with CAR-T cells we engineered to target mesothelin while also exhibiting lower levels of cytokine release. The FDA cleared our IND for TC-210 in January 2019. We subsequently received a request from the FDA's Center for Devices and Radiological Health (CDRH) for the submission of an investigational device exemption (IDE) application regarding our use of a commercially available in vitro diagnostic assay for screening mesothelin expression in tumors. The CDRH has since determined we do not need to submit an IDE application and we have initiated our Phase 1/2 clinical trial for TC-210. We expect to generate our first clinical data from our Phase 1/2 trial in the second half of 2019. We have received an FDA Orphan Drug Designation for the treatment of mesothelioma with TC-210 and also plan to apply for FDA Fast Track designation for TC-210.

Mesothelin is overexpressed on the cell surface in multiple cancers, including approximately 76% of malignant pleural mesotheliomas (the most common type of mesothelioma), 58% of ovarian cancers and 31% of NSCLC, among others. The following figure illustrates the proportion of cancer patients with mesothelin expressed on the surface of their tumors and are therefore candidates for TC-210 therapy.



NSCLC Background

NSCLC remains the leading cause of cancer-related mortality worldwide, accounting for approximately 18% of all cancer deaths. There are an estimated 200,000 new cases in the United States annually with an estimated 62,000 (31%) expressing mesothelin on the cell surface.

Patients with metastatic NSCLC have a poor prognosis with a median survival of approximately ten months and a five-year survival rate of approximately 15% to 20%. While recent advances with checkpoint inhibitors have demonstrated promising results, the majority of patients treated with these agents do not derive a long-term benefit. Notably, no standard of care is available for patients failing to respond or relapsing after checkpoint inhibitor therapy, a segment of the NSCLC market which is expected to grow in size as the use of immune checkpoint inhibitors increases in first- and second-line settings.

Ovarian Cancer Background

Epithelial ovarian cancer comprises approximately 90% of all ovarian malignancies. Approximately 22,000 patients in the United States were diagnosed with ovarian cancers in 2018 with an estimated 13,000 cases expressing mesothelin on the cell surface.

Taxane and platinum-based combinations have been the backbone of ovarian cancer treatment for the past 20 years, despite having very low efficacy rates (below 15%) in patients with advanced forms of the disease. The majority of patients progressing after platinum retreatment have no approved treatment options. Relapsed, recurrent ovarian cancer remains incurable with an estimated 14,000 deaths from ovarian cancer in 2018 in the United States alone.

Malignant Pleural/Peritoneal Mesothelioma Background

Malignant mesothelioma is a rare and aggressive malignancy arising from mesothelial cells lining the cavity surrounding the lungs (pleura), abdomen (peritoneum), heart (pericardium) or testes. Patients with either malignant pleural mesothelioma or malignant peritoneal mesothelioma are eligible for enrollment in our Phase 1/2 clinical trial of TC-210.

Malignant pleural mesothelioma is the most common form of mesothelioma, accounting for an estimated 84% of cases. Asbestos exposure causes approximately 80% of malignant pleural mesothelioma cases. There are an estimated 2,200 new cases per year of malignant pleural mesothelioma in the United States of which an estimated 1,700 express mesothelin on the cell surface.

Effective treatment options for patients with malignant pleural mesothelioma are very limited. The standard of care recommended is chemotherapy that includes a platinum salt and an anti-folate. Unfortunately, the ORR is 17% to 40% and the median overall survival of patients with malignant pleural mesothelioma is 12 to 19 months when systemic chemotherapy is used with or without anti-angiogenic agents or targeted therapy. Malignant pleural mesothelioma caused approximately 2,200 deaths in 2018 in the United States alone.

Malignant peritoneal mesothelioma is the second-most common form of mesothelioma, accounting for an estimated 10% of cases. While malignant peritoneal mesothelioma is less commonly studied than malignant pleural mesothelioma, similar systemic chemotherapy regimens of platinum and antifolate combinations are often used. The prognosis for patients with malignant peritoneal mesothelioma is poor as only 35% of patients survive more than two years after diagnosis.

Cholangiocarcinoma Background

Cholangiocarcinoma is a form of cancer that is composed of mutated epithelial cells that originate in the bile ducts. There are an estimated 8,000 new cholangiocarcinoma cases in the United States per year with about 50% expressing mesothelin on the cell surface. Most patients with cholangiocarcinoma have advanced-stage disease at presentation, for which the available standard-of-care chemotherapy (gemcitabine and cisplatin) renders a median overall survival of less than one year. Multiple products, including checkpoint inhibitors and others, are being tested in clinical trials, but cholangiocarcinoma remains an unmet medical need. Cholangiocarcinoma causes over 7,000 deaths per year in the United States alone.

We plan to submit an FDA Orphan Drug Designation application for TC-210’s treatment of cholangiocarcinoma. In addition, we plan to apply for FDA Fast Track, FDA Breakthrough Therapy and additional Orphan Drug Designations, as well as Accelerated Approvals, where applicable.

TC-210 Phase 1/2 Trial in Mesothelin-Positive Tumors

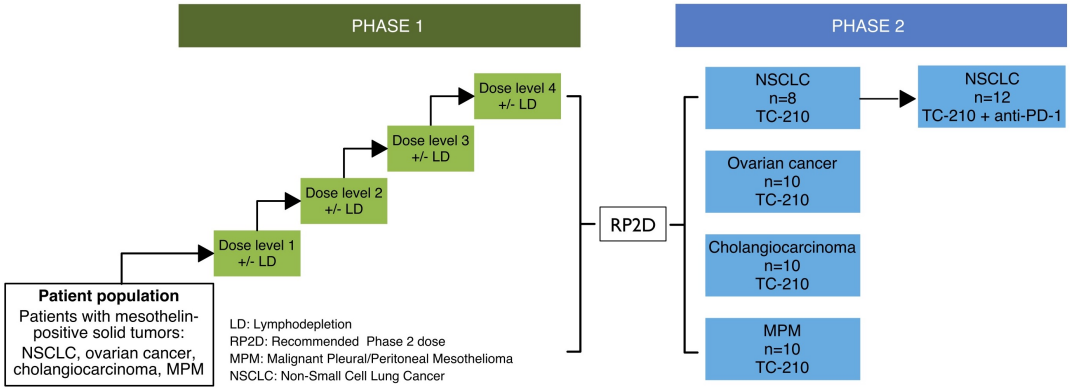
We have initiated a Phase 1/2 clinical trial of TC-210 in patients with mesothelin-positive NSCLC, ovarian cancer, malignant pleural/peritoneal mesothelioma and cholangiocarcinoma. Given the high unmet need and limited treatment options in malignant pleural/peritoneal mesothelioma and cholangiocarcinoma, our goal is to obtain Fast Track designations for TC-210 in those indications from the FDA, which we believe will provide the potential for accelerated licensing based on Phase 2 clinical trial data.

Our Phase 1/2 clinical trial consists of two parts:

- In the Phase 1 portion of the clinical trial, patients will receive TC-210 at four dose levels with or without lymphodepleting chemotherapy to determine the recommended Phase 2 dose (RP2D).

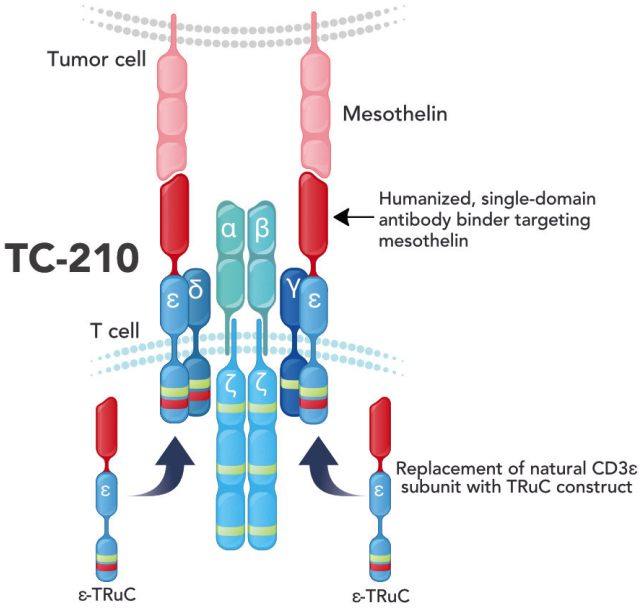
- The objective of the Phase 2 portion of the clinical trial, in addition to further characterizing the safety profile of TC-210, is to evaluate the efficacy of TC-210 in mesothelin-expressing cancers as assessed by ORR according to standard Response Evaluation Criteria In Solid Tumors (RECIST) v1.1 criteria (ORR: complete response + partial response). Secondary endpoints will include time to response, duration of response, progression free survival and overall survival. Approximately 50 patients will receive TC-210 at the RP2D schedule and will be stratified according to their cancer diagnosis in four groups: NSCLC, ovarian cancer, malignant pleural/peritoneal mesothelioma and cholangiocarcinoma. A total of ten patients per indication will be infused with TC-210 T cells, except in the NSCLC cohort where 20 patients will be treated, including eight receiving TC-210 as single agent and 12 receiving TC-210 in combination with the programmed cell death 1 (PD-1) blocking antibody.

The design of our Phase 1/2 clinical trial, as illustrated in the figure below, will allow us to further expand individual cohorts in the Phase 2 portion of the trial to evaluate the efficacy of TC-210 in a larger sample size, which we believe may accelerate regulatory timelines for approval in the United States.



Design of TC-210

The construct used to generate TC-210 is comprised of a humanized single-domain antibody that specifically binds to mesothelin on the cell surface. This binding domain is tethered to the human CD3ε subunit via a flexible linker to form the mesothelin-targeting TRuC construct, as shown below. We use a lentiviral vector to transfer the genetic information for the TRuC construct into a patient's own T cells. Once in the T cell, the TRuC protein is expressed and integrated into the endogenous TCR followed by transport of the reprogrammed TCR to the cell surface. There, it redirects the TRuC-T cells to recognize mesothelin-positive tumor cells and activate them to eliminate mesothelin-positive tumors. We believe that TC-210's unique way of engaging and powering T cells as well as its humanized binding domain could lead to improved clinical outcomes for patients. The following figure illustrates the design of TC-210.



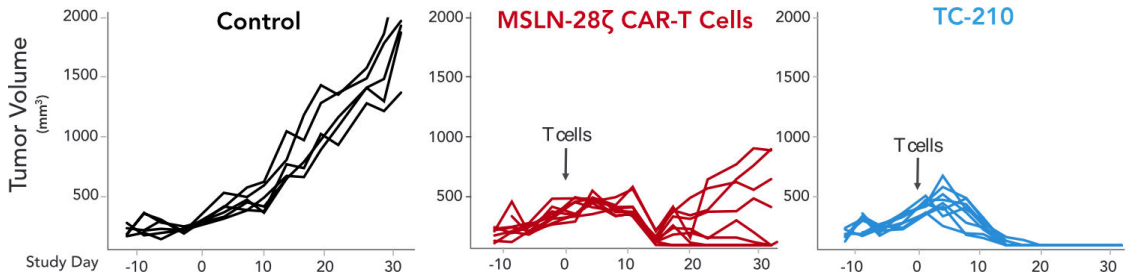
Preclinical Studies of TC-210

TC-210 has shown robust anti-tumor activity in cellular assays and animal models of malignant pleural/peritoneal mesothelioma, lung and ovarian cancers. We have completed a number of preclinical studies that have generated data on the mechanism-of-action, pharmacodynamic and pharmacology/toxicology data of TC-210. In those studies, TC-210 was compared head-to-head against mesothelin-targeting CAR-T cells (MSLN CAR-T cells) that we engineered with the same mesothelin binder expressed by TC-210. Our preclinical studies have highlighted the following attributes of TC-210 that we believe to be important for solid tumor clearance:

- Migration to and accumulation in the tumor site that was significantly faster and greater for TC-210 than that observed for the MSLN CAR-T cells;
- Mesothelin-dependent T cell activation, expansion and tumor clearance by TC-210 was faster than that observed for the MSLN CAR-T cells;
- Long-term functional persistence of TC-210 which is critical for preventing relapse; and
- Systemic cytokine levels produced by TC-210 were lower compared to the MSLN CAR-T cells, which could potentially translate into lower rates of adverse events.

TC-210 Showed Robust Mesothelioma Tumor Clearance

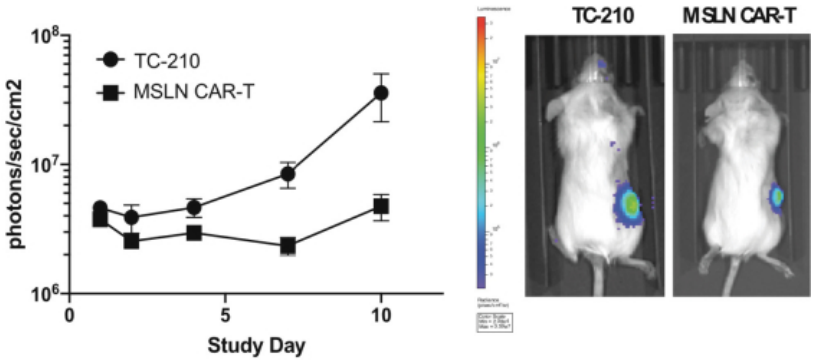
To compare the anti-tumor activity of TC-210 and MSLN CAR-T cells, we used a mouse xenograft model of mesothelioma. In the experiment shown below, we tested TC-210 against MSLN CAR-T cells that we engineered to incorporate the CD28 costimulatory domain – described below as MSLN-28ζ CAR-T. Mesothelioma cells overexpressing mesothelin were injected into mice. When tumors reached approximately 200 to 300 mm^3, the mice were infused with a total of $1.0x10^7$ T cells containing either $2.0x10^6$ TC-210 or $1.0x10^6$ MSLN-28ζ CAR-T cells. A separate group of nine animals was treated with a control. Treatment of tumor-bearing animals with TC-210 showed rapid tumor control and clearance of tumors by day 25 after start of treatment in all of the nine animals tested. In contrast, while the MSLN-28ζ CAR-T cell treated animals showed initial tumor regression, tumor relapse was only observed in four out of the nine animals tested with MSLN CAR-T cells. These observations conform to prior published studies showing poor long-term activity of MSLN-28ζ CAR-T cells in similar models.



TC-210 showed faster trafficking to and accumulation in mesothelioma tumors

One of the major challenges for CAR-T cell therapies in solid tumors has been the ability of CAR-T cells to migrate into the tumor tissue in significant numbers. In our preclinical studies, we observed that TC-210 expressed higher levels of the chemokine receptors CXCR3 and CCR10 than MSLN CAR-T cells we engineered. We believe this is one of the major factors causing the faster migration to and greater accumulation of TC-210 in tumors as compared to the MSLN CAR-T cells we engineered.

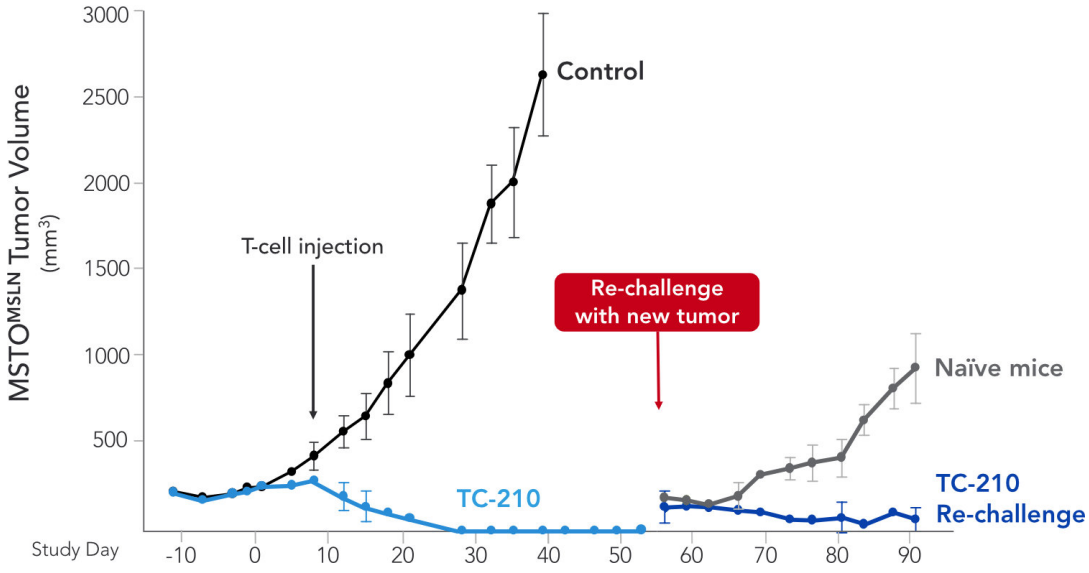
We investigated the ability of TC-210 to traffic to and accumulate in mesothelioma tumors. After mesothelin-overexpressing xenograft tumors reached a mean volume of approximately 200 mm3, the mice were randomized into two groups of five mice. The mice were then intravenously infused with either TC-210 or the MSLN CAR-T cells, which we engineered to co-express a tracing agent to analyze the migration pattern of TC-210 and the MSLN CAR-T cells using living images. As illustrated in the figure below, imaging studies showed that TC-210 migrated into the tumor faster and accumulated in greater number than observed for the MSLN CAR-T cells. The faster trafficking and accumulation of TC-210 correlated with faster tumor clearance compared to the MSLN CAR-T cells. Therefore, we believe that these properties of TC-210 could translate into improved clinical outcomes in patients.



TC-210 demonstrated persistent anti-tumor activity in a mesothelioma rechallenge model

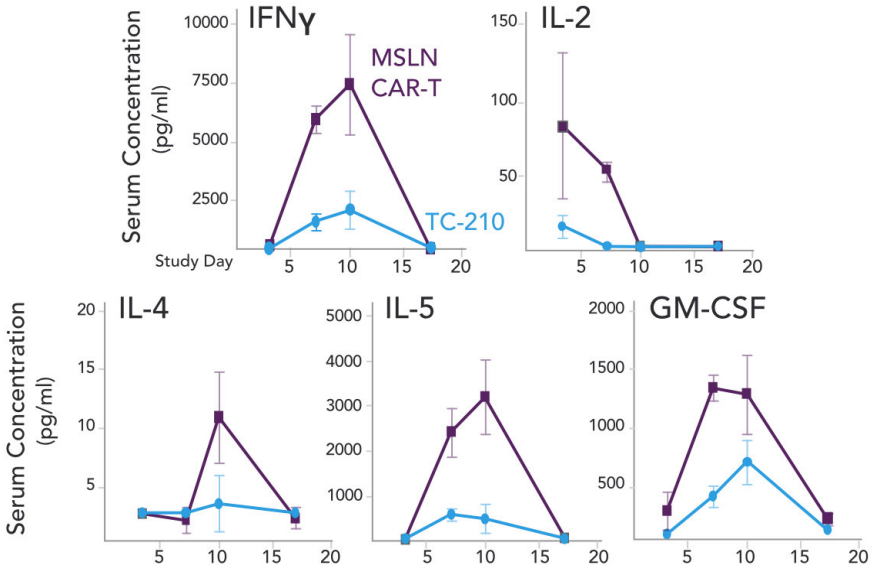
To evaluate the ability of TC-210 to persist and maintain its anti-tumor activity, we conducted a mesothelioma xenograft mouse study. The experiment consisted of two phases. In the first phase, mice with established mesothelioma tumors were treated with TC-210 or unmodified T cells. As shown before, tumors were cleared in all mice and no relapse was observed until 56 days after treatment with a single dose of TC-210. In the second phase, TC-210-treated mice were injected at a new site with mesothelioma cells to simulate tumor recurrence. As shown in the graph below, TC-210 controlled the outgrowth of new tumors until the end of the study after 90 days. By contrast, in untreated mice, the rechallenge with mesothelioma cells caused a rapid outgrowth of tumors.

In this study, TC-210 showed both long-term elimination of the primary mesothelin-expressing tumor cells and lasting functional persistence. This persistence is associated with the ability to migrate to new tumor sites and recognize and kill tumor cells expressing mesothelin.



TC-210 produced less cytokines than MSLN CAR-T cells

Cytokine release syndrome (CRS) is a life-threatening toxicity frequently associated with approved CD19-targeting CAR-T cell therapies. We compared the systemic release of cytokines in a mesothelin-positive lung cancer xenograft mouse model where one cohort was treated with TC-210 and another cohort with our engineered MSLN CAR-T cells. The serum levels of cytokines IFNγ, IL-2, IL-4, IL-5 and GM-CSF were measured at several time points after treatment. As shown in the figure below, TC-210 treated animals consistently produced lower circulating cytokine levels than the MSLN CAR-T cell treated animals over the time course examined. We believe this was due to natural feedback loops integrated into the entire TCR complex that could regulate overproduction of cytokines. We have observed similar results in a mesothelioma xenograft model. Based on our preclinical studies, we also believe that lower cytokine production by TC-210 and other TRuC-T cells could translate into lower rates of CRS and improved treatment tolerability.



TC-110: Our Lead Mono TRuC-T Cells Targeting CD19-Positive B-Cell Hematological Malignancies

We are also developing TC-110, a TRuC-T cell targeting CD19-positive B-cell hematological malignancies. The clinical development plan for TC-110 will initially focus on treating patients with adult ALL, DLBCL, FL, and other NHL subtypes. These are indications for which CAR-T cells have either been approved but faced clinical outcome limitations (specifically, DLBCL), proven to be too toxic for use (specifically, adult ALL), or have not been approved at all (specifically, FL). In our preclinical studies, we have observed better anti-tumor activity and persistence of TRuC-T cells compared to CAR-T cells we engineered to target CD19 while also exhibiting lower levels of cytokine release. We recently held a pre-IND meeting with the FDA for TC-110 and we expect to file an IND in the second half of 2019 and seek FDA Fast Track designation.

Adult ALL Background

Non-Hodgkin lymphomas (NHL) comprise a heterogeneous group of malignancies. DLBCL is the most common subtype of NHL, constituting up to 40% of cases globally. In 2018, there were an estimated 75,000 new cases of NHL and 20,000 related deaths in the United States. Approximately two-thirds of

patients with DLBCL are cured of their disease with frontline chemoimmunotherapy (R-CHOP). However, refractory patients have a median overall survival of only 6.3 months.

CD19-directed CAR-T cell therapy has shown activity in heavily pre-treated patients with CD19-positive DLBCL and two CAR-T cell therapies, Kymriah and Yescarta, have been approved for that indication. However, the response rate six months post-infusion ranges from 37% to 41% and both therapies are associated with high rates of severe CRS (13% to 23%) and neurotoxicity (12% to 28%). Our preclinical data show better anti-tumor activity and lower cytokine release with TC-110 compared to CD28-based or 4-1BB-based CAR-T cells we engineered against CD19-expressing tumors.

DLBCL Background

Non-Hodgkin lymphomas (NHL) comprise a heterogeneous group of malignancies. DLBCL is the most common subtype of NHL, constituting up to 40% of cases globally. In 2018, there were an estimated 75,000 new cases of NHL and 20,000 related deaths in the United States. Approximately two-thirds of patients with DLBCL are cured of their disease with frontline chemoimmunotherapy (R-CHOP). However, refractory patients have a median overall survival of only 6.3 months.

CD19-directed CAR-T cell therapy has shown activity in heavily pre-treated patients with CD19-positive DLBCL and two CAR-T cell therapies, Kymriah and Yescarta, have been approved for that indication. However, the response rate six months post-infusion ranges from 37% to 41% and both therapies are associated with high rates of severe CRS (13% to 23%) and neurotoxicity (12% to 28%). Our preclinical data show better anti-tumor activity and lower cytokine release with TC-110 compared to CD28-based or 4-1BB-based CAR-T cells we engineered against CD19-expressing tumors.

Follicular Lymphoma Background

Follicular Lymphoma (FL) is the most common indolent NHL in the Western hemisphere accounting for 20% of patients with newly diagnosed NHL. Approximately 15,000 patients were diagnosed in the United States with FL in 2018. The clinical course of patients with FL is generally indolent, with many patients remaining asymptomatic for months or even years after diagnosis. However, 20% of patients with FL relapse within two years of R-CHOP therapy and have a median five-year survival rate of only 50% compared to 90% for the remaining 80% of patients with a longer response duration. The experience with CAR-T cell therapy in FL is much more limited than in ALL or DLBCL but preliminary data indicate that CD19-directed adoptive T cell approaches are promising in high-risk FL.

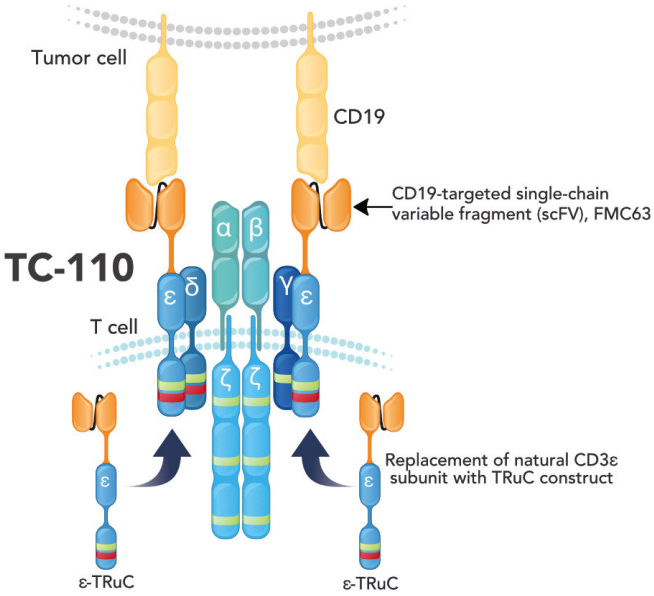
Background on Other NHL Subtypes

In addition to DLBCL and FL, we also plan to study TC-110 in patients with other, less common NHL subtypes, including mantle cell lymphoma (MCL) and primary mediastinal B-cell lymphoma (PMBCL). Patients with relapsed/refractory disease in these other NHL subtypes also have a substantial unmet medical need. MCL is an aggressive form of NHL with a median survival of approximately 5 years. PMBCL tends to respond well to initial therapy, but relapsed/refractory patients have a poor prognosis with a reported 25% 2-year survival.

We plan to apply for FDA Fast Track designation, FDA Breakthrough Therapy and Orphan Drug designations for TC-110, where applicable, as well as Accelerated Approval.

Design of TC-110

The construct used to generate TC-110 is comprised of the single chain variable fragment, FMC63, that specifically binds to CD19 on the cell surface that is fused with a flexible linker to the human CD3ε subunit. We use a lentiviral vector to introduce the genetic information of TC-110 into a patient's own T cells. In the cell, the fusion construct is integrated into the natural TCR and transported to the cell surface. The reprogramming of the TCR specificity enables TC-110 to attack and destroy hematological malignancies that are CD19-positive. The following figure illustrates the design of TC-110:



Summary of our Preclinical Data on TC-110

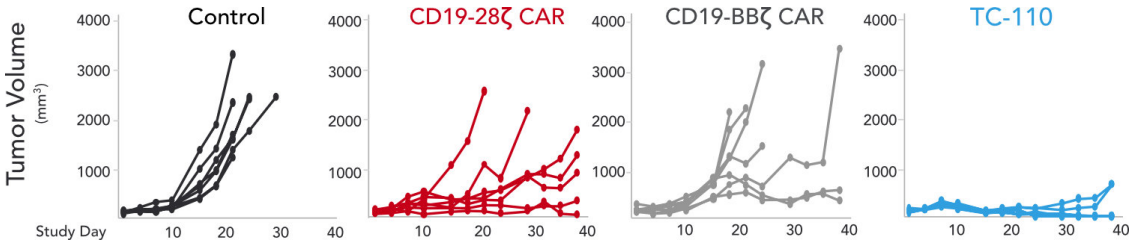
TC-110 showed robust activity in preclinical models where we compared the T cell signaling, cytokine production and anti-tumor activity of TC-110 with CD19-targeting CAR-T cells, which we engineered with the same CD19 binder as TC-110. These CAR-T cells had a similar design as currently used in approved CD19 CAR-T cell therapies but are not identical. Our preclinical data support our hypothesis that TC-110 could result in potent anti-tumor activity with lower cytokine levels than existing T cell therapies. In our preclinical studies of TC-110, we observed the following results:

- Rapid regression and clearance of tumors in a CD19-positive leukemia model;
- Elimination of tumors in a subcutaneous CD19 lymphoma model; and
- Lower cytokine release compared to CD19-targeting CAR-T cells that we engineered.

TC-110 cleared subcutaneous lymphoma in a mouse model more efficiently than CAR-T cells

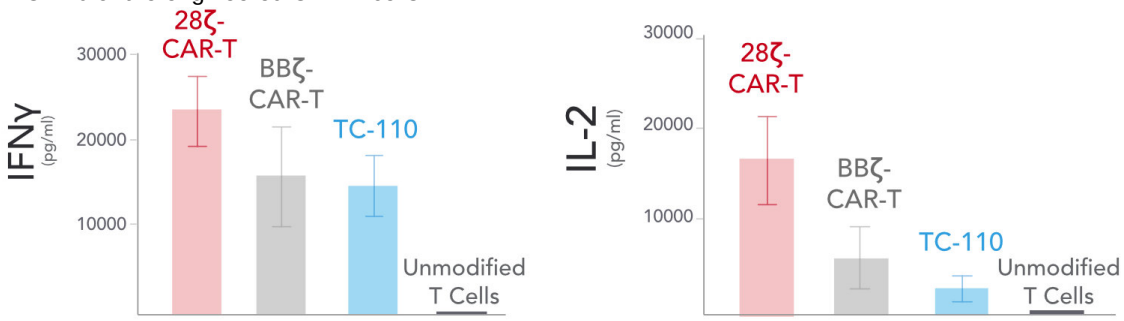
We compared the anti-tumor activity of TC-110 with that of two CD19 CAR-T cells that we engineered to replicate approved CAR-T cell therapies in a subcutaneous lymphoma xenograft model (Raji cell line). Six days after lymphoma cell injection under the skin, mice were treated with similar numbers of either unmodified T cells, TC-110, CD19 CAR-T cells we engineered with a 4-1BB costimulatory domain or CD19 CAR-T cells we engineered with a CD28 costimulatory domain, in each case bearing an identical CD19-binding domain (FMC63). As shown below, treatment with TC-110 resulted in tumor clearance in the majority of mice at the end of the study. In contrast, the CD19 CAR-T cells we engineered were not

capable of eradicating the lymphoma cells and despite an initial response, a significant number of animals relapsed. We believe these data support that TC-110 may have a higher and more sustained activity in treating lymphoma than the two CAR-T cell variants. The following figure shows a comparison of the tumor control of TC-110 and the two CAR-T cell variants in the Raji NSG model.



TC-110 releases less cytokines than CAR-T cells

We investigated the effect of TC-110 on cytokine release compared to CAR-T cells we engineered in a cell culture model. CRS is a major safety concern for CAR-T cell therapies. In the model, cytokine levels produced by TC-110 were significantly lower than those released by the CAR-T cells we engineered. These results, as illustrated below, are consistent with the lower levels of cytokine release observed in solid tumor models treated with TC-210 or the engineered CAR-T cells.



Additional TRuC-T Cell Product Candidates

TC-220: We are conducting IND-enabling studies for our mono TRuC-T cell product candidate, TC-220, targeting MUC16-positive solid tumors. While its expression in normal tissues is low, MUC16 is highly expressed in many solid tumors, including ovarian, pancreatic, gastric and colorectal cancers. We plan to initially develop TC-220 for the treatment of MUC16 overexpressing ovarian cancer, which represents a patient population of up to 17,000 in the United States alone. TC-220 has shown strong anti-tumor activity in preclinical models of MUC16-positive ovarian cancers. We plan to file an IND for TC-220 in the first half of 2020 and we expect to generate our first clinical data in the first half of 2021.

MUC16 is a highly glycosylated transmembrane protein with a very large extracellular region. It serves as a physical mucous barrier protecting the epithelium from invasion by pathogens. In cancer, MUC16 expression increases the risk of metastases and contributes to tumor immunosuppression. When overexpressed in tumors, the large extracellular domain of the MUC16 protein, known as CA-125, is shed. CA-125 is used as a biomarker of tumor progression in patients with ovarian, pancreatic and other cancers. Previous therapeutic approaches targeting MUC16 have not proven to be effective because they bind to soluble CA-125, whereas TC-220 is activated only upon binding to MUC16 expressed on the surface of tumor cells.

Dual TRuC Programs:

In cancer therapy, loss of antigen expression is one tumor escape mechanism that can lead to relapse. Once the antigen recognized by a T cell therapy is lost from the tumor cell surface, such cancer cells become invisible to T cells and can regrow a resistant tumor. For example, patients with glioblastoma multiforme (GBM) treated with CAR-T cells have been reported to relapse with target-negative tumor cells. Dual targeting is a means to potentially increase the response rates by binding to two target antigens. We believe that combined antigen targeting will enhance the potential of TRuC-T cells to more broadly recognize cancer cells, which may result in fewer cases of relapse due to target loss.

TC-310: We are developing TC-310, dual TRuC-T cells targeting both CD19 and CD22. Antigen escape is a leading mechanism of relapse in patients treated with CD19-targeting CAR-T cells. For example, 40% of patients treated with Kymriah relapse within twelve months post-infusion, and 65% of those relapsing cases are CD19-negative. This phenomenon has also been recently identified as a mechanism whereby DLBCL can relapse post CD19-directed CAR-T cell therapy. We believe simultaneously targeting two tumor antigens on leukemia or lymphoma cells will potentially improve response rates and reduce the risk of recurrence due to antigen escape, thus leading to more durable responses. These findings underscore the continued high medical need for patients with ALL and DLBCL and the possibility of improving clinical outcomes through the targeting of more than one antigen.

We believe that CD22 is an ideal partner for CD19 because it is present on most cases of ALL and DLBCL and both CD19 and CD22 expression on normal cells is restricted to the B-cell lineage. In a third-party Phase 1 clinical trial of a CD22-directed CAR-T cell therapy, 73% of patients showed initial objective response rates. But similar to CD19-targeting CAR-T cell therapies, patients relapsed due to loss of CD22 expression on tumor cells, which rendered the therapy ineffective. We intend to advance TC-310, which is currently at the preclinical development stage, into IND-enabling studies in 2019.

TC-410: We are developing TC-410, a dual TRuC-T cell designed to increase response rates and reduce the potential for antigen escape in solid tumors by targeting both mesothelin and MUC16. We are conducting preclinical studies to further characterize the expression profile of mesothelin and MUC16 in various cancers. We plan to advance TC-410 into IND-enabling studies in 2019.

Broadening our Core TRuC-T Cell Platform with a Series of Next-Generation Enhancements

We have developed a novel, transformative platform to address the limitations of existing T cell therapies. Our TRuC-T cell platform is designed to deliver the first HLA-independent TCR-T cell therapies to a broader population of patients with solid tumors and hematological malignancies. Our approach is to fuse a cancer antigen recognition domain directly to a subunit of the TCR, which becomes fully integrated into the natural complex. This has the effect of activating the entire TCR to produce a more powerful, yet controlled T cell response to cancer.

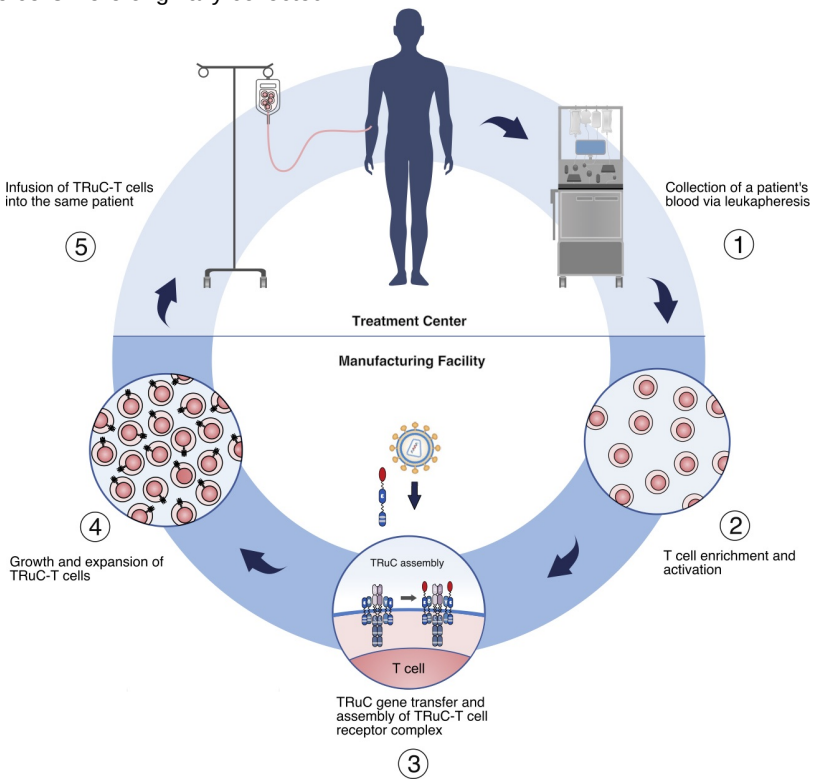
We are focused on continued innovation to broaden our platform through internal research and collaboration with leading academic laboratories and industry partners in the field of T-cell immunology, cell therapy, gene editing, and process development. These innovations fall into three broad categories:

- First, we are developing enhancements that target two antigens, or dual TRuC-T cells, to deal with potential antigen escape, a leading mechanism of cancer relapse in patients receiving CAR-T cell therapy.
- Second, we are developing several enhancements to control on-target, off-tumor activity and counter the immunosuppressive microenvironment of solid tumors. These include mechanisms to block a key cancer defense known as the PD-1/PD-L1 pathway.
- Third, we are evaluating multiple proprietary designs for off-the-shelf TRuC-T cells, aiming to give patients faster access to and reduce the costs of TRuC-T cell therapies.

Manufacture and Delivery of TRuC-T Cells to Patients

TRuC-T Cell Production and Delivery

The process of manufacturing cell and gene therapies, such as TRuC-T cells, is highly complex. As shown in the figure below, the generation of our TRuC-T cells starts with the collection of white blood cells from patients, known as leukapheresis, at the treatment center. The blood cells are shipped to a central manufacturing facility where they are further processed. Following the enrichment of the sample T cells, they are activated, which causes them to divide. In the next step, a viral vector is used to shuttle the genetic information encoding the TRuC construct into the T cells. During the assembly process of the TCR, the TRuC construct is integrated into the natural TCR complex and transported to the cell surface. The now reprogrammed TRuC-T cells are further stimulated to replicate and produce enough quantities to administer a therapeutic dose to the patient from whom the cells were originally collected.



We use a next-generation cell processing platform that performs cell sample loading, cell washing, density-based cell separation, magnetic separation, cell culture and final product formulation. This is a semi-automated and functionally closed system that we believe will enable us to scale our TRuC-T cell manufacturing and overcome the constraints associated with current processes.

TRuC-T Cell Manufacturing Strategy

We are devoting extensive resources to process development and manufacturing to optimize the reliability of our product candidates and reduce manufacturing costs and vein-to-vein time. This investment will ensure that our manufacturing and delivery process will have utility across all the product candidates in our pipeline.

The generation of a genetically-modified autologous T cell therapy such as TRuC-T cells involves several integrated and complex steps, including the collection of T cells through apheresis, cryopreservation, manufacture of the transfer vector under cGMP conditions, *ex vivo* selection, activation, transduction, and expansion of the TRuC-T cells, ultimately leading to infusion of TRuC-T cells into patients. The technical, logistical, and regulatory challenges associated with the virus and cell manufacturing processes are significant. We plan to simplify the manufacturing process through the implementation of automated technologies and the development of scalable processes aimed at reducing the cost of goods.

We have already taken two critical steps geared towards simplifying our manufacturing process. First, our TRuC-T cells are manufactured via a semi-automated and functionally closed system (CliniMACS Prodigy), which provides a common platform that will be employed in the development of all of the product candidates in our pipeline. This manufacturing process is economical, reliable, and scalable, and can support rapid development of the product candidates throughout the clinical life cycle and regulatory approvals. This system has a small footprint, which enables us to manufacture multiple products in parallel units within the same minimally controlled space, thereby reducing operating costs. Second, both the input leukapheresis material that enters the manufacturing process as well as the final TRuC-T cells are cryopreserved products, which simplifies the logistics for delivery to the patient and reduces the risk of product delivery failure. The entire vein-to-vein manufacturing process has safe-guards in place designed to ensure product identity and integrity throughout the production life-cycle.

We have entered into manufacturing agreements for the supply of GMP-S plasmids for generation of the viral vectors, which are manufactured by third parties. The viral vectors are manufactured through established agreements with various CDMOs. We outsource our T cell manufacturing process and we may enter into additional agreements to increase capacity for future clinical trials and commercialization if licensed. Because our starting materials are frozen, we expect to be able to base future agreements on rolling forecasts of regularly scheduled manufacturing runs, which we expect will minimize any cost overruns due to loss of reservation fees. Depending on the results of our clinical trials, we may choose to develop our own manufacturing capabilities.

As part of our manufacturing strategy, we plan to expand our capacity as we begin clinical trials and are planning for potential further expansion in anticipation of an approval for any of our TRuC-T cell product candidates. Under our existing agreements with CDMOs, we estimate that we have potential access to capacity to produce up to approximately 100 annual treatments per year, which we believe will be sufficient to conduct our initial planned clinical trials. We are in the process of adding manufacturing capacity to support larger clinical trials for our product candidates. To that end, in December 2018, we contracted with Cell Therapy Catapult Limited, United Kingdom to occupy a suite with our own personnel in their GMP manufacturing center in Stevenage, United Kingdom. We expect the suite to be operational in the second half of 2019, which we estimate would expand our manufacturing capacity to a total of approximately 400 treatments per year and facilitate conducting clinical trials in Europe. If our clinical trials are successful, we plan to acquire and develop our own manufacturing infrastructure to generate the additional capacity needed to support expanded clinical trials and commercial scale production. We believe our manufacturing platform can be scaled with minimal infrastructure while meeting GMP requirements, which will facilitate the design and building of a standard centralized manufacturing facility. Further into the future, however, we expect this system to be amenable to manufacturing in a controlled non-classified environment closer to or at the point of care, such as at a regional hub or hospital, resulting in a decentralized manufacturing model. We anticipate that this decentralized model would require minimal infrastructure, be led by operators that would require minimal technical training, shorten vein-to-vein time, and decrease costs.

Intellectual Property

Intellectual property is a fundamental component of our business and of vital importance in our field. We actively seek to protect the intellectual property and proprietary technology that we believe is important to

our business, including seeking, maintaining, enforcing and defending patent rights for our product candidates and processes, whether developed internally or licensed from third parties. We may additionally rely on regulatory protection afforded through orphan drug designations, data exclusivity, market exclusivity, and patent term extensions where available.

The TRuC-T cell platform was initially conceived and developed by our scientific founder, Dr. Patrick Baeuerle. The priority patent application disclosing the TRuC-T cell platform was filed in May 2015. Our further work encompassing a broad range of TRuC concepts has been described in subsequent patent applications.

Additional patent applications filed by us since 2015 include at least the following additional technological innovations and product-related claims:

- TRuC-T cells targeting an array of tumor antigens;
- TRuC-T cells targeting multiple types of antigens on the same tumor;
- engineered TRuC-T cells with enhanced activity and/or modulated activity;
- second generation off-the-shelf TRuC-T cells; and
- methods of using TRuC-T cells to treat human diseases, including solid tumors.

Our strategy is to pursue a variety of broad claims in the United States and foreign jurisdictions to provide multiple layers of patent protection, including:

- pursuing broad claims in the United States for the TRuC concept;
- pursuing claims to specific compositions of matter in connection with particular TRuC constructs (including specific protein and nucleic acid sequences); and
- methods of using the TRuC-T cell platform as monotherapy or in combination with other anti-cancer or immune system enhancing therapeutics.

Many of the patent applications that we own or in-license, including our trademark filings, are still in the early stages of prosecution and no claims have yet issued, with the exception of one issued U.S. patent. Examination of most of the patent applications that we own has not yet commenced, because they are either provisional applications or Patent Cooperation Treaty (PCT) applications that are not examined. We will need to decide whether and where to pursue protection for the inventions disclosed in these provisional and PCT applications before applicable statutory deadlines, our applications will only be examined in jurisdictions where we elect to pursue protection, and we will only have the opportunity to attempt to obtain patents in such jurisdictions where we elect to pursue protection. We are seeking protection across a range of commercially important territories, including (but not limited to) countries in North America, Europe, and Asia. As of March 15, 2019, our patent portfolio includes one issued U.S. patent, at least 16 pending U.S. provisional or nonprovisional patent applications, at least four pending Patent Cooperation Treaty (PCT) international applications, and at least 31 pending foreign patent applications, which patent applications we own or in-license. The claims of these patent applications are directed toward various aspects of our product candidates and research programs including compositions of matter, methods of use, and processes. These owned and in-licensed patent applications, if issued, are expected to expire on various dates from 2036 through 2039, in each case without taking into account any possible patent term adjustments or extensions.

Within our patent portfolio, as of March 15, 2019, we owned one issued U.S. patent, at least six pending U.S. provisional or U.S. nonprovisional patent applications at least two pending PCT international applications, and at least 21 pending foreign patent applications, and had a nonexclusive license from Harpoon Therapeutics, Inc. (Harpoon) to at least one pending U.S. provisional or U.S. nonprovisional patent application, and at least one pending PCT international application, and had an exclusive license to at least four pending foreign patent applications that include claims directed to TC-210, such as compositions of matter, manufacturing precursors or uses thereof. These owned and in-licensed patent applications, if issued, are expected to expire on various dates from 2036 through 2039, in each case

without taking into account any possible patent term adjustment or extensions.

Within our patent portfolio, as of March 15, 2019, we owned at least six pending U.S. provisional or U.S. nonprovisional patent applications, at least two pending PCT international application, and at least 14 pending foreign patent applications, and had an exclusive license to at least four pending foreign patent applications that include claims directed to TC-220, such as compositions of matter, manufacturing precursors or uses thereof. These owned and in-licensed patent applications, if issued, are expected to expire on various dates from 2036 through 2039, in each case without taking into account any possible patent term adjustment or extensions.

Within our patent portfolio, as of March 15, 2019, we owned at least five pending U.S. provisional or U.S. nonprovisional patent applications, at least two pending PCT international application, and at least 15 pending foreign patent applications, and had an exclusive license to at least four pending foreign patent applications that include claims directed to TC-110, such as compositions of matter, manufacturing precursors or uses thereof. These owned and in-licensed patent applications, if issued, are expected to expire on various dates from 2036 through 2039, in each case without taking into account any possible patent term adjustment or extensions.

Within our patent portfolio, as of March 15, 2019, we owned one issued U.S. patent, at least nine pending U.S. provisional or U.S. nonprovisional patent applications, at least three pending PCT international applications, and at least 21 pending foreign patent applications; and had a non-exclusive license to at least one pending U.S. provisional or U.S. nonprovisional patent application, and at least one pending PCT international application and had an exclusive license to at least four pending foreign patent applications, that include claims directed to TC-410, such as compositions of matter, manufacturing precursors or uses thereof. These owned and in-licensed patent applications, if issued, are expected to expire on various dates from 2036 through 2039, in each case without taking into account any possible patent term adjustment or extensions.

Within our patent portfolio, as of March 15, 2019, we owned at least five pending U.S. provisional or U.S. nonprovisional patent applications, at least three pending PCT international applications, and at least 15 pending foreign patent applications and had an exclusive license to at least four pending foreign patent applications that include claims directed to TC-310, such as compositions of matter, manufacturing precursors or uses thereof. These owned and in-licensed patent applications, if issued, are expected to expire on various dates from 2036 through 2039, in each case without taking into account any possible patent term adjustment or extensions.

The term of individual patents depends upon the legal term of the patents in the countries in which they are obtained. In most countries in which we file, the patent term is 20 years from the date of filing of the first non-provisional application to which priority is claimed. In the United States, a patent's term may be lengthened by patent term adjustment, which compensates a patentee for administrative delays by the U.S. Patent and Trademark Office (PTO) in granting a patent or may be shortened if a patent is terminally disclaimed over an earlier-filed patent. The term of a patent that covers an FDA-approved drug may also be eligible for a patent term restoration of up to five years under the Hatch-Waxman Act, which is designed to compensate for the patent term lost during the FDA regulatory review process. The length of the patent term restoration is calculated based on the length of time the drug is under regulatory review. A patent term restoration under the Hatch-Waxman Act 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 may be restored. Moreover, a patent can only be restored once, and thus, if a single patent is applicable to multiple products, it can only be extended based on one product. Similar provisions are available in Europe and certain other foreign jurisdictions to extend the term of a patent that covers an approved drug. If and when possible, we expect to apply for patent term extensions for patents covering our product candidates or their methods of use.

Our commercial success may depend in part on our ability to obtain and maintain patent and other proprietary protection for commercially important technology, inventions and know-how related to our business; defend and enforce our patents; preserve the confidentiality of our trade secrets; and operate without infringing the valid enforceable patents and proprietary rights of third parties. Our ability to stop third parties from making, using, selling, offering to sell or importing our products may depend on the extent to which we have rights under valid and enforceable patents or trade secrets that cover these activities. With respect to both in-licensed and company-owned intellectual property, we cannot be sure that patents will be granted with respect to any of our pending patent applications or with respect to any patent applications filed by us in the future, nor can we be sure that any of our existing patents or any patents that may be granted to us in the future will be commercially useful in protecting our commercial products and methods of manufacturing the same. Development and commercialization of products can be subject to substantial delays and it is possible that, at the time of commercialization, any patent covering the product has expired or will be in force for only a short period of time following commercialization. Numerous third-party U.S. and non-U.S. issued patents exist in the area of programmed T cell therapies, including patents held by our competitors. We cannot predict with any certainty if any third-party U.S. or foreign patent rights, or other proprietary rights, will be deemed infringed by the use of our technology, nor can we predict with certainty which, if any, of these rights will or may be asserted against us by third parties. Should we need to defend ourselves against any such claims, substantial costs may be incurred, regardless of whether such defense is successful. Furthermore, parties making such claims may be able to obtain injunctive or other equitable relief, which could effectively block our ability to develop or commercialize some or all our product candidates in the United States, the EU and other major markets.

We may rely, in some circumstances, on trade secrets to protect our technology. However, trade secrets can be difficult to protect. We seek to protect our proprietary technology and processes, in part, by entering into confidentiality agreements with our employees, consultants, 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 confidence in these individuals, organizations and systems, agreements or security measures may be breached, and we may not have adequate remedies for any breach. In addition, our trade secrets may otherwise become known or be independently discovered by competitors. To the extent that our consultants, contractors or collaborators use intellectual property owned by others in their work for us, disputes may arise as to the rights in related or resulting know-how and inventions.

Our trademark portfolio currently contains registration applications for TCR2, TRuC, and our logo in the United States.

Collaborations and Licenses

Harpoon License

In June 2017, we entered into a license with Harpoon (the Harpoon License) that grants us a perpetual, irrevocable, world-wide, non-exclusive, royalty free, sublicensable license to research, develop, make, use, sell, commercialize or otherwise exploit products based on Harpoon's MSLN polypeptide binding proteins (the MSLN Binder). We have incorporated the MSLN Binder into TC-210.

As consideration for the Harpoon License, we granted Harpoon a perpetual, irrevocable, world-wide, non-exclusive, royalty free, sublicensable license to research, develop, make, use, sell, commercialize or otherwise exploit products based on certain binding proteins which we had developed (the Out-Licensed Binder). We do not incorporate the Out-Licensed Binder into any of our product candidates.

Under the Harpoon License, we retain ownership of the Out-Licensed Binder and own any of our improvements to the MSLN Binder and any of our product candidates incorporating the MSLN

Binder. Similarly, Harpoon retains ownership of the MSLN Binder and owns any of its improvements to the Out-Licensed Binder and any of its products incorporating the Out-Licensed Binder. Each party is responsible for the prosecution and maintenance of the patent rights owned by such party.
The Harpoon License is effective through the expiration of all patents underlying the MSLN Binder and Out-Licensed Binder and it may be terminated by either party upon a material breach that remains uncured for 60 days after receiving notice thereof, or in the event of the other party's bankruptcy.

Cell Therapy Catapult Limited Collaboration Agreement

On December 18, 2018, we entered into a Collaboration Agreement with Cell Therapy Catapult Limited (Catapult) to establish our GMP manufacturing and supply chain at their GMP manufacturing center in Stevenage, United Kingdom. The agreement also provides us with an option to expand our collaboration area with a second GMP cleanroom suite in Catapult's second phase of development. The agreement is for a term of three years with earlier termination available to us on provision of twelve months' notice. Termination is also possible in the event of material breach of the Agreement that remains uncured for 90 days and insolvency of a party.

The Catapult manufacturing center is a GMP facility. The agreement will enable us to have our own dedicated manufacturing space in the Catapult manufacturing center. Catapult's contribution to collaboration is their GMP support, expertise, and inbound and outbound logistics and supply chain, being developed at the center. We expect the GMP manufacturing to be operational in the second half of 2019. We will use our own manufacturing process and we will be responsible for the operation of the manufacturing process in the suite.

Competition

We believe our novel TRuC-T cell platform, its design flexibility, superior performance over CAR-T cell and TCR-T cell therapies, emerging enhancements, and our knowledge of cellular immunotherapy should enable us to successfully develop novel and highly effective treatments for cancer. However, we may face intense and increasing competition from larger biotechnology and pharmaceutical companies with greater financial resources, who are also developing immuno-oncology therapies (including cellular therapies) and more traditional treatments for cancer. In addition, academic institutions, governmental agencies, public and private research institutions, and early stage or smaller companies could also prove competitive.

The market opportunity in oncology has led to a number of collaborations (GlaxoSmithKline plc (GlaxoSmithKline)/Adaptimmune Therapeutics PLC (Adaptimmune), Janssen Biotech, Inc. (Janssen)/ Nanjing Legend Pharmaceutical & Chemical Co., Ltd (Legend), bluebird bio, Inc. (bluebird)/ Regeneron Pharmaceuticals Inc. (Regeneron) and bluebird/Gritstone Oncology, Inc.) and major acquisitions (Gilead Sciences, Inc. (Gilead)/Kite Pharma Inc. (Kite), Celgene Corporation (Celgene)/Juno Therapeutics, Inc. (Juno)) among companies focused on cellular cancer therapies. If this trend continues, which we expect, we could see further consolidation of technical expertise and human capital. This potentially provides a partnership opportunity for us but could also make it more challenging for us to acquire complementary technology or products and recruit and retain qualified scientific and management personnel. In addition, this competition could impact our ability to recruit clinical trial sites and patients in a timely manner for our clinical trials. Larger companies with greater financial flexibility and global reach may be able to obtain regulatory approvals and gain widespread market acceptance before us, which could impact our commercial launch and could make our products obsolete or non-competitive.

We are developing one of our lead product candidates, TC-210, in combination with an immune checkpoint inhibitor for the treatment of NSCLC. Others are evaluating these immune checkpoint inhibitor approaches in combination with CAR-T cells and TCR-T cells to enhance efficacy in the treatment of solid tumors and hematological malignancies. We therefore could experience significant direct competition from this type of combination immunotherapy. We may also face substantial competition in the future from

other immunotherapies, if their use alone or in combination demonstrates a significant improvement in efficacy. Development of more effective small molecules, antibody-based approaches, cancer vaccines, oncolytic viruses and other products could lead to them preferentially being used as first- or second-line treatments, which would reduce the opportunity for our product candidates.

Despite the unique approach that we have developed to address the limitations of CAR-T cells and TCR-T cells, we expect to face increasing competition as new more effective treatments for cancer enter the market and further advancements in technologies are made. We expect market adoption of any treatments that we develop and commercialize to be dependent on, among other things, efficacy, safety, delivery, price and the availability of reimbursement from government and other third-party payors.

We expect the commercial opportunity for our products that we take to regulatory licensing to be reduced or eliminated if competitors develop and commercialize products that are more effective, safer (have fewer or less severe side effects), are more convenient or are less expensive or better reimbursed than any products that we may commercialize. We compete with larger, better-funded companies, who may obtain regulatory approval for their products more rapidly than we may obtain licensing for ours. This could result in our competitors establishing a strong market position for either the product or a specific indication before we are able to enter the market.

Competition for TC-210

The overexpression of mesothelin by numerous solid tumors, combined with its low expression on mesothelial cells lining the pleura, peritoneum, and pericardium, has led to a number of different mesothelin-targeting agents being tested in Phase 1/2 trials. These approaches include novel antibody therapeutics, such as unconjugated monoclonal antibodies, antibody-drug conjugates, bispecific antibodies as well as vaccines. Antibody-based approaches are being pursued by F. Hoffmann-La Roche Ltd, Bayer AG, Bristol-Myers Squibb Company, Selecta Biosciences, Inc., Novimmune SA, Harpoon Therapeutics, Inc., Amgen Inc., and Morphotek, Inc., among others. Antibody-based agents in development have been limited to date by immunogenicity, poor tumor penetration and dose-limiting toxicities associated with the therapy. Novartis, Atara Biotherapeutics, Inc., Memorial Sloan Kettering Cancer Center, the National Institutes of Health Clinical Center, Maxcyte, Inc., and several Chinese academic institutions are developing anti-mesothelin CAR-T cell therapies. Anti-mesothelin CAR-T cell therapies have been limited in the clinic by poor expansion, short persistence and immunogenicity.

Competition for TC-220

Approaches targeting tumors expressing MUC16 include antibody-based therapeutics, such as monoclonal antibodies and recombinant immunotoxins, as well as T cell-based approaches, such as CAR-T cells, and vaccines. Regeneron (in collaboration with Sanofi S.A.) is conducting a Phase 1/2 trial with a bispecific MUC16xCD3 antibody in patients with advanced platinum resistant ovarian cancer. Juno, in collaboration with Memorial Sloan Kettering Cancer Center, is conducting a Phase 1 trial of CAR-T cells against MUC16.

Competition for TC-110 and TC-310

Recent regulatory approvals of Gilead's and Novartis' CAR-T cell therapies and clinical results for Juno's CAR-T cell therapy have led a number of companies to increase their research and development efforts in the cell therapeutics field, including Janssen through its collaboration with Legend, as well as the entry into the field by many other companies. In addition to these CAR-T cell therapies, many companies are developing enhanced TCR-T cells, which may compete with TC-110 and TC-310 in B-cell hematological malignancies. These include Cellectis S.A./Allogene Therapeutics, Inc., Mustang Bio, Inc., Autolus Therapeutics plc, Crispr Therapeutics AG, Precision BioSciences, Inc., Unum Therapeutics, Inc., Eureka Therapeutics, Inc., Triumvira Immunologics, Inc., Poseida Therapeutics, Inc. and Miltenyi Biotec GmbH, among others. Companies such as F. Hoffmann-La Roche Ltd, Amgen Inc., Regeneron, MorphoSys AG, Forty Seven, Inc., and others are pursuing antibody based approaches. We therefore expect competition within the cell therapy field to intensify and for antibody-based approaches to more directly compete with TCR-T cell therapies in the future.

Government Regulation and Product Licensure

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, manufacture, pricing, quality control, approval, packaging, storage, recordkeeping, labeling, advertising, promotion, distribution, marketing, post-approval monitoring and reporting, and import and export of biopharmaceutical products. The processes for obtaining marketing approvals in the United States and in foreign countries and jurisdictions, along with compliance with applicable statutes and regulations and other regulatory authorities, require the expenditure of substantial time and financial resources.

Licensure and Regulation of Biologics in the United States

In the United States, biological products including gene therapy products, such as our lead product candidates, are licensed for marketing by the FDA under the Public Health Service Act (PHSA), and regulated by the FDA under the Federal Food, Drug, and Cosmetic Act (FDCA), as well as by other federal, state and local statute and regulations. Both the FDCA and the PHSA and their corresponding regulations govern, among other things, the testing, manufacturing, safety, potency, labeling, packaging, storage, record keeping, distribution, reporting, advertising, and other promotional practices involving biological products. Additionally, each clinical trial protocol for a gene therapy product candidate is reviewed by the FDA and, in limited situations, the National Institutes for Health (NIH) through its Recombinant DNA Advisory Committee (RAC). The FDA must license a biological product before it may be marketed within the United States.

Within the FDA, the Center for Biologics Evaluation and Research (CBER) regulates gene therapy products. Within the 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 the CBER on its reviews. The CBER works closely with the NIH and the RAC, which makes recommendations to the NIH on gene therapy issues and engages in a public discussion of scientific, safety, ethical and societal issues related to proposed and ongoing gene therapy protocols. To date, the FDA has licensed three human gene therapy products for sale and the agency has provided guidance for the development of other gene therapy products. This guidance includes a growing body of guidance documents on chemistry, manufacturing and control (CMC), clinical investigations and other areas of gene therapy development, all of which are intended to facilitate the industry's development of gene therapy products and their implementing regulations. Recently, NIH proposed to revise its guidelines overseeing gene therapy research, including deleting the protocol registration and reporting requirements for certain therapies and eliminating RAC review and reporting requirements for human gene transfer research.

The failure of an applicant to comply with the applicable regulatory requirements at any time during the product development process, including non-clinical testing, clinical testing, the approval process or post-approval process, may result in delays to the conduct of a study, regulatory review and approval, and/or administrative or judicial sanctions. These sanctions may include, but are not limited to, the FDA's refusal to allow an applicant to proceed with clinical trials, refusal to approve pending applications, license suspension or revocation, withdrawal of an approval, warning letters, adverse publicity, product recalls, product seizures, total or partial suspension of production or distribution, injunctions, fines, and civil or criminal investigations and penalties brought by the FDA or Department of Justice (DOJ), or other government entities, including state agencies.

An applicant seeking licensing to market and distribute a new biologic in the United States generally must satisfactorily complete each of the following steps before the product candidate will be licensed by the FDA.

- preclinical testing including laboratory tests, animal studies, and formulation studies, which must be performed in accordance with the FDA's good laboratory practice (GLP) regulations and standards;
- submission to the FDA of an IND for human clinical testing, which must become effective before human clinical trials may begin;
- approval by an institutional review board (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 (GCP);
- preparation and submission to the FDA of a BLA for a biological product which includes not only the results of the clinical trials, but also detailed information on the chemistry, manufacture, and quality controls for the product candidate and proposed labeling for one or more proposed indication(s) and the payment of user fees (unless exempt);
- FDA acceptance and substantive review of the BLA;
- review of the product candidate by an FDA advisory committee, where appropriate or if applicable;
- satisfactory completion of an FDA inspection of the manufacturing facility or facilities, including those of third parties, at which the product candidate or components thereof are manufactured to assess compliance with cGMP requirements and to assure that the facilities, methods, and controls are adequate to preserve the product's identity, strength, quality, and purity;
- satisfactory completion of any FDA audits of the non-clinical and clinical trial sites to assure compliance with GCP and the integrity of clinical data in support of the BLA;
- securing FDA licensure of the BLA to allow marketing of the new biological product; and
- compliance with any post-licensing requirements, including the potential requirement to implement a REMS and the potential requirement to conduct and any post-licensing studies required by the FDA.

Preclinical Studies and Investigational New Drug Application

Before an applicant begins testing a product candidate with potential therapeutic value in humans, the product candidate enters preclinical testing. Preclinical tests include laboratory evaluations of product chemistry, formulation, and stability, as well as other studies to evaluate, among other things, the toxicity of the product candidate. The conduct of the preclinical tests and formulation of the compounds for testing must comply with federal regulations and requirements, including GLP regulations and standards. The results of the preclinical tests, together with manufacturing information and analytical data, are submitted to the FDA a part of an IND. Some long-term preclinical testing, such as animal tests of reproductive adverse events and carcinogenicity, and long-term toxicity studies, may continue after the IND is submitted.

The IND and IRB Processes

An IND is an exemption from the FDCA that allows an unapproved product candidate to be shipped in interstate commerce for use in an investigational clinical trial and a request for FDA authorization to administer such investigational product to humans. Such authorization must be secured prior to interstate shipment and administration of any product candidate that is not the subject of an approved BLA. In support of a request for an IND, applicants must submit a protocol for each clinical trial and any subsequent protocol amendments must be submitted to the FDA as part of the IND. In addition, the results of the preclinical tests, together with manufacturing information, analytical data, any available clinical data or literature and plans for clinical trials, among other things, must be submitted to the FDA as part of an IND. The FDA requires a 30-day waiting period after the filing of each IND before clinical trials may begin. This waiting period is designed to allow the FDA to review the IND to determine whether human research subjects will be exposed to unreasonable health risks. At any time during this 30-day period, or thereafter, the FDA may raise concerns or questions about the conduct of the trials as outlined in the IND and impose a clinical hold or partial clinical hold. In this case, the IND sponsor and the FDA must resolve any outstanding concerns before clinical trials can begin.

Following commencement of a clinical trial under an IND, the FDA may also place a clinical hold or partial clinical hold on that trial. A clinical hold is an order issued by the FDA to the sponsor to delay a proposed clinical investigation or to suspend an ongoing investigation. A partial clinical hold is a delay or suspension of only part of the clinical work requested under the IND. For example, a specific protocol or part of a protocol is not allowed to proceed, while other protocols may do so. No more than 30 days after imposition of a clinical hold or partial clinical hold, the FDA will provide the sponsor a written explanation of the basis for the hold. Following issuance of a clinical hold or partial clinical hold, an investigation may only resume after the FDA has notified the sponsor that the investigation may proceed. The FDA will base that determination on information provided by the sponsor correcting the deficiencies previously cited or otherwise satisfying the FDA that the investigation can proceed.

A sponsor may choose, but is not required, to conduct a foreign 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 study complies with certain regulatory requirements of the FDA in order to use the study as support for an IND or application for marketing approval or licensing. In particular, such studies must be conducted in accordance with GCP, including review and approval by an independent ethics committee (IEC) and informed consent from subjects. The GCP requirements in the final rule encompass both ethical and data integrity standards for clinical studies and the FDA must be able to validate the data through an onsite inspection, if deemed necessary by the FDA. The FDA's regulations are intended to help ensure the protection of human subjects enrolled in non-IND foreign clinical studies, as well as the quality and integrity of the resulting data. They further help ensure that non-IND foreign studies are conducted in a manner comparable to that required for IND studies.

If a gene therapy trial is conducted at, or sponsored by, institutions receiving NIH funding for recombinant DNA research, prior to the submission of an IND to the FDA, a protocol and related documents must be submitted to, and the study registered with, the NIH Office of Biotechnology Activities (OBA) pursuant to the NIH Guidelines for Research Involving Recombinant DNA Molecules (the NIH Guidelines). Compliance with the NIH Guidelines is mandatory for investigators at institutions receiving NIH funds for research involving recombinant DNA. However, many companies and other institutions, not otherwise subject to the NIH Guidelines, voluntarily follow them. NIH is responsible for convening the RAC that discusses protocols that raise novel or particularly important scientific, safety or ethical considerations at one of its quarterly public meetings. The OBA will notify the FDA of the RAC's decision regarding the necessity for full public review of a gene therapy protocol. RAC proceedings and reports are posted to the OBA website and may be accessed by the public.

In addition to the foregoing IND requirements, an IRB representing each institution participating in the clinical trial must review and approve the plan for any clinical trial before it commences at that institution, and the IRB must conduct continuing review and reapprove the study at least annually. The IRB must review and approve, among other things, the study protocol and informed consent information to be provided to study subjects. An IRB must operate in compliance with FDA regulations. An IRB can suspend or terminate approval of a clinical trial at its institution, or an institution it represents, if the clinical trial is not being conducted in accordance with the IRB's requirements or if the product candidate has been associated with unexpected serious harm to patients.

Additionally, some trials are overseen by an independent group of qualified experts organized by the trial sponsor, known as a data safety monitoring board or committee (DSMB). This group provides authorization as to whether or not a trial may move forward at designated check points based on access that only the group maintains to available data from the study. Suspension or termination of development during any phase of clinical trials can occur if it is determined that the participants or patients are being exposed to an unacceptable health risk. Other reasons for suspension or termination may be made by us based on evolving business objectives and/or competitive climate.

Information about clinical trials must be submitted within specific timeframes to the NIH for public dissemination on its ClinicalTrials.gov website.

Additional Regulation for Gene Therapy Clinical Trials

In addition to the regulations discussed above, there are a number of additional standards that apply to clinical trials involving the use of gene therapy. The FDA has issued various guidance documents regarding gene therapies, which outline additional factors that the FDA will consider at each of the above stages of development, which relate to, among other things: the proper preclinical assessment of gene therapies; the CMC information that should be included in an IND; the proper design of tests to measure product potency in support of an IND or BLA; and measures to observe delayed adverse effects in subjects who have been exposed to investigational gene therapies when the risk of such effects is high. Further, the FDA usually recommends that sponsors observe subjects for potential gene therapy-related delayed adverse events for a 15-year period, including a minimum of five years of annual examinations followed by ten years of annual queries, either in person or by questionnaire, although the FDA recently proposed updating its guidance on long-term follow-up after administration of human gene therapy products.

The NIH and the FDA have a publicly accessible database, the Genetic Modification Clinical Research Information System, which includes information on gene therapy trials and serves as an electronic tool to facilitate the reporting and analysis of adverse events on these trials.

Human Clinical Trials in Support of a BLA

Clinical trials involve the administration of the investigational product candidate to human subjects under the supervision of a qualified investigator in accordance with GCP requirements which include, among other things, the requirement that all research subjects provide their informed consent in writing before their participation in any clinical trial. Clinical trials are conducted under written clinical trial 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.

Human clinical trials are typically conducted in three sequential phases, but the phases may overlap or be combined. Additional studies may also be required after licensing.

- 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 in patients. During Phase 1 clinical

trials, information about the investigational biological product's pharmacokinetics and pharmacological effects may be obtained to permit the design of well-controlled and scientifically valid Phase 2 clinical trials.

- Phase 2 clinical trials are generally conducted in a limited patient population to identify possible adverse effects and safety risks, evaluate the potency or 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 2 clinical trials are well controlled, closely monitored and conducted in a limited patient population.
- Phase 3 clinical trials proceed if the Phase 2 clinical trials demonstrate that a dose range of the product candidate is potentially potency or effective and has an acceptable safety profile. Phase 3 clinical trials are undertaken within an expanded patient population to further evaluate dosage, provide substantial evidence of clinical potency or efficacy, and further test for safety in an expanded and diverse patient population at multiple, geographically dispersed clinical trial sites. 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 license, and, if licensed, 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 and effectiveness after approval. Such post-approval trials are typically referred to as Phase 4 clinical trials. These studies are used to gain additional experience from the treatment of a larger number of patients in the intended treatment group and to further document a clinical benefit in the case of biologics licensed 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.

Progress reports detailing the results of the clinical trials must be submitted at least annually to the FDA. In addition, IND safety reports must be submitted to the FDA for any of the following: serious and unexpected suspected adverse reactions; findings from other studies or animal or *in vitro* testing that suggest a significant risk in humans exposed to the product; and any clinically important increase in the case of a serious suspected adverse reaction over that listed in the protocol or investigator brochure. Phase 1, Phase 2 and Phase 3 clinical trials may not be completed successfully within any specified period, or at all. Furthermore, the FDA or the sponsor may suspend or terminate a clinical trial at any time on various grounds, including a finding that the research subjects are being exposed to an unacceptable health risk. Similarly, an IRB can suspend or terminate approval of a clinical trial at its institution, or an institution it represents, if the clinical trial is not being conducted in accordance with the IRB's requirements or if the product has been associated with unexpected serious harm to patients. The FDA will typically inspect one or more clinical sites to assure compliance with GCP and the integrity of the clinical data submitted.

Clinical trials sometimes require submission of an application for an Investigational Device Exemption, or IDE, to the FDA. The IDE application, when requested, must be supported by appropriate data, such as animal and laboratory testing results, showing that it is safe to test the device in humans and that the investigational protocol is scientifically sound. The IDE application must be approved in advance by the FDA, unless the product is deemed a non-significant risk device and eligible for more abbreviated IDE requirements. Clinical trials for a significant risk device may begin once the IDE application is approved by the FDA as well as the appropriate institutional review boards, or IRBs, at the clinical trial sites, and the informed consent of the patients participating in the clinical trial is obtained.

Review and Approval of a BLA

In order to obtain approval to market a biological product in the United States, a marketing application must be submitted to the FDA that provides sufficient data establishing the safety, purity and potency of the proposed biological product for its intended indication. The application includes all relevant data

available from pertinent preclinical and clinical trials, including negative or ambiguous results as well as positive findings, together with detailed information relating to the product's chemistry, manufacturing, controls and proposed labeling, among other things. Data can come from company-sponsored clinical trials intended to test the safety and effectiveness of a use of a product, or from a number of alternative sources, including studies initiated by investigators. To support marketing approval, the data submitted must be sufficient in quality and quantity to establish the safety, purity and potency of the biological product to the satisfaction of the FDA.

The BLA is a vehicle through which applicants formally propose that the FDA license a new product for marketing and sale in the United States for one or more indications. Every new biological product candidate must be the subject of an approved BLA before it may be commercialized in the United States. Under federal law, the submission of most BLAs is subject to an application user fee, which for federal fiscal year 2019 is $2,588,478 for an application requiring clinical data. The sponsor of an approved BLA is also subject to an annual program fee, which for fiscal year 2019 is $309,915. 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.

Following submission of a BLA, the FDA conducts a preliminary review of the application generally within 60 calendar days of its receipt and strives to inform the sponsor by the 74th day after the FDA's receipt of the submission whether the application is sufficiently complete to permit substantive review. The FDA may request additional information rather than accept the application for filing. In this event, the application must be resubmitted with the additional information. The resubmitted application is also subject to review before the FDA accepts it for filing. Once the submission is accepted for filing, the FDA begins an in-depth substantive review. The FDA has agreed to specified performance goals in the review process of the BLAs. Under that agreement, 90% of original BLA submissions are meant to be reviewed within ten months of the 60-day filing date, and 90% of original BLAs that have been designated for "priority review" are meant to be reviewed within six months of the 60-day filing date. The review process and the Prescription Drug User Fee Act goal date may be extended by the FDA for three additional months to consider new information or clarification provided by the applicant to address an outstanding deficiency identified by the FDA following the original submission.

Before approving an application, the FDA typically will inspect the facility or facilities where the product is or will be manufactured. These pre-approval inspections may cover all facilities associated with a BLA submission, including component manufacturing, finished product manufacturing and control testing laboratories. The FDA will not approve an application unless it determines that the manufacturing processes and facilities are in compliance with cGMP requirements and adequate to assure consistent production of the product within required specifications. Additionally, before approving a BLA, the FDA will typically inspect one or more clinical sites to assure compliance with GCP.

In addition, as a condition of approval, the FDA may require an applicant to develop a REMS. REMS use risk minimization strategies beyond the professional labeling to ensure that the benefits of the product outweigh the potential risks. To determine whether a REMS is needed, the FDA will consider the size of the population likely to use the product, seriousness of the disease, expected benefit of the product, expected duration of treatment, seriousness of known or potential adverse events and whether the product is a new molecular entity.

The FDA may refer an application for a novel product to an advisory committee or explain why such referral was not made. Typically, an advisory committee is a panel of independent experts, including clinicians and other scientific experts, that reviews, evaluates and provides a recommendation as to whether the application should be approved and under what conditions. The FDA is not bound by the recommendations of an advisory committee, but it considers such recommendations carefully when making decisions.

Fast Track, Breakthrough Therapy, Priority Review and Regenerative Advanced Therapy Designations

The FDA is authorized to designate certain products for expedited review if they are intended to address an unmet medical need in the treatment of a serious or life-threatening disease or condition. These programs are referred to as Fast Track designation, Breakthrough Therapy designation, Priority Review designation and Regenerative Advanced Therapy designation.

Specifically, the FDA may designate a product for Fast Track review if it is intended, whether alone or in combination with one or more other products, for the treatment of a serious or life-threatening disease or condition, and it demonstrates the potential to address unmet medical needs for such a 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. This rolling review may be available if the FDA determines, after preliminary evaluation of clinical data submitted by the sponsor, that a Fast Track product may be effective. The sponsor must also provide, and the FDA must approve, a schedule for the submission of the remaining information and the sponsor must pay applicable user fees. However, the FDA's time period goal for reviewing a fast track application does not begin until the last section of the application is submitted. In addition, the Fast Track designation may be withdrawn by the FDA if the FDA believes that the designation is no longer supported by data emerging in the clinical trial process.

Second, a product may be designated as a Breakthrough Therapy if it is intended, either alone or in combination with one or more other products, to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the product may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. The 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 design the clinical trials in an efficient manner.

Third, the FDA may designate a product for priority review if it is a product that treats a serious condition and, if licensed, would provide a significant improvement in safety or effectiveness. The FDA determines, on a case-by-case basis, whether the proposed product represents a significant improvement when compared with other available therapies. Significant improvement may be illustrated by evidence of increased effectiveness in the treatment of a condition, elimination or substantial reduction of a treatment-limiting product reaction, documented enhancement of patient compliance that may lead to improvement in serious outcomes, and evidence of safety and effectiveness in a new subpopulation. A priority designation is intended to direct overall attention and resources to the evaluation of such applications, and to shorten the FDA's goal for taking action on a marketing application from ten months to six months.

With passage of the 21st Century Cures Act (the Cures Act), in December 2016, Congress authorized the FDA to accelerate review and approval of products designated as regenerative advanced therapies. A product is eligible for this 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 a regenerative advanced therapy designation include early interactions with FDA to expedite development and review, benefits available to breakthrough therapies, potential eligibility for priority review and accelerated approval based on surrogate or intermediate endpoints.

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 (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. Products granted accelerated approval must meet the same statutory standards for safety and effectiveness as those granted traditional approval.

For the purposes of accelerated approval, a surrogate endpoint is a marker, such as a laboratory measurement, radiographic image, physical sign, or other measure that is thought to predict clinical benefit, but is not itself a measure of clinical benefit. Surrogate endpoints can often be measured more easily or more rapidly than clinical endpoints. An intermediate clinical endpoint is a measurement of a therapeutic effect that is considered reasonably likely to predict the clinical benefit of a drug, such as an effect on IMM. The FDA has limited experience with accelerated approvals based on intermediate clinical endpoints, but has indicated that such endpoints generally may support accelerated approval where the therapeutic effect measured by the endpoint is not itself a clinical benefit and basis for traditional approval, if there is a basis for concluding that the therapeutic effect is reasonably likely to predict the ultimate clinical benefit of a product.

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. Thus, the benefit of accelerated approval derives from the potential to receive approval based on surrogate endpoints sooner than possible for trials with clinical or survival endpoints, rather than deriving from any explicit shortening of the FDA approval timeline, as is the case with priority review.

The accelerated approval pathway is usually contingent on a sponsor’s agreement to conduct, in a diligent manner, additional post-approval confirmatory studies to verify and describe the product’s clinical benefit. As a result, a product candidate licensed on this basis is subject to rigorous post-marketing compliance requirements, including the completion of Phase 4 or post-approval clinical trials to confirm the effect on the clinical endpoint. Failure to conduct required post-approval studies, or confirm a clinical benefit during post-marketing studies, would allow the FDA to initiate expedited proceedings to withdraw approval of the product. All promotional materials for product candidates licensed under accelerated regulations are subject to prior review by the FDA.

The FDA’s Decision on a BLA

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

If the FDA licenses a new product, it may limit the licensed indications for use of the product. 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 health care professionals, and elements to assure safe use (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 licensing, many types of changes to the licensed product, such as adding new indications, manufacturing changes and additional labeling claims, are subject to further testing requirements and FDA review and approval.

Post-Licensing Regulation

If regulatory licensing for marketing of a product or new indication for an existing product is obtained, the sponsor will be required to comply with all regular post-licensing regulatory requirements as well as any post-licensing requirements that the FDA may have imposed as part of the licensing process. The sponsor will be required to report, among other things, certain adverse reactions and manufacturing problems to the FDA, provide updated safety and potency or efficacy information and comply with requirements concerning advertising and promotional labeling requirements. Manufacturers and certain of their subcontractors are required to register their establishments with the FDA and certain state agencies, and are subject to periodic unannounced inspections by the FDA and certain state agencies for compliance with ongoing regulatory requirements, including cGMP regulations, which impose certain procedural and documentation requirements upon manufacturers. Changes to the manufacturing processes are strictly regulated and often require prior FDA approval before being implemented. 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.

A product may also be subject to official lot release, meaning that the manufacturer is required to perform certain tests on each lot of the product before it is released for distribution. If the product is subject to official release, the manufacturer must submit samples of each lot, together with a release protocol showing a summary of the history of manufacture of the lot and the results of all of the manufacturer's tests performed on the lot, to the FDA. The FDA may in addition perform certain confirmatory tests on lots of some products before releasing the lots for distribution. Finally, the FDA will conduct laboratory research related to the safety, purity, potency, and effectiveness of pharmaceutical products.

Once a license is granted, the FDA may withdraw the license if compliance with regulatory requirements is not maintained or if problems occur after the product reaches the market. Later discovery of previously unknown problems with a product, including adverse events of unanticipated severity or frequency, or with manufacturing processes, or failure to comply with regulatory requirements, may result in revisions to the licensed labeling to add new safety information; imposition of post-market studies or clinical trials to assess safety risks; 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, complete withdrawal of the product from the market, or product recalls;
- fines, warning letters, or holds on post-licensing clinical trials;
- refusal of the FDA to approve pending applications or supplements to licensed applications, or suspension or revocation of product license licenses;
- product seizure or detention, or refusal to permit the import or export of products; or
- injunctions or the imposition of civil or criminal penalties.

The FDA strictly regulates the marketing, labeling, advertising and promotion of prescription drug products placed on the market. This regulation includes, among other things, standards and regulations for direct-to-consumer advertising, communications regarding unapproved uses, industry-sponsored

scientific and educational activities, and promotional activities involving the Internet and social media. Promotional claims about a drug's safety or effectiveness are prohibited before the drug is licensed. After licensing, a drug product generally may not be promoted for uses that are not licensed by the FDA, as reflected in the product's prescribing information. In the United States, health care professionals are generally permitted to prescribe drugs for such uses not described in the drug's labeling, known as off-label uses, because the FDA does not regulate the practice of medicine. However, FDA regulations impose rigorous restrictions on manufacturers' communications, prohibiting the promotion of off-label uses. It may be permissible, under very specific, narrow conditions, for a manufacturer to engage in nonpromotional, non-misleading communication regarding off-label information, such as distributing scientific or medical journal information.

If a company is found to have promoted off-label uses, it may become subject to adverse public relations and administrative and judicial enforcement by the FDA, the Department of Justice, or the Office of the Inspector General of the Department of Health and Human Services (HHS), 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.

In addition, the distribution of prescription pharmaceutical products is subject to the Prescription Drug Marketing Act (PDMA) and its implementing regulations, as well as the Drug Supply Chain Security Act (DSCA), which regulate the distribution and tracing of prescription drug samples at the federal level, and set minimum standards for the regulation of distributors by the states. The PDMA, its implementing regulations and state laws limit the distribution of prescription pharmaceutical product samples, and the DSCA imposes requirements to ensure accountability in distribution and to identify and remove counterfeit and other illegitimate products from the market.

Pediatric Studies and Exclusivity

Under the Pediatric Research Equity Act, a BLA or supplement thereto for a biological product with a new active ingredient, indication, dosage form, dosing regimen or route of administration 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 also submit pediatric study plans prior to the assessment data. Those plans must contain an outline of the proposed pediatric study or studies the applicant plans to conduct, including study objectives and design, any deferral or waiver requests and other information required by regulation. The applicant, the FDA, and the FDA's internal review committee must then review the information submitted, consult with each other 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 ninety (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 licensing of the product for use in adults, or full or partial waivers from the pediatric data requirements. Additional requirements and procedures relating to deferral requests and requests for extension of deferrals are contained in FDASIA. Unless otherwise required by regulation, the pediatric data requirements do not apply to products with orphan designation.

The FDA Reauthorization Act of 2017 established new requirements to govern certain molecularly targeted cancer indications. Any company that submits a BLA three years after the date of enactment of that statute must submit pediatric assessments with the BLA if the biologic is intended for the treatment of an adult cancer and is directed at a molecular target that FDA determines to be substantially relevant to the growth or progression of a pediatric cancer. The investigation must be designed to yield clinically meaningful pediatric study data regarding the dosing, safety and preliminary potency to inform pediatric labeling for the product. Deferrals and waivers as described above are also available.

Pediatric exclusivity is another type of non-patent marketing exclusivity in the United States and, if granted, provides for the attachment of an additional six months of marketing protection to the term of any existing regulatory exclusivity, including the non-patent and orphan exclusivity. 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. The data do not need to show the product to be effective in the pediatric population studied; rather, if the clinical trial is deemed to fairly respond to the FDA's request, the additional protection is granted. If reports of requested pediatric studies are submitted to and accepted by the FDA within the statutory time limits, whatever statutory or regulatory periods of exclusivity or patent protection cover the product are extended by six months. This is not a patent term extension, but it effectively extends the regulatory period during which the FDA cannot license another application.

Orphan Drug Designations and Exclusivity

Under the Orphan Drug Act, the FDA may designate a biological product as an "orphan drug" if it is intended to treat a rare disease or condition, generally meaning that it affects fewer than 200,000 individuals in the United States, or more in cases in which there is no reasonable expectation that the cost of developing and making a product available in the United States for treatment of disease or condition will be recovered from sales of the product. A company must seek orphan drug designation before submitting a BLA for the candidate product. If the request is granted, the FDA will disclose the identity of the therapeutic agent and its potential use. Orphan drug designation does not shorten the PDUFA goal dates for the regulatory review and licensing process, although it does convey certain advantages such as tax benefits and exemption from the PDUFA application fee.

If a product with orphan designation receives the first FDA approval for the disease or condition for which it has such designation or for a select indication or use within the rare disease or condition for which it was designated, the product generally will receive orphan drug exclusivity. Orphan drug exclusivity means that the FDA may not license another sponsor's marketing application for the same drug for the same condition for seven years, except in certain limited circumstances. Orphan exclusivity does not block the licensing of a different product for the same rare disease or condition, nor does it block the licensing of the same product for different conditions. If a biologic designated as an orphan drug ultimately receives marketing licensing for an indication broader than what was designated in its orphan drug application, it may not be entitled to exclusivity.

Orphan drug exclusivity will not bar licensing of another product under certain circumstances, including if a subsequent product with the same biologic for the same condition is shown to be clinically superior to the licensed product on the basis of greater potency, purity or safety, or providing a major contribution to patient care, or if the company with orphan drug exclusivity is not able to meet market demand. This is the case despite an earlier court opinion holding that the Orphan Drug Act unambiguously required the FDA to recognize orphan exclusivity regardless of a showing of clinical superiority.

Biosimilars and Exclusivity

The 2010 Patient Protection and Affordable Care Act, which was signed into law on March 23, 2010, included a subtitle called the Biologics Price Competition and Innovation Act of 2009 (BPCIA). The BPCIA established a regulatory scheme authorizing the FDA to license biosimilars and interchangeable

biosimilars. The FDA has licensed several biosimilar products for use in the United States. As of September 30, 2018, however, no interchangeable biosimilars, however, have been licensed. The FDA has issued several guidance documents outlining an approach to review and licensing of biosimilars. Additional guidances are expected to be proposed and finalized by the FDA in the near term.

Under the BPCIA, a manufacturer may submit an application for licensure of a biological product that is “biosimilar to” or “interchangeable with” a previously licensed biological product or “reference product.” In order for the FDA to license a biosimilar product, it must find, among other things, that the product is “highly similar” to the reference product notwithstanding minor differences in clinically inactive components and 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 license 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 potency relative to exclusive use of the reference biologic.

Under the BPCIA, an application for a biosimilar or interchangeable biological product may not be submitted to the FDA until four years following the date of licensing of the reference product. The FDA may not license a biosimilar or interchangeable biological product until 12 years from the date on which the reference product was licensed. Even if a product is considered to be a reference product eligible for exclusivity, another company could market a competing version of that product if the FDA licenses a full BLA for such product containing the sponsor’s own preclinical data and data from adequate and well-controlled clinical trials to demonstrate the safety, purity, and potency of their product. The BPCIA also created certain exclusivity periods for biosimilars licensed as interchangeable products. At this juncture, it is unclear whether products deemed “interchangeable” by the FDA will, in fact, be readily substituted by pharmacies, which are governed by state pharmacy law.

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 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 of an IND and the submission date of a marketing application (such as a BLA), plus the time between the submission date of a marketing application and the ultimate licensing date. Patent term restoration cannot be used to extend the remaining term of a patent past a total of 14 years from the product’s licensing date. Only one patent applicable to a licensed product is eligible for the extension, and the application for the extension must be submitted prior to the expiration of the patent in question and within 60 days after approval of the relevant marketing application. A patent that covers multiple products for which licensing is sought can only be extended in connection with one of the licenses. The USPTO reviews and licenses the application for any patent term extension or restoration in consultation with the FDA.

The 21st Century Cures Act

On December 13, 2016, President Obama signed the Cures Act into law. The Cures Act is designed to modernize and personalize healthcare, spur innovation and research, and streamline the discovery and development of new therapies through increased federal funding of particular programs. It authorizes increased funding for the FDA to spend on innovation projects. The new law also amends the PHSA to reauthorize and expand funding for the NIH. The Cures Act establishes the NIH Innovation Fund to pay for the cost of development and implementation of a strategic plan, early stage investigators and research. It also charges NIH with leading and coordinating expanded pediatric research. Further, the Cures Act directs the Centers for Disease Control and Prevention to expand surveillance of neurological diseases.

With amendments to the FDCA and the PHSA, Title III of the Cures Act seeks to accelerate the discovery, development, and delivery of new medicines and medical technologies. To that end, and among other provisions, the Cures Act reauthorizes the existing priority review voucher program for certain drugs intended to treat rare pediatric diseases until 2020; creates a new priority review voucher program for drug applications determined to be material national security threat medical countermeasure applications; revises the FDCA to streamline review of combination product applications; requires FDA to evaluate the potential use of "real world evidence" to help support approval of new indications for approved drugs; provides a new "limited population" approval pathway for antibiotic and antifungal drugs intended to treat serious or life-threatening infections; and authorizes FDA to designate a drug as a "regenerative advanced therapy," thereby making it eligible for certain expedited review and approval designations.

Healthcare Law and Regulation

Health care providers and third-party payors play a primary role in the recommendation and prescription of biological products that are granted marketing licensing. Arrangements with providers, consultants, third-party payors and customers are subject to broadly applicable fraud and abuse, anti-kickback, false claims laws, patient privacy laws and regulations and other health care laws and regulations that may constrain business and/or financial arrangements. Restrictions under applicable federal and state health care laws and regulations, include the following:

- the federal Anti-Kickback Statute, which prohibits, among other things, persons and entities from knowingly and willfully soliciting, offering, paying, receiving or providing remuneration, directly or indirectly, in cash or in kind, to induce or reward either the referral of an individual for, or the purchase, order or recommendation of, any good or service, for which payment may be made, in whole or in part, under a federal health care program such as Medicare and Medicaid;
- the federal civil and criminal false claims laws, including the civil False Claims Act, and civil monetary penalties laws, which prohibit individuals or entities from, among other things, knowingly presenting, or causing to be presented, to the federal government, claims for payment that are false, fictitious or fraudulent or knowingly making, using or causing to made or used a false record or statement to avoid, decrease or conceal an obligation to pay money to the federal government.
- the federal Health Insurance Portability and Accountability Act of 1996 (HIPAA), which created additional federal criminal laws that prohibit, among other things, knowingly and willfully executing, or attempting to execute, a scheme to defraud any health care benefit program or making false statements relating to health care matters;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act, and their respective implementing regulations, including the Final Omnibus Rule published in January 2013, which impose obligations, including mandatory contractual terms, with respect to safeguarding the privacy, security and transmission of individually identifiable health information;
- the federal false statements statute, which prohibits knowingly and willfully falsifying, concealing or covering up a material fact or making any materially false statement in connection with the delivery of or payment for health care benefits, items or services;
- the federal transparency requirements known as the federal Physician Payments Sunshine Act, under the 2010 Patient Protection and Affordable Care Act, as amended by the Health Care Education Reconciliation Act (the ACA), which requires certain manufacturers of drugs, devices, biologics and medical supplies to report annually to the Centers for Medicare & Medicaid Services (CMS) within the HHS, information related to payments and other transfers of value made by that entity to physicians and teaching hospitals, 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 and false claims laws, which may apply to health care items or services that are reimbursed by non-government third-party payors, including private insurers.

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

Pharmaceutical Insurance Coverage and Health Care Reform

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 health care costs. Significant uncertainty exists as to the coverage and reimbursement status of products licensed by the FDA and other government authorities. Thus, even if a product candidate is licensed, sales of the product will depend, in part, on the extent to which third-party payors, including government health programs in the United States such as Medicare and Medicaid, commercial health insurers and managed care organizations, provide coverage and establish adequate reimbursement levels for, the product. The process for determining whether a payor will provide coverage for a product may be separate from the process for setting the price or reimbursement rate that the payor will pay for the product once coverage is licensed. Third-party payors are increasingly challenging the prices charged, examining the medical necessity and reviewing the cost-effectiveness of medical products and services and imposing controls to manage costs. Third-party payors may limit coverage to specific products on a licensed list, also known as a formulary, which might not include all of the licensed products for a particular indication.

In order to secure coverage and reimbursement for any product that might be licensed for sale, a company may need to conduct expensive pharmacoeconomic studies in order to demonstrate the medical necessity and cost-effectiveness of the product, in addition to the costs required to obtain FDA or other comparable marketing licenses. Nonetheless, product candidates may not be considered medically necessary or cost effective. A decision by a third-party payor not to cover a product could reduce physician utilization once the product is licensed and have a material adverse effect on sales, results of operations and financial condition. Additionally, a payor's decision to provide coverage for a product does not imply that an adequate reimbursement rate will be licensed. Further, one payor's determination to provide coverage for a product does not assure that other payors will also provide coverage and reimbursement for the product, and the level of coverage and reimbursement can differ significantly from payor to payor.

The containment of health care costs also has become a priority of federal, state and foreign governments and the prices of products have been a focus in this effort. Governments have shown significant interest in implementing cost-containment programs, including price controls, restrictions on reimbursement and requirements for substitution of generic products. Adoption of price controls and cost-containment measures, and adoption of more restrictive policies in jurisdictions with existing controls and measures, could further limit a company's revenue generated from the sale of any licensed products. 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 products for which a company or its collaborators receive marketing licenses, less favorable coverage policies and reimbursement rates may be implemented in the future.

There have been a number of federal and state proposals during the last few years regarding the pricing of pharmaceutical and biopharmaceutical products, limiting coverage and reimbursement for drugs and biologics and other medical products, government control and other changes to the health care system in the United States. In March 2010, the Affordable Care Act was enacted, which includes measures that have significantly changed health care financing by both governmental and private insurers. The

provisions of the Affordable Care Act of importance to the pharmaceutical and biotechnology industry are, among others, the following:

- an annual, nondeductible fee on any entity that manufactures or imports certain branded prescription drug agents or biologic agents, which is apportioned among these entities according to their market share in certain government health care programs;
- an increase in the rebates a manufacturer must pay under the Medicaid Drug Rebate Program to 23.1% and 13% of the average manufacturer price for branded and generic drugs, respectively;
- a new Medicare Part D coverage gap discount program, in which manufacturers must agree to offer 50% point-of-sale discounts to negotiated prices of applicable brand drugs to eligible beneficiaries during their coverage gap period, as a condition for the manufacturer's outpatient drugs to be covered under Medicare Part D;
- extension of manufacturers' Medicaid rebate liability to covered drugs dispensed to individuals who are enrolled in Medicaid managed care organizations, unless the drug is subject to discounts under the 340B drug discount program;
- a new methodology by which rebates owed by manufacturers under the Medicaid Drug Rebate Program are calculated for drugs that are inhaled, infused, instilled, implanted or injected;
- expansion of eligibility criteria for Medicaid programs by, among other things, allowing states to offer Medicaid coverage to additional individuals and by adding new mandatory eligibility categories for certain individuals with income at or below 133% of the federal poverty level, thereby potentially increasing manufacturers' Medicaid rebate liability;
- expansion of the entities eligible for discounts under the Public Health Service pharmaceutical pricing program;
- new requirements under the federal Physician Payments Sunshine Act for drug manufacturers to report information related to payments and other transfers of value made to physicians and teaching hospitals as well as ownership or investment interests held by physicians and their immediate family members;
- a new Patient-Centered Outcomes Research Institute to oversee, identify priorities in, and conduct comparative clinical effectiveness research, along with funding for such research;
- creation of the Independent Payment Advisory Board, which, if and when impaneled, will have authority to recommend certain changes to the Medicare program that could result in reduced payments for prescription drugs; and
- establishment of a Center for Medicare and Medicaid Innovation at CMS to test innovative payment and service delivery models to lower Medicare and Medicaid spending, potentially including prescription drug spending.

Other legislative changes have been proposed and adopted since the ACA was enacted. These changes include the Budget Control Act of 2011, which, among other things, led to aggregate reductions to Medicare payments to providers of up to 2% per fiscal year that started in 2013 and will stay in effect through 2024 unless additional Congressional action is taken, and the American Taxpayer Relief Act of 2012, which, among other things, reduced Medicare payments to several types of providers and increased the statute of limitations period for the government to recover overpayments to providers from three to five years. These new laws may result in additional reductions in Medicare and other healthcare funding and otherwise affect the prices we may obtain for any of our product candidates for which we may obtain regulatory licensing or the frequency with which any such product candidate is prescribed or used. Further, there have been several recent U.S. congressional inquiries and proposed state and federal legislation designed to, among other things, bring more transparency to drug pricing, review the relationship between pricing and manufacturer patient programs, reduce the costs of drugs under Medicare and reform government program reimbursement methodologies for drug products.

These healthcare reforms, as well as other healthcare reform measures that may be adopted in the future, may result in additional reductions in Medicare and other healthcare funding, more rigorous coverage criteria, new payment methodologies and additional downward pressure on the price for any

licensed product and/or the level of reimbursement physicians receive for administering any licensed product. Reductions in reimbursement levels may negatively impact the prices or the frequency with which products are prescribed or administered. Any reduction in reimbursement from Medicare or other government programs may result in a similar reduction in payments from private payors.

Further, since enactment of the Affordable Care Act, there have been numerous legal challenges and Congressional actions to repeal and replace provisions of the law. In May 2017, the U.S. House of Representatives passed legislation known as the American Health Care Act of 2017. Thereafter, the Senate Republicans introduced and then updated a bill to replace the Affordable Care Act known as the Better Care Reconciliation Act of 2017. The Senate Republicans also introduced legislation to repeal the Affordable Care Act without companion legislation to replace it, and a “skinny” version of the Better Care Reconciliation Act of 2017. In addition, the Senate considered proposed healthcare reform legislation known as the Graham-Cassidy Bill. None of these measures were passed by the U.S. Senate.

The Trump Administration has also taken executive actions to undermine or delay implementation of the Affordable Care Act. In January 2017, President Trump signed an Executive Order directing federal agencies with authorities and responsibilities under the Affordable Care Act to waive, defer, grant exemptions from, or delay the implementation of any provision of the Affordable Care Act that would impose a fiscal or regulatory burden on states, individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices. In October 2017, the President signed a second Executive Order allowing for the use of association health plans and short-term health insurance, which may provide fewer health benefits than the plans sold through the Affordable Care Act exchanges. At the same time, the Administration announced that it will discontinue the payment of cost-sharing reduction (CSR) payments to insurance companies until Congress approves the appropriation of funds for such CSR payments. The loss of the CSR payments is expected to increase premiums on certain policies issued by qualified health plans under the Affordable Care Act. A bipartisan bill to appropriate funds for CSR payments was introduced in the Senate, but the future of that bill is uncertain. Further, in July 2018 following a federal district court decision form New Mexico, the Administration announced that it would be freezing payments to insurers under the Affordable Care Act to cover sicker patients until it or Congress can address the appropriate methodology for calculating and making such payments. It remains to be seen how this action will affect the implementation of the Affordable Care Act.

More recently, with enactment of the Tax Cuts and Jobs Act of 2017, which was signed by the President on December 22, 2017, Congress repealed the “individual mandate.” The repeal of this provision, which requires most Americans to carry a minimal level of health insurance, will become effective in 2019. According to the Congressional Budget Office, the repeal of the individual mandate will cause 13 million fewer Americans to be insured in 2027 and premiums in insurance markets may rise. Additionally, on January 22, 2018, President Trump signed a continuing resolution on appropriations for fiscal year 2018 that delayed the implementation of certain Affordable Care Act-mandated fees, including the so-called “Cadillac” tax on certain high cost employer-sponsored insurance plans, the annual fee imposed on certain health insurance providers based on market share, and the medical device excise tax on non-exempt medical devices. The Congress will likely consider other legislation to replace elements of the Affordable Care Act, during the next Congressional session.

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

purchasing. In addition, regional health care authorities and individual hospitals are increasingly using bidding procedures to determine what pharmaceutical products and which suppliers will be included in their prescription drug and other health care programs. These measures could reduce the ultimate demand for our product candidates, once licensed, or put pressure on our product pricing.

In addition, on May 11, 2018, the Administration issued a plan to lower drug prices. Under this blueprint for action, the Administration indicated that HHS will: take steps to end the gaming of regulatory and patent processes by drug makers to unfairly protect monopolies; advance biosimilars and generics to boost price competition; evaluate the inclusion of prices in drug makers' ads to enhance price competition; speed access to and lower the cost of new drugs by clarifying policies for sharing information between insurers and drug makers; avoid excessive pricing by relying more on value-based pricing by expanding outcome-based payments in Medicare and Medicaid; work to give Part D plan sponsors more negotiation power with drug makers; examine which Medicare Part B drugs could be negotiated for a lower price by Part D plans, and improving the design of the Part B Competitive Acquisition Program; update Medicare's drug-pricing dashboard to increase transparency; prohibit Part D contracts that include "gag rules" that prevent pharmacists from informing patients when they could pay less out-of-pocket by not using insurance; and require that Part D plan members be provided with an annual statement of plan payments, out-of-pocket spending, and drug price increases.

At the state level, individual states are increasingly aggressive in passing legislation and implementing regulations designed to control pharmaceutical and biological product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. In addition, regional health care authorities and individual hospitals are increasingly using bidding procedures to determine what pharmaceutical products and which suppliers will be included in their prescription drug and other health care programs. These measures could reduce the ultimate demand for our product candidates, once licensed, or put pressure on our product pricing.

Review and 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 licensing for a product, an applicant will need to obtain the necessary approvals by the comparable non-U.S. 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 (MAA), and granting of a marketing authorization by these authorities before the product can be marketed and sold in the EU.

Clinical Trial Approval

The Clinical Trials Directive 2001/20/EC, the Directive 2005/28/EC on GCP and the related national implementing provisions of the individual EU Member States govern the system for the approval of clinical trials in the EU. Under this system, an applicant must obtain prior approval from the competent national authority of the EU Member States 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 competent ethics committee has issued a favorable opinion. The clinical trial application must be accompanied by, among other documents, an investigational medicinal product dossier (the Common Technical Document) with supporting information

prescribed by Directive 2001/20/EC, Directive 2005/28/EC, where relevant the implementing national provisions of the individual EU Member States and further detailed in applicable guidance documents.

In April 2014, the new Clinical Trials Regulation, (EU) No 536/2014 (Clinical Trials Regulation) was adopted. The Regulation was published on June 16, 2014 but is not expected to apply until 2019. The Clinical Trials Regulation will be directly applicable in all the EU Member States, repealing the current Clinical Trials Directive 2001/20/EC and replacing any national legislation that was put in place to implement the Directive. Conduct of all clinical trials performed in the EU will continue to be bound by currently applicable provisions until the new Clinical Trials Regulation becomes applicable. The extent to which on-going clinical trials will be governed by the Clinical Trials Regulation will depend on when the Clinical Trials Regulation becomes applicable and on the duration of the individual clinical trial. If a clinical trial continues for more than three years from the day on which the Clinical Trials Regulation becomes applicable the Clinical Trials Regulation will at that time begin to apply to the clinical trial.

The new Clinical Trials Regulation aims to simplify and streamline the approval of clinical trials in the EU. The main characteristics of the regulation include: a streamlined application procedure via a single entry point, the “EU Portal and Database”; a single set of documents to be prepared and submitted for the application as well as simplified reporting procedures for clinical trial sponsors; and a harmonized procedure for the assessment of applications for clinical trials, which is divided in two parts. Part I is assessed by the appointed reporting Member State, whose assessment report is submitted for review by the sponsor and all other competent authorities of all EU Member States in which an application for authorization of a clinical trial has been submitted (Concerned Member States). Part II is assessed separately by each Concerned Member State. Strict deadlines have been established for the assessment of clinical trial applications. The role of the relevant ethics committees in the assessment procedure will continue to be governed by the national law of the Concerned Member State. However, overall related timelines will be defined by the Clinical Trials Regulation.

PRIME Designation in the EU

In March 2016, the European Medicines Agency (EMA), launched an initiative to facilitate development of product candidates in indications, often rare, for which few or no therapies currently exist. The PRIority Medicines (PRIME), scheme 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. Importantly, a dedicated Agency contact and rapporteur from the Committee for Human Medicinal Products (CHMP) or Committee for Advanced Therapies are appointed early in PRIME scheme facilitating increased understanding of the product at EMA’s Committee level. A kick-off meeting initiates these relationships and includes a team of multidisciplinary experts at the EMA to provide guidance on the overall development and regulatory strategies.

Marketing Authorization

To obtain a marketing authorization for a product under EU regulatory systems, an applicant must submit an MAA, either under a centralized procedure administered by the EMA or one of the procedures administered by competent authorities in EU Member States (decentralized procedure, national procedure, or mutual recognition procedure). A marketing authorization may be granted only to an applicant established in the EU. Regulation (EC) No 1901/2006 provides that prior to obtaining a marketing authorization in the EU, applicants must demonstrate compliance with all measures included in an EMA-approved Pediatric Investigation Plan (PIP) covering all subsets of the pediatric population,

unless the EMA has granted a product-specific waiver, class waiver, or a deferral for one or more of the measures included in the PIP.

The centralized procedure provides for the grant of a single marketing authorization by the European Commission that is valid across the European Economic Area. Pursuant to Regulation (EC) No. 726/2004, the centralized procedure is compulsory for specific products, including for medicines produced by certain biotechnological processes, products designated as orphan medicinal products, ATMPs and products with a new active substance indicated for the treatment of certain diseases, including products for the treatment of cancer. For products with a new active substance indicated for the treatment of other diseases and products that are highly innovative or for which a centralized process is in the interest of patients, the centralized procedure may be optional. The centralized procedure may at the request of the applicant also be used in certain other cases. We anticipate that the centralized procedure will be mandatory for the product candidates we are developing.

Under the centralized procedure, the CHMP is also responsible for several post-authorization and maintenance activities, such as the assessment of modifications or extensions to an existing marketing authorization. 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. At the end of this period, the CHMP provides a scientific opinion on whether or not a marketing authorization should be granted in relation to a medicinal product. Within 15 calendar days of receipt of a final opinion from the CHMP, the European Commission must prepare a draft decision concerning an application for marketing authorization. This draft decision must take the opinion and any relevant provisions of EU law into account. Before arriving at a final decision on an application for centralized authorization of a medicinal product the European Commission must consult the Standing Committee on Medicinal Products for Human Use. The Standing Committee is composed of representatives of the EU Member States and chaired by a non-voting European Commission representative. The European Parliament also has a related “droit de regard”. The European Parliament’s role is to ensure that the European Commission has not exceeded its powers in deciding to grant or refuse to grant a marketing authorization.

The European Commission may grant a so-called “marketing authorization under exceptional circumstances”. Such authorization is intended for products for which the applicant can demonstrate that it is unable to provide comprehensive data on the efficacy and safety under normal conditions of use, because the indications for which the product in question is intended are encountered so rarely that the applicant cannot reasonably be expected to provide comprehensive evidence, or in the present state of scientific knowledge, comprehensive information cannot be provided, or it would be contrary to generally accepted principles of medical ethics to collect such information. Consequently, marketing authorization under exceptional circumstances may be granted subject to certain specific obligations, which may include the following:

- the applicant must complete an identified program of studies within a time period specified by the competent authority, the results of which form the basis of a reassessment of the benefit/risk profile;
- the medicinal product in question may be supplied on medical prescription only and may in certain cases be administered only under strict medical supervision, possibly in a hospital and in the case of a radiopharmaceutical, by an authorized person; and
- the package leaflet and any medical information must draw the attention of the medical practitioner to the fact that the particulars available concerning the medicinal product in question are as yet inadequate in certain specified respects.

A marketing authorization under exceptional circumstances is subject to annual review to reassess the risk-benefit balance in an annual reassessment procedure. Continuation of the authorization is linked to the annual reassessment and a negative assessment could potentially result in the marketing authorization being suspended or revoked. The renewal of a marketing authorization of a medicinal product under exceptional circumstances, however, follows the same rules as a “normal” marketing authorization. Thus, a marketing authorization under exceptional circumstances is granted for an initial five years, after which the authorization will become valid indefinitely, unless the EMA decides that safety grounds merit one additional five-year renewal.

The European Commission may also grant a so-called “conditional marketing authorization” prior to obtaining the comprehensive clinical data required for an application for a full marketing authorization. Such conditional marketing authorizations may be granted for product candidates (including medicines designated as orphan medicinal products), if (i) the risk-benefit balance of the product candidate is positive, (ii) it is likely that the applicant will be in a position to provide the required comprehensive clinical trial data, (iii) the product fulfills an unmet medical need and (iv) the benefit to public health of the immediate availability on the market of the medicinal product concerned outweighs the risk inherent in the fact that additional data are still required. A conditional marketing authorization may contain specific obligations to be fulfilled by the marketing authorization holder, including obligations with respect to the completion of ongoing or new studies, and with respect to the collection of pharmacovigilance data. Conditional marketing authorizations are valid for one year, and may be renewed annually, if the risk-benefit balance remains positive, and after an assessment of the need for additional or modified conditions and/or specific obligations. The timelines for the centralized procedure described above also apply with respect to the review by the CHMP of applications for a conditional marketing authorization.

The EU medicines rules expressly permit the EU Member States to adopt national legislation prohibiting or restricting the sale, supply or use of any medicinal product containing, consisting of or derived from a specific type of human or animal cell, such as embryonic stem cells. While the product candidates we have in development do not make use of embryonic stem cells, it is possible that the national laws in certain EU Member States may prohibit or restrict us from commercializing our product candidates, even if they have been granted an EU marketing authorization.

Unlike the centralized authorization procedure, the decentralized marketing authorization procedure requires a separate application to, and leads to separate approval by, the competent authorities of each EU Member State in which the product is to be marketed. This application is identical to the application that would be submitted to the EMA for authorization through the centralized procedure. The reference EU Member State prepares a draft assessment and drafts of the related materials within 120 days after receipt of a valid application. The resulting assessment report is submitted to the concerned EU Member States who, within 90 days of receipt, must decide whether to approve the assessment report and related materials. If a concerned EU Member State cannot approve the assessment report and related materials due to concerns relating to a potential serious risk to public health, disputed elements may be referred to the European Commission, whose decision is binding on all EU Member States.

The mutual recognition procedure similarly is based on the acceptance by the competent authorities of the EU Member States of the marketing authorization of a medicinal product by the competent authorities of other EU Member States. The holder of a national marketing authorization may submit an application to the competent authority of an EU Member State requesting that this authority recognize the marketing authorization delivered by the competent authority of another EU Member State.

Regulatory Data Protection in the EU

In the EU, innovative medicinal products 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 Directive 2001/83/EC. Regulation (EC) No 726/2004 repeats the

entitlement for medicinal products authorized in accordance with the centralized authorization procedure. Data exclusivity prevents applicants for authorization of generics of these innovative products from referencing the innovator's data to assess a generic (abridged) application for a period of eight years. During the additional two-year period of market exclusivity, a generic marketing authorization application can be submitted and authorized, and the innovator's data may be referenced, but no generic medicinal product can be placed on the EU market until the expiration of the market exclusivity. The overall ten-year period will be extended to a maximum of 11 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 their authorization, are held to bring a significant clinical benefit in comparison with existing therapies. Even if a compound is considered to be a new chemical 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, non-clinical tests and clinical trials.

Periods of Authorization and Renewals

A marketing authorization has an initial validity for five years in principle. The marketing authorization may be renewed after five years on the basis of a re-evaluation of the risk-benefit balance by the EMA or by the competent authority of the EU Member State. To this 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.

The European Commission or the competent authorities of the EU Member States may decide, on justified grounds relating to pharmacovigilance, to proceed with one further five-year period of marketing authorization. Once subsequently definitively renewed, the marketing authorization shall be valid for an unlimited period. Any authorization which is not followed by the actual placing of the medicinal product on the EU market (in case of centralized procedure) or on the market of the authorizing EU Member State within three years after authorization ceases to be valid (the so-called sunset clause).

Orphan Drug Designation and Exclusivity

Regulation (EC) No. 141/2000, as implemented by Regulation (EC) No. 847/2000 provides that a drug 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.

Once authorized, orphan medicinal products are entitled to 10 years of market exclusivity in all EU Member States and in addition a range of other benefits during the development and regulatory review process including scientific assistance for study protocols, authorization through the centralized marketing authorization procedure covering all member countries and a reduction or elimination of registration and marketing authorization fees. However, marketing authorization may be granted to a similar medicinal product with the same orphan indication during the 10-year period with the consent of the marketing authorization holder for the original orphan medicinal product or if the manufacturer of the original orphan medicinal product is unable to supply sufficient quantities. Marketing authorization may also be granted to a similar medicinal product with the same orphan indication if this product is safer, more effective or otherwise clinically superior to the original orphan medicinal product. The period of market exclusivity may, in addition, be reduced to six years if it can be demonstrated on the basis of available evidence that

the original orphan medicinal product is sufficiently profitable not to justify maintenance of market exclusivity.

Regulatory Requirements after a Marketing Authorization has been Obtained

In case an authorization for a medicinal product in the EU is obtained, 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 products. These include:

Regulatory Requirements after a Marketing Authorization has been Obtained

In case an authorization for a medicinal product in the EU is obtained, the holder of the marketing authorization is required to comply with a range of requirements applicable to the manufacturing, marketing, promotion and sale of medicinal products. These include:

- Compliance with the European Union's stringent pharmacovigilance or safety reporting rules must be ensured. These rules can impose post-authorization studies and additional monitoring obligations.
- The manufacturing of authorized medicinal products, for which a separate manufacturer's license is mandatory, must also be conducted in strict compliance with the applicable EU laws, regulations and guidance, including Directive 2001/83/EC, Directive 2003/94/EC, Regulation (EC) No 726/2004 and the European Commission Guidelines for Good Manufacturing Practice. These requirements include compliance with EU cGMP standards when manufacturing medicinal products and active pharmaceutical ingredients, including the manufacture of active pharmaceutical ingredients outside of the EU with the intention to import the active pharmaceutical ingredients into the EU.
- The marketing and promotion of authorized drugs, 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 notably under Directive 2001/83EC, as amended, and EU Member State laws. Direct-to-consumer advertising of prescription medicines is prohibited across the EU.

Brexit and the Regulatory Framework in the United Kingdom

On June 23, 2016, the electorate in the United Kingdom voted in favor of leaving the EU (commonly referred to as "Brexit"). Thereafter, on March 29, 2017, the country formally notified the EU of its intention to withdraw pursuant to Article 50 of the Lisbon Treaty. The withdrawal of the United Kingdom from the EU will take effect either on the effective date of the withdrawal agreement or, in the absence of agreement, two years after the United Kingdom provides a notice of withdrawal pursuant to the EU Treaty. Since the regulatory framework for pharmaceutical products in the United Kingdom covering 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 could materially impact the future regulatory regime which applies to products and the approval of product candidates in the United Kingdom. It remains to be seen how, if at all, Brexit will impact regulatory requirements for product candidates and products in the United Kingdom. There is a risk of disrupted import and export processes due to a lack of administrative processing capacity by the respective United Kingdom and EU customs agencies that may delay time-sensitive shipments required for our GMP manufacturing operations at Catapult's facility.

Pricing Decisions for Approved Products

In the EU, pricing and reimbursement schemes vary widely from country to country. Some 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 or so-called health technology assessments, in order to obtain reimbursement or pricing approval. For example, the EU provides options for its Member States to restrict the range of products for which their national health insurance systems provide reimbursement and to control the prices of medicinal products for human use. 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. Other Member States allow companies to fix their own prices for products, but 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 health care 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 Member States, and parallel trade, or 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 products, if approved in those countries.

Employees

As of March 15, 2019, we had 47 full-time employees and one part-time employee. Twenty two of our employees have Ph.D. or M.D. degrees and 38 of our employees are engaged in research and development activities.

Our Corporate Information

We were incorporated under the laws of the State of Delaware on May 29, 2015 under the name TCR^2, Inc. In November 2016, we changed our name to TCR^2 Therapeutics Inc. Our principal executive offices are located at 100 Binney Street, Suite 710, Cambridge, MA 02142, and our telephone number is (617) 949-5200. Our website address is www.tcr2.com. Our website and the information contained on, or that can be accessed through, the website will not be deemed to be incorporated by reference in, and are not considered part of, this Annual Report on Form 10-K.

In February 2019, we completed our initial public offering ("IPO") pursuant to which we issued and sold 5,750,000 shares of common stock at a public offering price of $15.00 per share, resulting in net proceeds of $80.2 million, after deducting underwriting discounts and commissions and other offering expenses. Upon the closing of the IPO, our outstanding redeemable convertible preferred stock automatically converted into shares of common stock.

See Part II-Item 7-Management’s Discussion and Analysis of Financial Condition and Results of Operations and Note 1 to the consolidated financial statements included in Part II-Item 8 for more information about the above-mentioned transactions.

We are an "emerging growth company" as defined in the Jumpstart Our Business Startups Act of 2012. We will remain an emerging growth company until the earlier of: (i) the last day of the fiscal year (a) following the fifth anniversary of the completion of the IPO, (b) in which we have total annual gross revenue of at least $1.07 billion, or (c) in which we are deemed to be a large accelerated filer, which means the market value of our common stock that is held by non-affiliates exceeds $700.0 million as of the prior June 30th, and (ii) the date on which we have issued more than $1.0 billion in non-convertible debt during the prior three-year period.

Available Information

Our Internet address is www.tcr2.com. Our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, including exhibits, proxy and information statements and amendments to those reports filed or furnished pursuant to Sections 13(a), 14, and 15(d) of the Securities Exchange Act of 1934, as amended, or the Exchange Act, are available through the "Investors" portion of our website free of charge as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC. Information on our website is not part of this Annual Report on Form 10-K or any of our other securities filings unless specifically incorporated herein by reference. In addition, our filings with the SEC may be accessed through the SEC's Interactive Data Electronic Applications system at www.sec.gov. All statements made in any of our securities filings, including all forward-looking statements or information, are made as of the date of the document in which the statement is included, and we do not assume or undertake any obligation to update any of those statements or documents unless we are required to do so by law.

Our code of conduct, corporate governance guidelines and the charters of our Audit Committee, Compensation Committee and Nominating and Corporate Governance Committee are available through our website at www.tcr2.com.

Item 1A. Risk Factors

Careful consideration should be given to the following risk factors, in addition to the other information set forth in this Annual Report on Form 10-K and in other documents that we file with the Securities and Exchange Commission, or SEC, in evaluating the Company and our business. Investing in our common stock involves a high degree of risk. If any of the following risks and uncertainties actually occurs, our business, prospects, financial condition and results of operations could be materially and adversely affected. The risks described below are not intended to be exhaustive and are not the only risks facing the Company. Additional risks and uncertainties not presently known to us or that we currently deem immaterial also may impact our business, prospects, financial condition and results of operations.

Risks Related to Our Financial Condition and Capital Requirements

Our limited 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 a clinical-stage immunotherapy company with a limited operating history. We commenced operations in May 2015, and our operations to date have been limited to organizing and staffing our company, business planning, raising capital, conducting discovery and research activities, filing patent applications, identifying potential product candidates, undertaking preclinical studies and establishing arrangements with third parties for the manufacture of initial quantities of our product candidates and component materials. Most of our product candidates are still in preclinical development. We have not yet demonstrated our ability to successfully initiate, conduct or complete any clinical trials, obtain marketing approvals, manufacture a commercial-scale product or arrange for a third party to do so on our behalf, or conduct sales, marketing and distribution activities necessary for successful product commercialization. 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.

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

We expect our financial condition and operating results to continue to fluctuate significantly from quarter to quarter and year to year due to a variety of factors, many of which are beyond our control. Accordingly, you should not rely upon the results of any quarterly or annual periods as indications of future operating performance.

We have incurred significant losses since inception, and we expect to incur losses over the next several years and may not be able to achieve or sustain revenues or profitability in the future.

Investment in biopharmaceutical product development is a highly speculative undertaking and entails substantial upfront capital expenditures and significant risk that any potential product candidate will fail to demonstrate adequate effect or an acceptable safety profile, gain regulatory approval and become commercially viable. We are still in the early stages of development of our product candidates. We have no products licensed for commercial sale and have not generated any revenue from product sales to date, and we continue to incur significant research and development and other expenses related to our ongoing operations. We have financed our operations primarily through private placements of our preferred stock and our initial public offering.

We have incurred significant net losses in each period since our inception in May 2015. For the year ended December 31, 2018, we incurred a net loss of $24.3 million. As of December 31, 2018, we had an accumulated deficit of $85.6 million. We expect to continue to incur significant losses for the foreseeable future, and we expect these losses to increase substantially if and as we:

- continue our research and development efforts and submit investigational new drug applications (INDs) for our lead product candidates;
- conduct preclinical studies and clinical trials for our current and future product candidates based on our TRuC-T cell platform;
- establish manufacturing capabilities for both clinical and commercial supplies of our product candidates;
- seek marketing approvals for any product candidates that successfully complete clinical trials;
- build commercial infrastructure to support sales and marketing for our product candidates;
- expand, maintain and protect our intellectual property portfolio;
- hire additional clinical, regulatory and scientific personnel; and
- operate as a public company.

Because of the numerous risks and uncertainties associated with pharmaceutical product development, we are unable to accurately predict the timing or amount of increased expenses we will incur or when, if ever, we will be able to achieve profitability. Even if we succeed in commercializing one or more of our product candidates, we will continue to incur substantial research and development and other expenditures to develop, seek regulatory approval for, and market additional product candidates. We may encounter unforeseen expenses, difficulties, complications, delays and other unknown factors that may adversely affect our business. The size of our future net losses will depend, in part, on the rate of future growth of our expenses and our ability to generate revenue. Our prior losses and expected future losses have had and will continue to have an adverse effect on our stockholders' equity and working capital.

We have not generated any revenue from our product candidates and may never be profitable.

Our ability to become profitable depends upon our ability to generate revenue. To date, we have not generated any revenue from any of our product candidates. We do not expect to generate significant revenue unless or until we successfully complete clinical development and obtain regulatory approval of, and then successfully commercialize, at least one of our product candidates. Other than TC-210, all of our product candidates are in the preclinical stages of development and will require additional preclinical studies, clinical development, regulatory review and approval, substantial investment, access to sufficient commercial manufacturing capacity and significant marketing efforts before we can generate any revenue from product sales. TC-210, our most advanced mono TRuC-T cell product candidate targeting mesothelin-positive solid tumors, is in the early stages of clinical development and has not yet been evaluated in clinical trials and will require additional regulatory review and approval, substantial investment, access to sufficient commercial manufacturing capacity and significant marketing efforts before we can generate any revenue from product sales. TC-110, our mono TRuC-T cell product candidate targeting CD19-positive B-cell hematological malignancies, and TC-220 have yet to complete IND-enabling studies. Our other TRuC-T cell product candidates are in early preclinical stages. We have not yet administered any of our product candidates in humans and, as such, we face significant translational risk as our product candidates advance to the clinical stage. Our ability to generate revenue depends on a number of factors, including, but not limited to:

- timely completion of our preclinical studies and clinical trials, which may be significantly slower or cost more than we currently anticipate and will depend substantially upon the performance of third-party contractors;
- our ability to complete IND-enabling studies and successfully submit INDs or comparable applications;
- whether we are required by the U.S. Food and Drug Administration (FDA) or similar foreign regulatory authorities to conduct additional clinical trials or other studies beyond those planned

to support the approval and commercialization of our product candidates or any future product candidates;
- our ability to demonstrate to the satisfaction of the FDA and similar foreign regulatory authorities the safety, potency, purity and acceptable risk to benefit profile of our product candidates or any future product candidates;
- the prevalence, duration and severity of potential side effects or other safety issues experienced with our product candidates or future product candidates, if any;
- the timely receipt of necessary marketing approvals from the FDA and similar foreign regulatory authorities;
- the willingness of physicians, operators of clinics and patients to utilize or adopt any of product candidates or future product candidates to treat solid tumors and hematological malignancies;
- our ability and the ability of third parties with whom we contract to manufacture adequate clinical and commercial supplies of our product candidates or any future product candidates, remain in good standing with regulatory authorities and develop, validate and maintain commercially viable manufacturing processes that are compliant with current good manufacturing practices (cGMP);
- our ability to successfully develop a commercial strategy and thereafter commercialize our product candidates or any future product candidates in the United States and internationally, if licensed for marketing, reimbursement, sale and distribution in such countries and territories, whether alone or in collaboration with others;
- patient demand for our product candidates and any future product candidates, if licensed; and
- our ability to establish and enforce intellectual property rights in and to our product candidates or any future product candidates.

Many of the factors listed above are beyond our control, and could cause us to experience significant delays or prevent us from obtaining regulatory approvals or commercialize our product candidates. Even if we are able to commercialize our product candidates, we may not achieve profitability soon after generating product sales, if ever. If we are unable to generate sufficient revenue through the sale of our product candidates or any future product candidates, we may be unable to continue operations without continued funding.

If we fail to obtain additional financing, we may be unable to continue our research and product development programs.

Our operations have consumed substantial amounts of cash since inception. We expect to continue to spend substantial amounts (including the net proceeds from our initial public offering, or IPO) to continue the clinical development of our product candidates, including our Phase 1/2 clinical trial of TC-210 and ongoing and planned IND-enabling studies for our other product candidates. If licensed, we will require significant additional amounts in order to launch and commercialize our product candidates.

We had cash, cash equivalents and short-term investments of approximately $123.2 million as of December 31, 2018. In February , we completed our initial public offering (IPO) raising approximately $80.2 million, inclusive of the exercise of the underwriters' overallotment option. Our existing cash, cash equivalents and short-term investments may not be sufficient to fund all of our efforts that we plan to undertake.

We believe that our existing cash, cash equivalents and short-term investments, will be sufficient to fund our operations at least into 2022. However, we have based this estimate on assumptions that may prove to be wrong. Additionally, changing circumstances may cause us to consume capital significantly faster than we currently anticipate, and we may need to spend more money than currently expected because of circumstances beyond our control. Accordingly, we will need to obtain substantial additional funding in connection with our continuing operations. We cannot be certain that additional funding will be available on acceptable terms, or at all. If we are unable to raise additional capital in sufficient amounts or on terms acceptable to us, we may have to significantly delay, scale back or discontinue our research and

development initiatives. We could be required to seek collaborators for our product candidates 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 our product candidates in markets where we otherwise would seek to pursue development or commercialization ourselves.

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.

Risks Related to the Development of Our Product Candidates

Our approach to the discovery and development of product candidates based on our TRuC-T cell platform represents a novel approach to cancer treatment, which creates significant challenges for us.

Our future success depends on the successful development of our product candidates, which target solid tumors and hematologic malignancies using the complete T cell receptor (TCR) complex without the need for human leukocyte antigen (HLA) matching. Advancing our product candidates based on our innovative TRuC-T cell platform creates significant challenges for us, including:

- educating medical personnel about the administration of TRuC-T cell therapies on a stand-alone basis or in combination with built-in immune and tumor modulators;
- educating medical personnel regarding the potential side effect profile of our product candidates, such as the potential adverse side effects related to cytokine release syndrome (CRS), neurotoxicity or autoimmune or rheumatologic disorders;
- administering chemotherapy to patients in advance of administering our product candidates, which may increase the risk of adverse side effects;
- sourcing clinical and, if licensed, commercial, supplies for the materials used to manufacture and process our product candidates;
- manufacturing viral vectors to deliver TRuC constructs to T cells;
- developing a robust and reliable TRuC-T cell manufacturing process as well as a complete shipment lifecycle and supply chain, including efficiently managing shipment of patient cells from and to clinical sites, minimizing potential contamination to the cell product and effectively scaling manufacturing capacity to meet demand;
- managing costs of inputs and other supplies while scaling production;
- using medicines to manage adverse side effects of our product candidates, which may not adequately control the side effects and/or may have a detrimental impact on the potency of the treatment;
- obtaining and maintaining regulatory approval from the FDA for our product candidates; and
- establishing sales and marketing capabilities upon obtaining any regulatory approval to gain market acceptance of a novel therapy.

In developing our product candidates, we have not exhaustively explored different options in the design of the TRuC construct and in the method for manufacturing TRuC-T cells. We may find our existing TRuC-T cells and manufacturing process may be substantially improved with future design or process changes, necessitating development of new or additional TRuC constructs and further clinical testing and delaying commercial launch of our first products. For example:

- We have made several TRuC constructs and used preclinical studies to select product candidates to advance into clinical trials. The preclinical studies are limited in their ability to predict behavior in patients. As we gain experience working with TRuC constructs, we may decide to select other TRuC constructs for clinical development.
- We have used a lentiviral vector to deliver the TRuC construct to T cells. In the future, we may find that another viral vector or non-viral transfer process offers advantages. Switching from

lentiviral to another delivery system would necessitate additional process development and clinical testing and delay the development of existing product candidates.
- The process by which patient cells are converted into a TRuC-T cell has many steps that can influence quality and activity. We have explored a subset of variables and expect to continue to improve and optimize the manufacturing process. Depending upon the nature of the process changes, we may be compelled to perform bridging studies and/or to re-start clinical development, causing delays in time to market and potentially introducing a risk of failure if new processes do not perform as expected.

We are very early in our development efforts. Most of our product candidates are still in preclinical development. If we are unable to advance our product candidates through 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. Most of our product candidates are still in preclinical development, and TC-210, our most advanced product candidate, is still in the early stages of clinical development. Our ability to generate product revenues, which we do not expect will occur for many years, if ever, will depend heavily on the successful development and eventual commercialization of one or more of our product candidates. The success of our product candidates will depend on several factors, including the following:

- successful completion of preclinical studies;
- successful initiation of clinical trials;
- successful patient enrollment in and completion of clinical trials;
- receipt and related terms of marketing approvals and licensures from applicable regulatory authorities;
- obtaining and maintaining patent and trade secret protection and regulatory exclusivity for our product candidates;
- making arrangements with third-party manufacturers, or establishing manufacturing capabilities, for both clinical and commercial supplies of our product candidates;
- establishing sales, marketing and distribution capabilities and launching commercial sales of our products, if and when approved, whether alone or in collaboration with others;
- acceptance of our products, if and when approved, by patients, the medical community and third-party payors;
- effectively competing with other cancer therapies;
- obtaining and maintaining third-party coverage and adequate reimbursement;
- maintaining a continued acceptable safety profile of our products following licensure; and
- effectively competing with other therapies.

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

We have no experience as a company in conducting clinical trials.

We have no experience as a company in conducting clinical trials. In part because of this lack of experience, we cannot be certain that our ongoing preclinical studies will be completed on time or if the planned preclinical studies and clinical trials will begin or be completed on time, if at all. Large-scale clinical trials would require significant additional financial and management resources and reliance on third-party clinical investigators, contract research organizations (CROs) and consultants. Relying on third-party clinical investigators, CROs and consultants may force us to encounter delays that are outside of our control.

Our business is highly dependent on our lead product candidates, TC-210 and TC-110, and we must complete IND-enabling studies and clinical testing before we can seek regulatory approval and begin commercialization of any of our product candidates.

There is no guarantee that any of our product candidates will proceed in preclinical or clinical development or achieve regulatory approval. The process for obtaining marketing approval for any product candidate is very long and risky and there will be significant challenges for us to address in order to obtain marketing approval as planned or, if at all.

There is no guarantee that the results obtained in current preclinical studies or our Phase 1/2 clinical trial of TC-210 or TC-110 will be sufficient to obtain regulatory approval or marketing authorization for such product candidates. Negative results in the development of our lead product candidates may also impact our ability to obtain regulatory approval for our other product candidates, either at all or within anticipated timeframes because, although other product candidates may target different indications, the underlying technology platform, manufacturing process and development process is the same for all of our product candidates. Accordingly, a failure in any one program may affect the ability to obtain regulatory approval to continue or conduct clinical programs for other product candidates.

In addition, because we have limited financial and personnel resources and are placing significant focus on the development of our lead product candidates, we may forgo or delay pursuit of opportunities with other future product candidates 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 other future product candidates for specific indications may not yield any commercially viable future product candidates. If we do not accurately evaluate the commercial potential or target market for a particular future product candidate, we may relinquish valuable rights to those future product candidates 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 future product candidates.

Our preclinical studies and clinical trials may fail to demonstrate adequately the safety, potency and purity of any of our product candidates, which would prevent or delay development, regulatory approval and commercialization.

Before obtaining regulatory approvals for the commercial sale of our product candidates, including TC-210 and TC-110, we must demonstrate through lengthy, complex and expensive preclinical studies and clinical trials that our product candidates are both safe and effective for use in each target indication. Preclinical and clinical testing is expensive and can take many years to complete, and its outcome is inherently uncertain. Failure can occur at any time during the preclinical study and clinical trial processes, and, because our product candidates are in an early stage of development, there is a high risk of failure and we may never succeed in developing marketable products. The results of preclinical studies and early clinical trials of our product candidates may not be predictive of the results of later-stage clinical trials. There is typically an extremely high rate of attrition from the failure of product candidates proceeding through preclinical studies and clinical trials. Product candidates in later stages of clinical trials may fail to show the desired safety, potency and purity profile despite having progressed through preclinical studies and initial clinical trials. A number of companies in the biopharmaceutical industry have suffered significant setbacks in advanced clinical trials due to lack of potency or efficacy, insufficient durability of potency or efficacy or unacceptable safety issues, notwithstanding promising results in earlier trials. Most product candidates that commence preclinical studies and clinical trials are never approved as products.

Any preclinical studies or clinical trials that we may conduct may not demonstrate the safety, potency and purity necessary to obtain regulatory approval to market our product candidates. If the results of our ongoing or future preclinical studies and clinical trials are inconclusive with respect to the safety, potency

and purity of our product candidates, if we do not meet the clinical endpoints with statistical and clinically meaningful significance, or if there are safety concerns associated with our product candidates, we may be prevented or delayed in obtaining marketing approval for such product candidates. In some instances, there can be significant variability in safety, potency or purity results between different preclinical studies and clinical trials of the same product candidate due to numerous factors, including changes in trial procedures set forth in protocols, differences in the size and type of the patient populations, changes in and adherence to the clinical trial protocols and the rate of dropout among clinical trial participants. Additionally, our preclinical studies comparing our product candidates to chimeric antigen receptor T (CAR-T) cells utilized CAR-T cells that we engineered, rather than the CAR-T cell therapies that are currently approved by the FDA. Although we believe, based on the results we observed in these preclinical studies, that our product candidates have the potential to improve upon the safety and efficacy of currently approved CAR-T cell therapies, these results may not be predictive of the outcome of our future preclinical studies and clinical trials, including any potential preclinical studies and clinical trials that may compare our product candidates to FDA-approved CAR-T cells.

Clinical development involves a lengthy and expensive process with an uncertain outcome, and results of earlier studies and trials may not be predictive of future clinical trial results. If our preclinical studies and clinical trials are not sufficient to support regulatory approval of any of our product candidates, we may incur additional costs or experience delays in completing, or ultimately be unable to complete, the development of such product candidate.

We cannot be certain that our preclinical study and clinical trial results will be sufficient to support regulatory approval of our product candidates. Clinical testing is expensive and can take many years to complete, and its outcome is inherently uncertain. Human clinical trials are expensive and difficult to design and implement, in part because they are subject to rigorous regulatory requirements. Failure or delay can occur at any time during the clinical trial process.

We may experience delays in obtaining the FDA's authorization to initiate clinical trials under future INDs, completing ongoing preclinical studies of our other product candidates, and initiating our planned preclinical studies and clinical trials. Additionally, we cannot be certain that preclinical studies or clinical trials for our product candidates will begin on time, not require redesign, enroll an adequate number of subjects on time, or be completed on schedule, if at all. Clinical trials can be delayed or terminated for a variety of reasons, including delays or failures related to:

- the FDA or comparable foreign regulatory authorities disagreeing as to the design or implementation of our clinical trials;
- delays in obtaining regulatory approval to commence a clinical trial;
- reaching agreement on acceptable terms with prospective CROs and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and clinical trial sites;
- obtaining institutional review board (IRB) approval at each clinical trial site;
- recruiting an adequate number of suitable patients to participate in a clinical trial;
- having subjects complete a clinical trial or return for post-treatment follow-up;
- clinical trial sites deviating from clinical trial protocol or dropping out of a clinical trial;
- addressing subject safety concerns that arise during the course of a clinical trial;
- adding a sufficient number of clinical trial sites; or
- obtaining sufficient product supply of product candidate for use in preclinical studies or clinical trials from third-party suppliers.

For example, in February 2019, we received a request from the FDA's Center for Devices and Radiological Health (CDRH) for the submission of an investigational device exemption (IDE) application regarding our use of a commercially available in vitro diagnostic assay for screening mesothelin expression in tumors. The CDRH subsequently determined that we did not need to submit an IDE application, but such a requirement, or other unexpected FDA requests, could lead to future delays of our

clinical trials. We may experience numerous adverse or unforeseen events during, or as a result of, preclinical studies and clinical trials that could delay or prevent our ability to receive marketing approval or commercialize our product candidates, including:

- we may receive feedback from regulatory authorities that requires us to modify the design of our clinical trials;
- clinical trials of our product candidates may produce negative or inconclusive results, and we may decide, or regulators may require us, to conduct additional clinical trials or abandon our research efforts for our other product candidates;
- the number of patients required for clinical trials of our product candidates may be larger than we anticipate, enrollment in these clinical trials may be slower than we anticipate or participants may drop out of our clinical trials at a higher rate than we anticipate;
- our third-party contractors may fail to comply with regulatory requirements, fail to maintain adequate quality controls or be unable to provide us with sufficient product supply to conduct and complete preclinical studies or clinical trials of our product candidates in a timely manner, or at all;
- we or our investigators might have to suspend or terminate clinical trials of our product candidates for various reasons, including non-compliance with regulatory requirements, a finding that our product candidates have undesirable side effects or other unexpected characteristics or a finding that the participants are being exposed to unacceptable health risks;
- the cost of clinical trials of our product candidates may be greater than we anticipate;
- the quality of our product candidates or other materials necessary to conduct preclinical studies or clinical trials of our product candidates may be insufficient or inadequate;
- regulators may revise the requirements for approving our product candidates, or such requirements may not be as we anticipate; and
- future collaborators may conduct clinical trials in ways they view as advantageous to them but that are suboptimal for us.

If we are required to conduct additional clinical trials or other testing of our product candidates beyond those that we currently contemplate, if we are unable to successfully complete clinical trials of our product candidates or other testing, if the results of these trials or tests are not positive or are only moderately positive or if there are safety concerns, our business and results of operations may be adversely affected and we may incur significant additional costs. In addition, costs to treat patients with relapsed or refractory cancer and to treat potential side effects that may result from our product candidates can be significant. Accordingly, our clinical trial costs are likely to be significantly higher than those for more conventional therapeutic technologies or drug product candidates.

We could also encounter delays if a clinical trial is suspended or terminated by us, by the IRBs of the institutions in which such clinical trials are being conducted, by the Data Safety Monitoring Board (DSMB) for such clinical trial or by the FDA or other regulatory authorities. Such authorities may suspend or terminate a clinical trial due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical trial protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from the product candidates, changes in governmental regulations or administrative actions or lack of adequate funding to continue the clinical trial.

If we experience delays in the completion, or termination, of any preclinical study or clinical trial of our product candidates, the commercial prospects of our product candidates may be harmed, and our ability to generate revenues from any of these product candidates will be delayed or not realized at all. In addition, any delays in completing our preclinical studies or clinical trials may increase our costs, slow down our product candidate development and approval process and jeopardize our ability to commence product sales and generate revenues. Any of these occurrences may significantly harm our business, financial condition and prospects. In addition, many of the factors that cause, or lead to, a delay in the

commencement or completion of clinical trials may also ultimately lead to the denial of regulatory approval of our product candidates. If one or more of our product candidates generally prove to be ineffective, unsafe or commercially unviable, our entire pipeline and TRuC-T cell platform would have little, if any, value, which would have a material and adverse effect on our business, financial condition, results of operations and prospects.

We may rely on third parties to manufacture our clinical product supplies, and we may rely on third parties to produce and process our product candidates, if licensed.

We do not currently own any facility that may be used as our clinical scale manufacturing and processing facility and expect to rely on outside vendors to manufacture supplies and process our product candidates. We have not yet caused any product candidates to be manufactured or processed on a commercial scale and may not be able to do so for any of our product candidates. We plan to make changes as we work to optimize the manufacturing process. For example, we may switch or be required to switch from research-grade materials to commercial-grade materials in order to get regulatory approval of our product candidates. We cannot be sure that even minor changes in the process will result in therapies that are safe and effective and licensed for commercial sale.

The facilities used by our contract manufacturers to manufacture our product candidates must be approved by the FDA or other foreign regulatory authorities following inspections that will be conducted after we submit an application to the FDA or other foreign regulatory authorities. We may not control the manufacturing process of, and may be completely dependent on, our contract manufacturing partners for compliance with cGMPs and any other regulatory requirements of the FDA or other regulatory authorities for the manufacture of our product candidates. We have no control over the ability of our contract manufacturers to maintain adequate quality control, quality assurance and qualified personnel. If the FDA or a comparable foreign regulatory authority does not approve these facilities for the manufacture of our product candidates or if it withdraws any approval in the future, we may need to find alternative manufacturing facilities, which would significantly impact our ability to develop, obtain regulatory approval for or market our product candidates, if licensed.

We cannot guarantee that our product candidates will show any functionality in the solid tumor microenvironment.

There are no approved CAR-T or engineered TCR-T cell immunotherapies for solid tumors. We believe our TruC-T cell product candidates will be effective against solid tumors. While we plan to develop product candidates for use in solid tumors, including TC-210, we cannot guarantee that our product candidates will show any functionality in the solid tumor microenvironment. The cellular environment in which solid tumor cells thrive is generally hostile to T cells due to factors such as the presence of immunosuppressive cells, humoral factors and limited access to nutrients. Our TRuC-T cell-based product candidates may not be able to access the solid tumor, and even if they do, they may not be able to exert anti-tumor effects in a hostile tumor microenvironment. In addition, the safety profile of our product candidates may differ in a solid tumor setting. As a result, our product candidates may not demonstrate potency in solid tumors. If we are unable to make our product candidates function in solid tumors, our development plans and business may be significantly harmed.

Since the number of patients that we plan to dose in our Phase 1/2 clinical trial of TC-210 is small, the results from such clinical trial, once completed, may be less reliable than results achieved in larger clinical trials, which may hinder our efforts to obtain regulatory approval for our product candidates.

In our Phase 1/2 clinical trial of TC-210, we plan to evaluate the safety profile of TC-210 and establish the recommended Phase 2 dose in approximately 50 patients with non-small cell lung cancer (NSCLC), ovarian cancer, malignant pleural/peritoneal mesothelioma and cholangiocarcinoma. The preliminary results of clinical trials with smaller sample sizes, such as our Phase 1/2 clinical trial of TC-210, can be

disproportionately influenced by various biases associated with the conduct of small clinical trials, such as the potential failure of the smaller sample size to accurately depict the features of the broader patient population, which limits the ability to generalize the results across a broader community, thus making the clinical trial results less reliable than clinical trials with a larger number of patients. As a result, there may be less certainty that such product candidates would achieve a statistically significant effect in any future clinical trials. If we conduct any future clinical trials of TC-210, we may not achieve a statistically significant result or the same level of statistical significance, if any, that we might have anticipated based on the results observed in our initial Phase 1/2 clinical trial.

We may not be able to file INDs or IND amendments to commence additional clinical trials on the timelines we expect, and even if we are able to, the FDA may not permit us to proceed.

We expect to submit an IND for TC-110 in the second half of 2019 and for TC-220 in the first half of 2020. However, we may not be able to file such INDs on the timelines we expect. For example, we may experience manufacturing delays or other delays with IND-enabling studies. In July 2018, for example, a power failure that occurred during a manufacturing run to produce virus for our Phase 1/2 clinical trial of TC-210 caused us to abandon that manufacturing run and resulted in a month-long delay in the process of manufacturing the requisite virus to support our IND filing for TC-210 and consequently a delay in the IND filing itself. Moreover, we cannot be sure that submission of an IND will result in the FDA allowing further clinical trials to begin, or that, once begun, issues will not arise that suspend or terminate clinical trials. Additionally, even if such regulatory authorities agree with the design and implementation of the clinical trials set forth in an IND, we cannot guarantee that such regulatory authorities will not change their requirements in the future. These considerations also apply to new clinical trials we may submit as amendments to existing INDs.

Our product candidates may cause undesirable side effects or have other properties that could halt their clinical development, prevent their regulatory approval, require expansion of the trial size, limit their commercial potential, or result in significant negative consequences.

Undesirable side effects caused by our product candidates could cause us or regulatory authorities, including IRBs, to interrupt, delay, or halt clinical trials and could result in a more restrictive label or the delay or denial of regulatory approval by the FDA or other comparable foreign regulatory authorities. Further, clinical trials by their nature utilize a sample of the potential patient population. With a limited number of subjects and limited duration of exposure, rare and severe side effects of our product candidates may only be uncovered with a significantly larger number of patients exposed to the drug. Because of our planned dose escalation design for our clinical trials, undesirable side effects could also result in an expansion in the size of our clinical trials, increasing the expected costs and timeline of our clinical trials. Additionally, results of our clinical trials could reveal a high and unacceptable severity and prevalence of side effects or unexpected characteristics, which may stem from our therapies specifically or may be due to an illness from which the clinical trial subject is suffering.

Autoimmunity may occur after TRuC-T cell treatment. TRuC-T cells are generated from a patient's own T cells isolated from their peripheral blood. There is a theoretical risk that this process will expand a patient's own T cell that has autoreactivity, or that may recognize healthy cells, and upon re-infusion may trigger an autoimmune reaction resulting in damage to normal tissues and potentially even death.

Autoimmune reaction triggered by an interaction between a patient's naturally occurring antibodies and engineered T cells is a theoretical safety risk of product candidates we develop using our TRuC-T cell platform. If a patient's self-generated antibodies were directed to a target expressed on the surface of cells in normal tissue (autoantibodies), engineered T cells would be directed to attack these same tissues, potentially resulting in off-tumor effects. These autoantibodies may be present whether or not the patient has an active autoimmune disease. In our clinical testing, we plan to take steps to minimize the likelihood that this occurs, for example by excluding patients with a history of severe autoimmune disease from our

trials. There is no guarantee, however, that we will not observe autoimmune reactions in the future and no guarantee that if we do, that we will be able to implement interventions to address the risk.

Immunogenicity, which is the reaction between a patient's immune system and a foreign protein outside of the autoimmune context, is an additional theoretical safety risk of product candidates we develop using our TRuC-T cell platform. Patients' immune systems may recognize the TRuC construct on the TRuC-T cell as a foreign protein and fight against it, potentially rendering it ineffective, or even provoking an allergic/anaphylactoid response or other adverse side effects. The immunogenic potential of novel therapeutics like TRuC-T cells is difficult to predict. There is no guarantee that we will not observe immunogenic reactions in the future and no guarantee that if we do, that we will be able to implement interventions to address the risk.

If unacceptable toxicities arise in the development of our product candidates, we could suspend or terminate our clinical trials or the FDA or comparable foreign regulatory authorities, or local regulatory authorities such as IRBs, could order us to cease clinical trials. Competent national health authorities, such as the FDA, could also deny approval of our product candidates for any or all targeted indications. Treatment-related side effects could also affect patient recruitment or the ability of enrolled patients to complete the clinical trial or result in potential product liability claims. In addition, these side effects may not be appropriately recognized or managed by the treating medical staff, as toxicities resulting from T cell therapy are not normally encountered in the general patient population and by medical personnel. We expect to have to train medical personnel using our product candidates to understand the side effect profile of our product candidates for both our planned clinical trials and upon any commercialization of any product candidates, if licensed. Inadequate training in recognizing or managing the potential side effects of our product candidates could result in patient deaths. Any of these occurrences may significantly harm our business, financial condition and prospects.

Our product candidates may target healthy cells expressing target antigens leading to potentially fatal adverse effects.

Our product candidates target specific antigens that are also expressed on healthy cells. For example, our lead product candidate, TC-210, targets mesothelin, an antigen commonly found on mesotheliomas, ovarian cancers, and NSCLC, as well in healthy cells that line the pleura, pericardium and peritoneum. TC-110 targets CD19, which is overexpressed in several cancers including B-cell leukemias and lymphomas, but is also expressed by normal B-cells. Our product candidates may target healthy cells, leading to serious and potentially fatal adverse effects. In our Phase 1/2 clinical trial of TC-210, we plan to use a dose escalation model to closely monitor the effect of TC-210 on vital organs and other potential side effects. In clinical testing of TC-110, we also plan to closely monitor the effect of TC-110 on normal B-cells that express CD19 and for other side effects. Even though we intend to closely monitor the side effects of our product candidates in both preclinical studies and clinical trials, we cannot guarantee that products will not target and kill healthy cells.

Our product candidates may have serious and potentially fatal cross-reactivity to other peptides or protein sequences within the body.

Our product candidates may recognize and bind to a peptide unrelated to the target antigen to which it is designed to bind. If this peptide is expressed within normal tissues, our product candidates may target and kill the normal tissue in a patient, leading to serious and potentially fatal adverse effects. Detection of any cross-reactivity may halt or delay any ongoing clinical trials for any TRuC-T cell based product candidate and prevent or delay regulatory approval. Unknown cross-reactivity of the TRuC-T cell binding domain to related proteins could also occur. We have also developed a preclinical screening process to identify cross-reactivity of the TRuC-T cell binders. Any cross-reactivity that impacts patient safety could materially impact our ability to advance our product candidates into clinical trials or to proceed to marketing approval and commercialization.

The viral vectors used to manufacture our TRuC-T cells may incorrectly modify the genetic material of a patient's T cells, potentially triggering the development of a new cancer or other adverse events.

Our TRuC-T cells are manufactured by using a viral vector to insert genetic information encoding the TRuC construct into the patient's T cells. The TRuC construct is then integrated into the natural TCR complex and transported to the surface of the patient's T cells. Because the viral vector modifies the genetic information of the T cell, there is a theoretical risk that modification will occur in the wrong place in the T cell's genetic code, leading to vector-related insertional oncogenesis, and causing the T cell to become cancerous. If the cancerous T cell is then administered to the patient with the TRuC-T cells, the cancerous T cell could trigger the development of a new cancer in the patient. We use lentiviral vectors to insert genetic information into T cells, which we believe have a lower risk of insertional oncogenesis as opposed to other types of viral vectors. However, the risk of insertional oncogenesis remains a concern for gene therapy and we cannot assure that it will not occur in any of our ongoing or planned preclinical studies or clinical trials. There is also the potential risk of delayed adverse events following exposure to gene therapy products due to persistent biological activity of the genetic material or other components of vectors used to carry the genetic material. The FDA has stated that lentiviral vectors possess characteristics that may pose high risks of delayed adverse events. If any such adverse events occur, further advancement of our preclinical studies or clinical trials could be halted or delayed, which would have a material adverse effect on our business and operations.

If we encounter difficulties enrolling patients in our clinical trials, our clinical development activities could be delayed or otherwise adversely affected.

We may experience difficulties in patient enrollment in our clinical trials for a variety of reasons. The timely completion of clinical trials in accordance with their protocols depends on, among other things, our ability to enroll a sufficient number of patients who remain in the clinical trial until its conclusion. The enrollment of patients depends on many factors, including:

- the patient eligibility criteria defined in the clinical trial protocol;
- the size of the patient population required for analysis of the clinical trial's primary endpoints;
- the proximity of patients to clinical trial sites;
- the design of the clinical trial;
- our ability to recruit clinical trial investigators with the appropriate competencies and experience;
- our ability to obtain and maintain patient consents;
- reporting of the preliminary results of any of our clinical trials; and
- the risk that patients enrolled in clinical trials will drop out of the clinical trials before the manufacturing and infusion of our product candidates or clinical trial completion.

In addition, our clinical trials will compete with other clinical trials for product candidates that are in the same therapeutic areas as our product candidates, and this competition will reduce the number and types of patients available to us because some patients who might have opted to enroll in our clinical trials may instead opt to enroll in a clinical trial being conducted by one of our competitors. Since the number of qualified clinical investigators is limited, we expect to conduct some of our clinical trials at the same clinical trial sites that some of our competitors use, which will reduce the number of patients who are available for our clinical trials at such clinical trial sites. Moreover, because our product candidates represent a departure from more commonly used methods for cancer treatment, potential patients and their doctors may be inclined to use conventional therapies, such as chemotherapy and hematopoietic stem cell transplantation, rather than enroll patients in any future clinical trial. Additionally, because some of our clinical trials are in patients with relapsed/refractory cancer, the patients are typically in the late stages of their disease and may experience disease progression independent from our product candidates, making them unevaluable for purposes of the clinical trial and requiring additional patient enrollment.

Delays in completing patient enrollment may result in increased costs or may affect the timing or outcome of our ongoing and planned clinical trials, which could prevent completion or commencement of these clinical trials and adversely affect our ability to advance the development of our product candidates.

Manufacturing and administering our product candidates is complex and we may encounter difficulties in production, particularly with respect to process development or scaling up of our manufacturing capabilities. If we encounter such difficulties, our ability to provide supply of our TRuC-T cells for clinical trials or for commercial purposes could be delayed or stopped.

The process of manufacturing and administering our product candidates is complex and highly regulated. The manufacture of our product candidates involves complex processes, including the manufacture of a lentiviral delivery vector containing the genetic information for our TRuC construct and manufacturing T cells containing the TRuC construct for the final product candidates. More specifically, the manufacture of our product candidates includes harvesting white blood cells from the patient, isolating certain T cells from the white blood cells, combining patient T cells with our lentiviral delivery vector through a process known as transduction, expanding the transduced T cells to obtain the desired dose, and ultimately infusing the modified T cells back into the patient's body. As a result of the complexities entailed in this process, our manufacturing and supply costs are likely to be higher than those at more traditional manufacturing processes and the manufacturing process is less reliable and more difficult to reproduce. Additionally, the number of facilities that are capable of harvesting patients' cells for the manufacture of our product candidates and other autologous cell therapy products and product candidates is limited. As the number of autologous cell therapy products and product candidates increases, the limited number of facilities capable of harvesting patients' cells could result in delays in the manufacture and administration of our product candidates.

We rely on third parties for the manufacture of our lentiviral vectors and our product candidates. These third-party manufacturers may incorporate their own proprietary processes into our lentiviral vector and product candidate manufacturing processes. We have limited control and oversight of a third party's proprietary process, and a third party may elect to modify its process without our consent or knowledge. These modifications could negatively impact our manufacturing, including product loss or failure that requires additional manufacturing runs or a change in manufacturer, both of which could significantly increase the cost of and significantly delay the manufacture of our product candidates.

Our manufacturing process is and will be susceptible to product loss or failure due to logistical issues, including manufacturing issues associated with the differences in patients' white blood cells, interruptions in the manufacturing process, contamination, equipment or reagent failure, power failures, supplier error and variability in patient characteristics. For example, in July 2018, a power failure that occurred during a manufacturing run to produce virus for our Phase 1/2 clinical trial of TC-210 caused us to abandon that run, and resulted in a month-long delay in the process of manufacturing the requisite virus to support our IND filing for TC-210 and consequently a delay in the IND filing itself. Even minor deviations from normal manufacturing processes could result in reduced production yields, product defects and other supply disruptions. If for any reason we lose a patient's white blood cells, or such material gets contaminated or processing steps fail at any point, the manufacturing process of the TRuC-T cells for that patient will need to be restarted and the resulting delay may adversely affect that patient's outcome. If microbial, viral or other contaminations are discovered in our product candidates or in the manufacturing facilities in which our product candidates are made or administered, such manufacturing facilities may need to be closed for an extended period of time to investigate and remedy the contamination.

As our product candidates progress through preclinical studies and clinical trials towards licensure and commercialization, it is expected that various aspects of the manufacturing and administration process will be altered in an effort to optimize processes and results. We have already identified some improvements to our manufacturing and administration processes, but these changes may not achieve the intended objectives, and could cause our product candidates to perform differently and affect the results of planned clinical trials or other future clinical trials. In addition, such changes may require

amendments to be made to regulatory applications which may further delay the timeframes under which modified manufacturing processes can be used for any of our product candidates.

Developing a commercially viable process is a difficult and uncertain task, and there are risks associated with scaling to the level required for advanced clinical trials or commercialization, including, among others, increased costs, potential problems with process scale-out, process reproducibility, stability issues, lot consistency, and timely availability of reagents or raw materials. In addition, changes to our manufacturing process may also require further review and approval by the FDA, leading to delays in our clinical trials. Competitors have had difficulty reliably producing T-cell therapies in the commercial setting. If we experience similar challenges manufacturing product candidates to approved specifications, this may limit our product candidates' utilization and our ability to receive payment for these product candidates once approved. We may ultimately be unable to reduce the expenses associated with our product candidates to levels that will allow us to achieve a profitable return on investment.

We do not have our own clinical-scale manufacturing facility and are currently reliant on a limited number of manufacturers for our lentiviral vector and a single manufacturer to provide our needs for producing our TRuC-T cell product candidates. We are in the process of adding manufacturing capacity to support larger clinical trials for our product candidates and have contracted with Cell Therapy Catapult Limited (Catapult) to occupy a suite in their GMP manufacturing center in Stevenage, United Kingdom, which we expect to be operational in the second half of 2019. We plan to pursue additional manufacturing capacity in the United States and in Europe to meet our future demands and may build our own manufacturing capabilities to meet the patient demand for our product candidates. These third-party manufacturing providers may not be able to provide adequate resources or capacity to meet our needs.

We plan to establish our own manufacturing facility and infrastructure in addition to or in lieu of relying on third parties for the manufacture of our product candidates and the use of third-party manufacturing suites, which will be costly, time-consuming, and which may not be successful.

We are in the process of adding manufacturing capacity within Catapult's GMP manufacturing center for our larger clinical trials and we may establish our own commercial manufacturing facility to mitigate our reliance on third-party vendors and ensure we can manage the supply chain, change control and reduction of costs and other benefits. The establishment of our own commercial manufacturing facility would be a costly and time-consuming process that we expect to require additional capital to fund and take several years before becoming operational.

We have no experience as a company in setting up, building or managing a manufacturing facility or manufacturing suite, and may never be successful in developing our own manufacturing suite, manufacturing facility or manufacturing capability. We will need to hire additional personnel to manage our operations and facilities and develop the necessary infrastructure to continue the research and development, and eventual commercialization, if approved, of our product candidates. If we fail to recruit the required personnel and generally manage our growth effectively or fail to select the correct location, the development and production of our product candidates could be curtailed or delayed. Even if we are successful in establishing a manufacturing suite or manufacturing facility, our manufacturing capabilities could be affected by cost-overruns, unexpected delays, equipment failures, labor shortages, natural disasters, power failures and numerous other factors that could prevent us from realizing the intended benefits of our manufacturing strategy and have a material adverse effect on our business.

In addition, the FDA, the European Medicines Agency (EMA) and other foreign regulatory authorities may require us to submit samples of any lot of any licensed product together with the protocols showing the results of applicable tests at any time. Under some circumstances, the FDA, the EMA or other foreign regulatory authorities may require that we not distribute a lot until the relevant 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 product launches or clinical trials, which

could be costly to us and otherwise harm our business, financial condition, results of operations and prospects. Problems in our manufacturing process could restrict our ability to meet market demand for our products.

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

Any problems in our manufacturing process or facilities 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.

We may have difficulty validating our manufacturing process as we manufacture TRuC-T cells from an increasingly diverse patient population for our clinical trials.

During our development of the manufacturing process, our TRuC-T cells have demonstrated consistency from lot to lot and from donor to donor. However, our sample size is small and the starting material is from healthy donors. Once we have experience with working with white blood cells taken from our patient population, we may encounter unforeseen difficulties due to starting with material from donors who are not healthy, including challenges inherent in harvesting white blood cells from unhealthy patients.
Although we believe our current manufacturing process is scalable for commercialization, we may encounter challenges in validating our process due to the heterogeneity of the product starting material. However, we anticipate that during the early phases of our clinical trials we will be able to adapt our process to account for these differences resulting in a more robust process. We cannot guarantee that any other issues relating to the heterogeneity of the starting material will not impact our ability to commercially manufacturing our product candidates.

The market opportunities for our product candidates may be relatively small as it will be limited to those patients who are ineligible for or have failed prior treatments and our estimates of the prevalence of our target patient populations may be inaccurate.

Cancer therapies are sometimes characterized as first line, second line, or third line, and the FDA often approves new therapies initially only for a particular line of use. When cancer is detected early enough, first line therapy is sometimes adequate to cure the cancer or prolong life without a cure. Whenever first line therapy, usually chemotherapy, antibody drugs, tumor-targeted small molecules, hormone therapy, radiation therapy, surgery, or a combination of these, proves unsuccessful, second line therapy may be administered. Second line therapies often consist of more chemotherapy, radiation, antibody drugs, tumor-targeted small molecules, or a combination of these. Third line therapies can include hematopoietic stem cell transplantation in certain cancers, chemotherapy, antibody drugs and small molecule tumor-targeted therapies, more invasive forms of surgery and new technologies. We expect to initially seek approval of our product candidates in most instances at least as a second or third line therapy, for use in patients with relapsed or refractory metastatic cancer. Subsequently, for those product candidates that prove to be sufficiently safe and beneficial, if any, we would expect to seek approval as a second line therapy and potentially as a first line therapy, but there is no guarantee that our product candidates, even if licensed as a second or third or subsequent line of therapy, would be licensed for an earlier line of therapy, and, prior to any such approvals, we may have to conduct additional clinical trials. Consequently, the potentially addressable patient population for our product candidates may be extremely limited or may not be amenable to treatment with our product candidates.

Our projections of both the number of people who have the cancers we are targeting, as well as the subset of people with these cancers in a position to receive a particular line of therapy and who have the potential to benefit from treatment with our product candidates, are based on our beliefs and estimates. These estimates have been derived from a variety of sources, including scientific literature, surveys of clinics, patient foundations or market research, and may prove to be incorrect. Further, new therapies

may change the estimated incidence or prevalence of the cancers that we are targeting. Consequently, even if our product candidates are approved for a second or third line of therapy, the number of patients that may be eligible for treatment with our product candidates may turn out to be much lower than expected.

Our product candidates rely on the use of protein binding domains, or binders, to target specific cancers, which we may develop or which may be developed by third parties. We are limited in our ability to apply our product candidates to a wider range of potential target cancers by our ability to develop, partner for or acquire these binders on commercially reasonable terms.

TRuC-T cell therapies require the use of antigen-specific protein binding domains, or binders, which guide the TRuC-T cells and bind to the antigens on the surface of a tumor to target specific types of cancers. Our ability to develop and commercialize our product candidates will depend on our ability to develop these binders or partner for such binders on commercially reasonable terms for use in clinical trials as well as the availability of such binders for use in commercialized products, if licensed. For example, we have a non-exclusive license for the mesothelin binder incorporated into the TRuC construct for TC-210 from Harpoon Therapeutics, Inc. (Harpoon). However, we cannot be certain that our Harpoon license or potential future collaborations will provide us with a steady supply of binders that we can utilize in combination with the TRuC construct to develop future product candidates. If we are unable to enter into such collaborations on commercially reasonable terms or fail to realize the benefits of any such collaboration, we may be limited to using antibody fragments that we are able to independently develop which may limit the ability of our product candidates to target and kill cancer cells.

The failure to enter into a successful collaboration or to develop our own binders may delay our development timelines, increase our costs and jeopardize our ability to develop future product candidates as a commercially viable drug, which could result in delays in product development and harm our business.

We currently have no marketing and sales organization and have no experience in marketing products. If we are unable to establish marketing and sales capabilities or enter into agreements with third parties to market and sell our product candidates, if licensed, we may not be able to generate product revenue.

We currently have no sales, marketing or distribution capabilities and have no experience in marketing products. We intend to develop an in-house marketing organization and sales force, which will require significant capital expenditures, management resources and time. We will have to compete with other pharmaceutical and biotechnology companies to recruit, hire, train and retain marketing and sales personnel.

If we are unable or decide not to establish internal sales, marketing and distribution capabilities, we will pursue collaborative arrangements regarding the sales and marketing of our products, if licensed. However, there can be no assurance that we will be able to establish or maintain such collaborative arrangements, or if we are able to do so, that they will have effective sales forces. Any revenue we receive will depend upon the efforts of such third parties, which may not be successful. We may have little or no control over the marketing and sales efforts of such third parties and our revenue from product sales may be lower than if we had commercialized our product candidates ourselves. We also face competition in our search for third parties to assist us with the sales and marketing efforts of our product candidates.

There can be no assurance that we will be able to develop in-house sales and distribution capabilities or establish or maintain relationships with third-party collaborators to commercialize any product in the United States or overseas.

A variety of risks associated with marketing our product candidates internationally could materially adversely affect our business.

We plan to seek regulatory approval of our product candidates outside of the United States and, accordingly, we expect that we will be subject to additional risks related to operating in foreign countries if we obtain the necessary approvals, including:

- differing regulatory requirements in foreign countries;
- unexpected changes in tariffs, trade barriers, price and exchange controls and other regulatory requirements;
- economic weakness, including inflation, or political instability in particular foreign economies and markets;
- compliance with tax, employment, immigration and labor laws for employees living or traveling abroad;
- foreign taxes, including withholding of payroll taxes;
- foreign currency fluctuations, which could result in increased operating expenses and reduced revenue, and other obligations incident to doing business in another country;
- difficulties staffing and managing foreign operations;
- workforce uncertainty in countries where labor unrest is more common than in the United States;
- potential liability under the Foreign Corrupt Practices Act of 1977 or comparable foreign regulations;
- challenges enforcing our contractual and intellectual property rights, especially in those foreign countries that do not respect and protect intellectual property rights to the same extent as the United States;
- production shortages resulting from any events affecting raw material supply or manufacturing capabilities abroad; and
- business interruptions resulting from geo-political actions, including war and terrorism.

These and other risks associated with international operations may materially adversely affect our ability to attain or maintain profitable operations.

We face significant competition, and our operating results will suffer if we fail to compete effectively.

The biopharmaceutical industry is characterized by intense competition and rapid innovation. Our competitors may be able to develop other products or drugs that are able to achieve similar or better results. Our potential competitors include larger biotechnology and pharmaceutical companies with greater resources than us, academic institutions, governmental agencies, public and private research institutions and early stage or smaller companies. Many of our competitors have substantially greater financial, technical and other resources, such as larger research and development staff, experienced marketing and manufacturing organizations and well-established sales forces. In addition, many of these competitors are active in seeking patent protection and licensing arrangements in anticipation of collecting royalties for use of technology that they have developed. Mergers and acquisitions in the biotechnology and pharmaceutical industries may result in even more resources being concentrated in our competitors. Competition may increase further as a result of advances in the commercial applicability of technologies and greater availability of capital for investment in these industries. Our competitors, either alone or with collaborative partners, may succeed in developing, acquiring or licensing on an exclusive basis drug or biologic products that are more effective, safer, more easily commercialized or less costly than our product candidates or may develop proprietary technologies or secure patent protection that we may need for the development of our technologies and products. We believe the key competitive factors that will affect the development and commercial success of our product candidates are safety, potency, purity, tolerability, reliability, convenience of use, price and reimbursement.

Specifically, we face significant competition from companies developing chimeric antigen receptor, TCR, and T cell directed bispecific antibody technologies, including Novartis AG, Gilead Sciences, Inc., Celgene Corporation, Amgen Inc., F. Hoffmann-La Roche Ltd, bluebird bio, Inc., Bayer AG, Selecta Biosciences, Inc., Adaptimmune Therapeutics PLC, Regeneron Pharmaceuticals, Inc., Allogene Therapeutics, Inc., Autolus Therapeutics plc, Eureka Therapeutics, Inc., Atara Biotherapeutics Inc., Crispr Therapeutics AG, Precision BioSciences, Inc., Pfizer Inc., Novimmune SA, and Triumvira Immunologics Inc. Even if we obtain regulatory approval of our product candidates, the availability and price of our competitors' products could limit the demand and the price we are able to charge for our product candidates. We may not be able to implement our business plan if the acceptance of our product candidates is inhibited by price competition or the reluctance of physicians to switch from existing methods of treatment to our product candidates, or if physicians switch to other new drug or biologic products or choose to reserve our product candidates for use in limited circumstances. For additional information regarding our competition, see "Business—Competition."

Risks Related to Government Regulation

The FDA regulatory approval process is lengthy and time-consuming, and we may experience significant delays in the clinical development and regulatory approval of our product candidates.

We have not previously submitted a Biologics License Application (BLA) to the FDA or similar licensure applications to comparable foreign regulatory authorities. A BLA must include extensive preclinical and clinical data and supporting information to establish the product candidate's safety, purity and potency for each desired indication. The BLA must also include significant information regarding the manufacturing controls for the product. We expect the novel nature of our product candidates to create further challenges in obtaining regulatory approval. Accordingly, the regulatory approval pathway for our product candidates may be uncertain, complex, expensive and lengthy, and licensure may not be obtained.

We may also experience delays in completing planned clinical trials for a variety of reasons, including delays related to:

- the availability of financial resources to commence and complete the planned trials;
- reaching agreement on acceptable terms with prospective CROs and clinical trial sites, the terms of which can be subject to extensive negotiation and may vary significantly among different CROs and clinical trial sites;
- obtaining approval at each clinical trial site by an IRB or ethics committee;
- recruiting suitable patients to participate in a clinical trial;
- having patients complete a clinical trial or return for post-treatment follow-up;
- clinical trial sites deviating from trial protocol or dropping out of a trial;
- adding new clinical trial sites; or
- manufacturing sufficient quantities of qualified materials under cGMPs, including current Good Tissue Practices (cGTPs), and applying them on a subject by subject basis for use in clinical trials.

We could also experience delays if physicians encounter unresolved ethical issues associated with enrolling patients in clinical trials of our product candidates in lieu of prescribing existing treatments that have established safety, efficacy, potency and purity profiles. Further, a clinical trial may be suspended or terminated by us, the IRBs for the institutions in which such trials are being conducted, the Data Monitoring Committee for such trial, or by the FDA or other regulatory authorities due to a number of factors, including failure to conduct the clinical trial in accordance with regulatory requirements or our clinical protocols, inspection of the clinical trial operations or trial site by the FDA or other regulatory authorities resulting in the imposition of a clinical hold, unforeseen safety issues or adverse side effects, failure to demonstrate a benefit from using a product candidate, changes in governmental regulations or administrative actions or lack of adequate funding to continue the clinical trial. If we experience termination of, or delays in the completion of, any clinical trial of our product candidates, the commercial

prospects for our product candidates will be harmed, and our ability to generate product revenue will be delayed. In addition, any delays in completing our clinical trials will increase our costs, slow down our product development and approval process and jeopardize our ability to commence product sales and generate revenue.

Securing regulatory approval also requires the submission of information about the biologic manufacturing process and inspection of manufacturing facilities by the relevant regulatory authority. The FDA or comparable foreign regulatory authorities may fail to approve our manufacturing processes or facilities, whether run by us or our commercial manufacturing organizations (CMOs). In addition, if we make manufacturing changes to our product candidates in the future, we may need to conduct additional preclinical studies to bridge our modified product candidates to earlier versions.

Many of the factors that cause, or lead to, a delay in the commencement or completion of clinical trials may ultimately lead to the denial of regulatory approval of our product candidates.

We may be unable to obtain regulatory approval for our product candidates under applicable regulatory requirements. The denial or delay of any such approval would delay commercialization of our product candidates and adversely impact our potential to generate revenue, our business and our results of operations.

The research, testing, manufacturing, labeling, licensure, sale, marketing and distribution of biologic products are subject to extensive regulation by the FDA and other regulatory authorities in the United States and other countries, and such regulations differ from country to country. We are not permitted to market our product candidates in the United States or in any foreign countries until they receive the requisite licensure from the applicable regulatory authorities of such jurisdictions.

The FDA or any foreign regulatory authorities can delay, limit or deny licensure of our product candidates for many reasons, including:

- our inability to demonstrate to the satisfaction of the FDA or the applicable foreign regulatory authority that any of our product candidates are safe, potent and pure;
- the FDA's or the applicable foreign regulatory agency's disagreement with our trial protocol or the interpretation of data from preclinical studies or clinical trials;
- our inability to demonstrate that the clinical and other benefits of any of our product candidates outweigh any safety or other perceived risks;
- the FDA's or the applicable foreign regulatory agency's requirement for additional preclinical studies or clinical trials;
- the results of clinical trials may not meet the level of statistical significance required by the FDA or comparable foreign regulatory authorities for licensure;
- the FDA's or the applicable foreign regulatory agency's failure to approve the manufacturing processes or facilities of third-party manufacturers upon which we rely;
- the potential for approval policies or regulations of the FDA or the applicable foreign regulatory authorities to significantly change in a manner rendering our clinical data insufficient for licensure;
- the data collected from clinical trials of our product candidates may not be sufficient to the satisfaction of the FDA or comparable foreign regulatory authorities to support the submission of a BLA or other comparable submission in foreign jurisdictions or to obtain licensure of our product candidates in the United States or elsewhere; or
- the approval policies or regulations of the FDA or comparable foreign regulatory authorities may significantly change in a manner rendering our clinical data insufficient for approval.

Any of these factors, many of which are beyond our control, may result in our failing to obtain regulatory approval to market any of our product candidates, which would significantly harm our business, results of operations, and prospects. Of the large number of biological products in development, only a small

percentage successfully complete the FDA or other regulatory approval processes and are commercialized. Even if we eventually complete clinical testing and receive licensure from the FDA or applicable foreign regulatory authorities for any of our product candidates, the FDA or the applicable foreign regulatory agency may grant licensure contingent on the performance of costly additional clinical trials which may be required after licensure. The FDA or the applicable foreign regulatory agency also may license our product candidates for a more limited indication or a narrower patient population than we originally requested, and the FDA, or applicable foreign regulatory agency, may not license our product candidates with the labeling that we believe is necessary or desirable for the successful commercialization of such product candidates.

In addition, even if the trials are successfully completed, preclinical and clinical data are often susceptible to varying interpretations and analyses, and we cannot guarantee that the FDA or comparable foreign regulatory authorities will interpret the results as we do, and more clinical trials could be required before we submit our product candidates for approval. To the extent that the results of the clinical trials are not satisfactory to the FDA or comparable foreign regulatory authorities for support of a marketing application, approval of our product candidates may be significantly delayed, or we may be required to expend significant additional resources, which may not be available to us, to conduct additional clinical trials in support of potential approval of our product candidates.

Any delay in obtaining, or inability to obtain, applicable regulatory approval would delay or prevent commercialization of our product candidates and would materially adversely impact our business and prospects.

We may seek orphan drug status for TC-210, TC-110 and some of our other future product candidates, but we may be unable to obtain such designations or to maintain the benefits associated with orphan drug status, including market exclusivity, which may cause our revenue, if any, to be reduced.

Under the Orphan Drug Act, the FDA may grant orphan designation to a drug or biologic intended to treat a rare disease or condition, defined as a disease or condition with a patient population of fewer than 200,000 in the United States, or a patient population greater than 200,000 in the United States when there is no reasonable expectation that the cost of developing and making available the drug or biologic in the United States will be recovered from sales in the United States for that drug or biologic. Orphan drug designation must be requested before submitting a BLA. In the United States, orphan drug designation entitles a party to financial incentives such as opportunities for grant funding towards clinical trial costs, tax advantages and user-fee waivers. After the FDA grants orphan drug designation, the generic identity of the drug and its potential orphan use are disclosed publicly by the FDA. Orphan drug designation does not convey any advantage in, or shorten the duration of, the regulatory review and approval process.

If a product that has orphan drug designation subsequently receives the first FDA approval for a particular active ingredient for the disease for which it has such designation, the product is entitled to orphan product exclusivity, which means that the FDA may not approve any other applications, including a BLA, to market the same biologic for the same indication for seven years, except in limited circumstances such as a showing of clinical superiority to the product with orphan drug exclusivity or if FDA finds that the holder of the orphan drug exclusivity has not shown that it can assure the availability of sufficient quantities of the orphan drug to meet the needs of patients with the disease or condition for which the drug was designated. As a result, even if one of our product candidates receives orphan exclusivity, the FDA can still approve other drugs that have a different active ingredient for use in treating the same indication or disease. Furthermore, the FDA can waive orphan exclusivity if we are unable to manufacture sufficient supply of our product.

We have applied for orphan drug designation for the treatment of malignant mesothelioma with TC-210 and we may seek orphan drug designation for TC-210, TC-110 and some or all of our other future product candidates in additional orphan indications in which there is a medically plausible basis for the use of

these products, including cholangiocarcinoma. Even when we obtain orphan drug designation, exclusive marketing rights in the United States may be limited if we seek licensure for an indication broader than the orphan designated indication and may be lost if the FDA later determines that the request for designation was materially defective or if the manufacturer is unable to assure sufficient quantities of the product to meet the needs of patients with the rare disease or condition. In addition, although we intend to seek orphan drug designation for other product candidates, we may never receive such designations.

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

A Breakthrough Therapy designation by the FDA, even if granted for any of our product candidates, may not lead to a faster development or regulatory review or approval process and it does not increase the likelihood that our product candidates will receive marketing approval.

We plan to seek a Breakthrough Therapy designation for TC-210 and TC-110 and may seek Breakthrough Therapy designation for some or all of our future product candidates. A breakthrough therapy is defined as a drug or biologic that is intended, alone or in combination with one or more other drugs or biologics, to treat a serious or life-threatening disease or condition and preliminary clinical evidence indicates that the drug, or biologic, may demonstrate substantial improvement over existing therapies on one or more clinically significant endpoints, such as substantial treatment effects observed early in clinical development. For product candidates that have been designated as breakthrough therapies, interaction and communication between the FDA and the sponsor of the trial can help to identify the most efficient path for clinical development while minimizing the number of patients placed in ineffective control regimens. Biologics designated as breakthrough therapies by the FDA may also be eligible for other expedited approval programs, including Accelerated Approval.

Designation as a breakthrough therapy is within the discretion of the FDA. Accordingly, even if we believe one of our product candidates meets the criteria for designation as a breakthrough therapy, the FDA may disagree and instead determine not to make such designation. In any event, the receipt of a Breakthrough Therapy designation for a product candidate may not result in a faster development process, review or licensure compared to candidate products considered for licensure under non-expedited FDA review procedures and does not assure ultimate approval by the FDA. In addition, even if one or more of our product candidates qualify as breakthrough therapies, the FDA may later decide that the product no longer meets the conditions for qualification. Thus, even though we intend to seek Breakthrough Therapy designation for TC-210 and some or all of our future product candidates for the treatment of various cancers, there can be no assurance that we will receive breakthrough therapy designation.

A Fast Track designation by the FDA, even if granted for TC-210, TC-110 or any other future product candidate(s), may not lead to a faster development or regulatory review or approval process, and does not increase the likelihood that our product candidates will receive marketing approval.

If a drug is intended for the treatment of a serious or life-threatening condition and the drug demonstrates the potential to address unmet medical needs for this condition, the drug sponsor may apply for FDA Fast Track designation for a particular indication. We plan to seek Fast Track designation for TC-210 and TC-110 and may seek Fast Track designation for certain of our future product candidates, but there is no

assurance that the FDA will grant this status to any of our proposed product candidates. Marketing applications filed by sponsors of products in Fast Track development may qualify for priority review under the policies and procedures offered by the FDA, but the Fast Track designation does not assure any such qualification or ultimate marketing approval by the FDA. The FDA has broad discretion whether or not to grant Fast Track designation, so even if we believe a particular product candidate is eligible for this designation, there can be no assurance that the FDA would decide to grant it. Even if we do receive Fast Track designation, we may not experience a faster development process, review or licensure compared to conventional FDA procedures, and receiving a Fast Track designation does not provide assurance of ultimate FDA approval. In addition, the FDA may withdraw Fast Track designation if it believes that the designation is no longer supported by data from our clinical development program. In addition, the FDA may withdraw any Fast Track designation at any time.

Accelerated approval by the FDA, even if granted for TC-210 and TC-110 or any other future product candidates, may not lead to a faster development or regulatory review or approval process and it does not increase the likelihood that our product candidates will receive marketing approval.

We plan to seek approval of TC-210 and TC-110, and may seek approval of future product candidates using FDA's accelerated approval pathway. A product may be eligible for accelerated approval if it treats a serious or life-threatening condition and generally provides a meaningful advantage over available therapies. In addition, it must demonstrate an effect on a surrogate endpoint that is reasonably likely to predict clinical benefit or on a clinical endpoint that can be measured earlier than irreversible morbidity or mortality (IMM) that is reasonably likely to predict an effect on IMM or other clinical benefit. As a condition of approval, the FDA may require that a sponsor of a drug or biologic receiving accelerated approval perform adequate and well-controlled post-marketing clinical trials. These confirmatory trials must be completed with due diligence. In addition, the FDA currently requires as a condition for accelerated approval pre-approval of promotional materials, which could adversely impact the timing of the commercial launch of the product. Even if we do receive accelerated approval, we may not experience a faster development or regulatory review or approval process, and receiving accelerated approval does not provide assurance of ultimate FDA approval.

Obtaining and maintaining regulatory approval of our product candidates in one jurisdiction does not mean that we will be successful in obtaining regulatory approval of our product candidates in other jurisdictions.

Obtaining and maintaining regulatory approval of our product candidates in one jurisdiction does not guarantee that we will be able to obtain or maintain regulatory approval in any other jurisdiction, while a failure or delay in obtaining regulatory approval in one jurisdiction may have a negative effect on the regulatory approval process in others. For example, even if the FDA grants marketing approval of a product candidate, comparable regulatory authorities in foreign jurisdictions must also approve the manufacturing, marketing and promotion of the product candidate in those countries. Approval and licensure procedures vary among jurisdictions and can involve requirements and administrative review periods different from, and greater than, those in the United States, including additional preclinical studies or clinical trials as clinical trials conducted in one jurisdiction may not be accepted by regulatory authorities in other jurisdictions. In many jurisdictions outside the United States, a product candidate must be approved for reimbursement before it can be approved for sale in that jurisdiction. In some cases, the price that we intend to charge for our products is also subject to approval.

We may also submit marketing applications in other countries. Regulatory authorities in jurisdictions outside of the United States have requirements for approval of product candidates with which we must comply prior to marketing in those jurisdictions. Obtaining foreign regulatory approvals and compliance with foreign regulatory requirements could result in significant delays, difficulties and costs for us and could delay or prevent the introduction of our products in certain countries. If we fail to comply with the regulatory requirements in international markets and/or receive applicable marketing approvals, our target

market will be reduced and our ability to realize the full market potential of our product candidates will be harmed.

Even if we receive regulatory approval of our product candidates, we will be subject to ongoing regulatory obligations and continued regulatory review, which may result in significant additional expense and we may be subject to penalties if we fail to comply with regulatory requirements or experience unanticipated problems with our product candidates.

Any regulatory approvals that we receive for our product candidates will require surveillance to monitor the safety, potency and purity of the product candidate. The FDA may also require a risk evaluation and mitigation strategy in order to license our product candidates, which could entail requirements for a medication guide, physician communication plans or additional elements to ensure safe use, such as restricted distribution methods, patient registries and other risk minimization tools. In addition, if the FDA or a comparable foreign regulatory authority approves our product candidates, the manufacturing processes, labeling, packaging, distribution, adverse event reporting, storage, advertising, promotion, import, export and recordkeeping for our product candidates will be subject to extensive and ongoing regulatory requirements. These requirements include submissions of safety and other post-marketing information and reports, registration, as well as continued compliance with cGMPs, cGTPs and good clinical practices (GCPs) for any clinical trials that we conduct post-licensure. Later discovery of previously unknown problems with our product candidates, including adverse events of unanticipated severity or frequency, or with our third-party manufacturers or manufacturing processes, or failure to comply with regulatory requirements, may result in, among other things:

- restrictions on the marketing or manufacturing of our product candidates, withdrawal of the product from the market or voluntary or mandatory product recalls;
- revisions to the labeling, including limitation on approved uses or the addition of additional warnings, contraindications or other safety information, including boxed warnings;
- imposition of a Risk Evaluation and Mitigation Strategy (REMS), which may include distribution or use restrictions;
- requirements to conduct additional post-market clinical trials to assess the safety of the product;
- fines, warning letters or holds on clinical trials;
- refusal by the FDA to approve pending applications or supplements to approved applications filed by us or suspension or revocation of license approvals;
- product seizure or detention, or refusal to permit the import or export of our product candidates; and
- injunctions or the imposition of civil or criminal penalties.

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

Coverage and reimbursement may be limited or unavailable in certain market segments for our product candidates, which could make it difficult for us to sell our product candidates, if licensed, profitably.

In both domestic and foreign markets, successful sales of our product candidates, if licensed, will depend on the availability of adequate coverage and reimbursement from third-party payors. In addition, because our product candidates represent new approaches to the treatment of cancer, we cannot accurately estimate the potential revenue from our product candidates.

Patients who are provided medical treatment for their conditions generally rely on third-party payors to reimburse all or part of the costs associated with their treatment. Adequate coverage and reimbursement from governmental healthcare programs, such as Medicare and Medicaid, and commercial payors is critical to new product acceptance.

Government authorities and third-party payors, such as private health insurers and health maintenance organizations, decide which drugs and treatments they will cover and the amount of reimbursement. Reimbursement by a third-party payor may depend upon a number of factors, including, but not limited to, 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 approval of a product from a government or other third-party payor is a time-consuming and costly process that could require us to provide to the payor supporting scientific, clinical and cost-effectiveness data for the use of our products. Even if we obtain coverage for a given product, the resulting reimbursement payment rates might not be adequate for us to achieve or sustain profitability or may require co-payments that patients find unacceptably high. Patients are unlikely to use our product candidates unless coverage is provided and reimbursement is adequate to cover a significant portion of the cost of our product candidates.

In the United States, no uniform policy of coverage and reimbursement for products exists among third-party payors. Therefore, coverage and reimbursement for products can differ significantly from payor to payor. As a result, the coverage determination process is often a time-consuming and costly process that will require us to provide scientific and clinical support for the use of our product candidates to each payor separately, with no assurance that coverage and adequate reimbursement will be obtained.

We intend to seek approval to market our product candidates in both the United States and in selected foreign jurisdictions. If we obtain licensure in one or more foreign jurisdictions for our product candidates, we will be subject to rules and regulations in those jurisdictions. In some foreign countries, particularly those in the European Union (EU), the pricing of biologics is subject to governmental control. In these countries, pricing negotiations with governmental authorities can take considerable time after obtaining marketing approval of a product candidate. In addition, market acceptance and sales of our product candidates will depend significantly on the availability of adequate coverage and reimbursement from third-party payors for our product candidates and may be affected by existing and future healthcare reform measures.

Third-party payors, whether domestic or foreign, or governmental or commercial, are developing increasingly sophisticated methods of controlling healthcare costs. In both the United States and certain foreign jurisdictions, there have been a number of legislative and regulatory changes to the healthcare system that could impact our ability to sell our products profitably. In particular, in 2010, Patient Protection and Affordable Care Act as amended by the Health Care and Education Reconciliation Act of 2010 (collectively, the Affordable Care Act) was enacted. The Affordable Care Act and its implementing regulations, among other things, revised the methodology by which rebates owed by manufacturers to the state and federal government for covered outpatient drugs and certain biologics, including our product candidates, under the Medicaid Drug Rebate Program are calculated, increased the minimum Medicaid rebates owed by most manufacturers under the Medicaid Drug Rebate Program, extended the Medicaid Drug Rebate Program to utilization of prescriptions of individuals enrolled in Medicaid managed care organizations, subjected manufacturers to new annual fees and taxes for certain branded prescription drugs and provided incentives to programs that increase the federal government's comparative effectiveness research.

Members of the U.S. Congress and the Trump administration have expressed an intent to pass legislation or adopt executive orders to fundamentally change or repeal parts of the Affordable Care Act. While Congress has not passed repeal legislation to date, the Tax Cuts and Jobs Act of 2017 (TCJA) repealed, effective January 1, 2019, the tax-based shared responsibility payment imposed by the Affordable Care Act on certain individuals who fail to maintain qualifying health coverage for all or part of a year that is commonly referred to as the “individual mandate.” On December 14, 2018, a federal district court in Texas ruled that upon the repeal of the shared responsibility payment, the ACA’s individual mandate will become unconstitutional. The court further ruled that the individual mandate is not severable from the remaining provisions of the Affordable Care Act, and that the remaining provisions are therefore invalid. The court, however, did not grant an injunction against enforcement of the Affordable Care Act. An appeal of the decision is expected.

Further, on January 20, 2017, President Trump signed an Executive Order directing federal agencies with authorities and responsibilities under the Affordable Care Act to waive, defer, grant exemptions from, or delay the implementation of any provision of the Affordable Care Act that would impose a fiscal burden on states or a cost, fee, tax, penalty or regulatory burden on individuals, healthcare providers, health insurers, or manufacturers of pharmaceuticals or medical devices. On October 13, 2017, President Trump signed an Executive Order terminating the cost-sharing subsidies that reimburse insurers under the Affordable Care Act. Several state Attorneys General filed suit to stop the administration from terminating the subsidies, but their request for a restraining order was denied by a federal judge in California on October 25, 2017. In addition, the Centers for Medicare & Medicaid Services (CMS) within the U.S. Department of Health and Human Services (HHS) has recently proposed regulations that would give states greater flexibility in setting benchmarks for insurers in the individual and small group marketplaces, which may have the effect of relaxing the essential health benefits required under the Affordable Care Act for plans sold through such marketplaces. There may be further changes to the Affordable Care Act as a result of new legislation or further executive, administrative or judicial action.

Other legislative changes have been proposed and adopted in the United States since the Affordable Care Act was enacted. In August 2011, the Budget Control Act of 2011, among other things, created measures for spending reductions by Congress. A Joint Select Committee on Deficit Reduction, tasked with recommending a targeted deficit reduction of at least $1.2 trillion for the years 2013 through 2021, was unable to reach required goals, thereby triggering the legislation’s automatic reduction to several government programs. This includes aggregate reductions of Medicare payments to providers up to 2% per fiscal year. In January 2013, President Obama signed into law the American Taxpayer Relief Act of 2012 (ATRA), which delayed for another two months the budget cuts mandated by these sequestration provisions of the Budget Control Act of 2011. In March 2013, President Obama signed an executive order implementing sequestration, and in April 2013, the 2% Medicare payment reductions went into effect. ATRA also, among other things, reduced Medicare payments to several providers, including hospitals, imaging centers and cancer treatment centers, and increased the statute of limitations period for the government to recover overpayments to providers from three to five years.

In addition, on May 11, 2018, the Trump administration issued a plan to lower drug prices. Under this blueprint for action, the Trump administration indicated that HHS will: take steps to end the use of regulatory and patent processes by drug makers to protect their products from competition; advance biosimilars and generics to boost price competition; evaluate the inclusion of prices in drug makers’ ads to enhance price competition; speed access to and lower the cost of new drugs by clarifying policies for sharing information between insurers and drug makers; avoid excessive pricing by relying more on value-based pricing by expanding outcome-based payments in Medicare and Medicaid; work to give Part D plan sponsors more negotiation power with drug makers; examine which Medicare Part B drugs could be negotiated for a lower price by Part D plans, and improving the design of the Part B Competitive Acquisition Program; update Medicare’s drug-pricing dashboard to increase transparency; prohibit Part D contracts that include “gag rules” that prevent pharmacists from informing patients when they could pay

less out-of-pocket by not using insurance; and require that Part D plan members be provided with an annual statement of plan payments, out-of-pocket spending, and drug price increases.

At the state level, individual states are increasingly aggressive in passing legislation and implementing regulations designed to control pharmaceutical and biological product pricing, including price or patient reimbursement constraints, discounts, restrictions on certain product access and marketing cost disclosure and transparency measures, and, in some cases, designed to encourage importation from other countries and bulk purchasing. In addition, regional health care authorities and individual hospitals are increasingly using bidding procedures to determine what pharmaceutical products and which suppliers will be included in their prescription drug and other health care programs. These measures could reduce the ultimate demand for our products, once licensed, or put pressure on our product pricing.

We expect that additional state and federal healthcare reform measures will be adopted in the future, any of which could limit the amounts that federal and state governments will pay for healthcare products and services, which could result in reduced demand for our product candidates or additional pricing pressures.

The impact of recent healthcare reform legislation and other changes in the healthcare industry and in healthcare spending on us is currently unknown, and may adversely affect our business model.

Our revenue prospects could be affected by changes in healthcare spending and policy in the United States and abroad. We operate in a highly regulated industry and new laws, regulations or judicial decisions, or new interpretations of existing laws, regulations or decisions, related to healthcare availability, the method of delivery or payment for healthcare products and services could negatively impact our business, operations and financial condition.

There have been, and likely will continue to be, legislative and regulatory proposals at the foreign, federal and state levels directed at broadening the availability of healthcare and containing or lowering the cost of healthcare. We cannot predict the initiatives that may be adopted in the future, including repeal, replacement or significant revisions to the Affordable Care Act. The continuing efforts of the government, insurance companies, managed care organizations and other payors of healthcare services to contain or reduce costs of healthcare and/or impose price controls may adversely affect:

- the demand for our product candidates, if we obtain regulatory approval;
- our ability to set a price that we believe is fair for our products;
- our ability to obtain coverage and reimbursement approval for a product;
- our ability to generate revenue and achieve or maintain profitability;
- the level of taxes that we are required to pay; and
- the availability of capital.

Any reduction in reimbursement from Medicare or other government programs may result in a similar reduction in payments from private payors, which may adversely affect our future profitability.

Regulatory requirements in the United States and abroad governing cell therapy products have changed frequently and may continue to change in the future, which could negatively impact our ability to complete clinical trials and commercialize our product candidates in a timely manner, if at all.

Regulatory requirements in the United States and abroad governing cell therapy products have changed frequently and may continue to change in the future. The FDA has established the Office of Tissues and Advanced Therapies within its Center for Biologics Evaluation and Research to consolidate the review of gene therapy and related products, and has established the Cellular, Tissue and Gene Therapies Advisory Committee, among others, to advise this review. Recently, the National Institutes of Health

proposed to revise its guidelines for overseeing gene therapy research, including deleting the protocol registration and reporting requirements for certain therapies and eliminating Recombinant DNA Advisory Committee review and reporting requirements for human gene transfer research.

Inadequate funding for the FDA, the SEC and other government agencies could hinder their ability to hire and retain key leadership and other personnel, prevent new products and services from being developed or commercialized in a timely manner or otherwise prevent those agencies from performing normal business functions on which the operation of our business may rely, which could negatively impact our business.

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

Disruptions at the FDA and other agencies may also slow the time necessary for new drugs to be reviewed and/or approved by necessary government agencies, which would adversely affect our business. For example, over the last several years the U.S. government has shut down several times and certain regulatory agencies, such as the FDA and the SEC, have had to furlough critical FDA, SEC and other government employees and stop critical activities. If a prolonged government shutdown occurs, it could significantly impact the ability of the FDA to timely review and process our regulatory submissions, which could have a material adverse effect on our business. Further, in our operations as a public company, future government shutdowns could impact our ability to access the public markets and obtain necessary capital in order to properly capitalize and continue our operations.

Our employees, independent contractors, consultants, commercial partners and vendors may engage in misconduct or other improper activities, including noncompliance with regulatory standards and requirements.

We are exposed to the risk of employee fraud or other illegal activity by our employees, independent contractors, consultants, commercial partners and vendors. Misconduct by these parties could include intentional, reckless and/or negligent conduct that fails to: comply with the regulations of the FDA and other similar foreign regulatory authorities, provide true, complete and accurate information to the FDA and other similar foreign regulatory authorities, comply with manufacturing standards we have established, comply with healthcare fraud and abuse laws in the United States and similar foreign fraudulent misconduct laws or report financial information or data accurately or to disclose unauthorized activities to us. If we obtain FDA approval of any of our product candidates and begin commercializing those products in the United States, our potential exposure under such laws and regulations will increase significantly, and our costs associated with compliance with such laws and regulations are also likely to increase. These laws may impact, among other things, our current activities with principal investigators and research patients, as well as proposed and future sales, marketing and education programs. In particular, the promotion, sales and marketing of healthcare items and services, as well as certain business arrangements in the healthcare industry, are subject to extensive laws designed to prevent fraud, kickbacks, self-dealing and other abusive practices. These laws and regulations may restrict or prohibit a wide range of pricing, discounting, marketing and promotion, structuring and commission(s), certain customer incentive programs and other business arrangements generally. Activities subject to these laws also involve the improper use of information obtained in the course of patient recruitment for clinical trials. The laws that may affect our ability to operate include, but are not limited to:

- the federal Anti-Kickback Statute, which prohibits, among other things, knowingly and willfully soliciting, receiving, offering or paying any remuneration (including any kickback, bribe, or rebate), directly or indirectly, overtly or covertly, in cash or in kind, to induce, or in return for,

either the referral of an individual, or the purchase, lease, order or recommendation of any good, facility, item or service for which payment may be made, in whole or in part, under a federal healthcare program, such as the Medicare and Medicaid programs;

- federal civil and criminal false claims laws and civil monetary penalty laws, which prohibit, among other things, individuals or entities from knowingly presenting, or causing to be presented, claims for payment or approval from Medicare, Medicaid, or other third-party payors that are false or fraudulent or knowingly making a false statement to improperly avoid, decrease or conceal an obligation to pay money to the federal government;
- the federal Health Insurance Portability and Accountability Act of 1996 (HIPAA), which created new federal criminal statutes that prohibit knowingly and willfully executing, or attempting to execute, a scheme to defraud any healthcare benefit program or obtain, by means of false or fraudulent pretenses, representations, or promises, any of the money or property owned by, or under the custody or control of, any healthcare benefit program, regardless of the payor (for example, public or private) and knowingly and willfully falsifying, concealing or covering up by any trick or device a material fact or making any materially false statements in connection with the delivery of, or payment for, healthcare benefits, items or services relating to healthcare matters;
- HIPAA, as amended by the Health Information Technology for Economic and Clinical Health Act of 2009 (HITECH), and their respective implementing regulations, which impose requirements on certain covered healthcare providers, health plans, and healthcare clearinghouses as well as their respective business associates that perform services for them that involve the use, or disclosure of, individually identifiable health information, relating to the privacy, security and transmission of individually identifiable health information without appropriate authorization;
- the federal Physician Payment Sunshine Act, created under the Affordable Care Act and its implementing regulations, which require manufacturers of drugs, devices, biologicals and medical supplies for which payment is available under Medicare, Medicaid or the Children's Health Insurance Program (with certain exceptions) to report annually to HHS information related to payments or other transfers of value made to physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors) and teaching hospitals, as well as ownership and investment interests held by physicians and their immediate family members; and
- federal consumer protection and unfair competition laws, which broadly regulate marketplace activities and activities that potentially harm consumers.

Additionally, we are subject to state and foreign equivalents of each of the healthcare laws described above, among others, some of which may be broader in scope and may apply regardless of the payor.

We have adopted a code of business conduct and ethics, but it is not always possible to identify and deter employee misconduct, and the precautions we take to detect and prevent inappropriate conduct may not be effective in controlling unknown or unmanaged risks or losses or in protecting us from governmental investigations or other actions or lawsuits stemming from a failure to be in compliance with such laws or regulations.

Efforts to ensure that our business arrangements with third parties will comply with applicable healthcare laws and regulations will involve substantial costs. Because of the breadth of these laws and the narrowness of the statutory exceptions and safe harbors available, it is possible that some of our business activities could be subject to challenge under one or more of such laws. It is possible that governmental authorities will conclude that our business practices may not comply with current or future statutes, regulations or case law involving applicable fraud and abuse or other healthcare laws and regulations. If our operations are found to be in violation of any of these laws or any other governmental regulations that may apply to us, we may be subject to significant criminal, civil and administrative sanctions including monetary penalties, damages, fines, disgorgement, individual imprisonment, and exclusion from participation in government funded healthcare programs, such as Medicare and Medicaid, additional reporting requirements and oversight if we become subject to a corporate integrity agreement

or similar agreement to resolve allegations of non-compliance with these laws, reputational harm, and we may be required to curtail or restructure our operations, any of which could adversely affect our ability to operate our business and our results of operations.

The risk of our being found in violation of these laws is increased by the fact that many of them have not been fully interpreted by the regulatory authorities or the courts, and their provisions are open to a variety of interpretations. Any action against us for violation of these laws, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business. The shifting compliance environment and the need to build and maintain robust and expandable systems to comply with multiple jurisdictions with different compliance and/or reporting requirements increases the possibility that a healthcare company may run afoul of one or more of the requirements.

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 also prohibited in the EU. The provision of benefits or advantages to physicians is governed by the national anti-bribery laws of EU Member States, such as the U.K. Bribery Act 2010, or the Bribery Act. 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 collection, use, disclosure, transfer, or other processing of personal data regarding individuals in the EU, including personal health data, is subject to the EU General Data Protection Regulation (GDPR), which became effective on May 25, 2018. The GDPR is wide-ranging in scope and imposes numerous requirements on companies that process personal data, including requirements relating to processing health and other sensitive data, obtaining consent of the individuals to whom the personal data relates, providing information to individuals regarding data processing activities, implementing safeguards to protect the security and confidentiality of personal data, providing notification of data breaches, and taking certain measures when engaging third-party processors. The GDPR also imposes strict rules on the transfer of personal data to countries outside the EU, including the United States, and permits data protection authorities to impose large penalties for violations of the GDPR, including potential fines of up to €20 million or 4% of annual global revenues, whichever is greater. The GDPR also confers a private right of action on data subjects and consumer associations to lodge complaints with supervisory authorities, seek judicial remedies, and obtain compensation for damages resulting from violations of the GDPR. Compliance with the GDPR will be a rigorous and time-intensive process that may increase our cost of doing business or require us to change our business practices, and despite those efforts, there is a risk that we may be subject to fines and penalties, litigation, and reputational harm in connection with our European activities.

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

We are subject to numerous environmental, health and safety laws and regulations, including those governing laboratory procedures and the handling, use, storage, treatment and disposal of hazardous materials and wastes. Our operations involve the use of hazardous and flammable materials, including chemicals and biological and radioactive materials. Our operations also produce hazardous waste products. 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. We also could incur significant costs associated with civil or criminal fines and penalties.

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

Even if we are able to commercialize any product candidates, the 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, coverage and reimbursement for new drug products vary widely from country to country. Current and future legislation may significantly change the approval requirements in ways that could involve additional costs and cause delays in obtaining approvals. Some countries require approval of the sale price of a drug before it can be marketed. In many countries, the pricing review period begins after marketing or product licensing approval is granted. To obtain reimbursement or pricing approval in some countries, we may be required to conduct a clinical trial that compares the cost-effectiveness of our product candidate to other available therapies. 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 product candidate in a particular country, but then be subject to price regulations that delay our commercial launch of the product, possibly for lengthy time periods, and negatively impact the revenues, if any, we are able to generate from the sale of the product in that country. Adverse pricing limitations may hinder our ability to recoup our investment in one or more product candidates, even if our product candidates obtain marketing approval.

Our ability to commercialize any product candidates successfully also will depend in part on the extent to which coverage and adequate reimbursement for these products and related treatments will be available from government healthcare programs, private health insurers and other organizations. Government authorities and third-party payors, such as private health insurers and health maintenance organizations, 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, government authorities and third-party payors are requiring that drug companies provide them with predetermined discounts from list prices and are challenging the prices charged for medical products. Coverage and reimbursement may not be available for any product that we commercialize and, even if these are available, the level of reimbursement may not be satisfactory. Reimbursement may affect the demand for, or the price of, any product candidate for which we obtain marketing approval. Obtaining and maintaining adequate reimbursement for our products may be difficult. We may be required to conduct expensive pharmacoeconomic studies to justify coverage and reimbursement or the level of reimbursement relative to other therapies. If coverage and adequate reimbursement are not available or reimbursement 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 coverage and reimbursement for newly approved drugs, and coverage may be more limited than the purposes for which the drug is approved by the FDA or similar regulatory authorities outside of the United States. Moreover, eligibility for coverage and reimbursement does not imply that a drug will be paid for in all cases or at a rate that covers our costs, including research, development, intellectual property, manufacture, sale and distribution expenses. Interim reimbursement levels for new drugs, 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 drug and the clinical setting in which it is used, may be based on reimbursement levels already set for lower cost drugs and

may be incorporated into existing payments for other services. Net prices for drugs 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 drugs from countries where they may be sold at lower prices than in the United States. Third-party payors often rely upon Medicare coverage policy and payment limitations in setting their own reimbursement policies. Our inability to promptly obtain coverage and adequate reimbursement rates from both government-funded and private payors for any approved products that we develop could have a material adverse effect on our operating results, our ability to raise capital needed to commercialize products and our overall financial condition.

The expected withdrawal of the United Kingdom from the European Union, commonly referred to as "Brexit," may disrupt import and export processes between the United Kingdom and the European Union, potentially delaying time-sensitive shipments and adversely affecting our GMP manufacturing operations at Catapult.

In June 2016, a majority of the eligible members of the electorate in the United Kingdom voted to withdraw from the European Union in a national referendum, commonly referred to as "Brexit." The withdrawal of the United Kingdom from the European Union was set to take place on March 29, 2019; however, the United Kingdom and the European Union are currently negotiating the terms of the United Kingdom's relationship with the European Union, and United Kingdom has not withdrawn from the European Union. There is the potential that the United Kingdom and the European Union may not agree to a withdrawal arrangement before the date the United Kingdom leaves the European Union. We have contracted with the Cell Therapy Catapult Limited (Catapult) to occupy a suite with our own personnel in their GMP manufacturing center in Stevenage, United Kingdom. There is a risk that Brexit may disrupt import and export processes due to a lack of administrative processing capacity by the respective United Kingdom and European Union customs agencies that may delay time-sensitive shipments of equipment and materials from the European Union that are required for GMP manufacturing in our Catapult suite. It is also possible that Brexit may negatively affect our ability to attract and retain employees for our operations at Catapult, particularly those from the European Union.

Risks Related to Our Intellectual Property

If we are unable to obtain and maintain patent protection for any products we develop and for our technology, or if the scope of the patent protection obtained 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, and our technology may be adversely affected.

Our success depends in large part on our ability to obtain and maintain patent protection in the United States and other countries with respect to our product candidates, their respective components, formulations, combination therapies, methods used to manufacture them and methods of treatment and development that are important to our business. If we do not adequately protect our intellectual property rights, competitors may be able to erode or negate any competitive advantage we may have, which could harm our business and ability to achieve profitability. To protect our proprietary position, we file patent applications in the United States and abroad related to our novel product candidates that are important to our business; we may in the future also license or purchase patent applications filed by others. If we are unable to secure or maintain patent protection with respect to our antibody technology and any proprietary products and technology we develop, our business, financial condition, results of operations, and prospects could be materially harmed.

If the scope of the patent protection we or our potential licensors obtain is not sufficiently broad, we may not be able to prevent others from developing and commercializing technology and products similar or identical to ours. The degree of patent protection we require to successfully compete in the marketplace may be unavailable or severely limited in some cases and may not adequately protect our rights or permit us to gain or keep any competitive advantage. We cannot provide any assurances that any of our patents

have, or that any of our pending patent applications that mature into issued patents will include, claims with a scope sufficient to protect our current and future product candidates or otherwise provide any competitive advantage. In addition, to the extent that we license intellectual property in the future, we cannot assure you that those licenses will remain in force. In addition, the laws of foreign countries may not protect our rights to the same extent as the laws of the United States. Furthermore, patents have a limited lifespan. In the United States, the natural expiration of a patent is generally 20 years after it is filed. Various extensions may be available; however, the life of a patent, and the protection it affords, is limited. 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.

Even if they are unchallenged, our patents and pending patent applications, if issued, may not provide us with any meaningful protection or prevent competitors from designing around our patent claims to circumvent our patents by developing similar or alternative technologies or therapeutics in a non-infringing manner. For example, a third party may develop a competitive therapy that provides benefits similar to one or more of our product candidates but that uses a formulation and/or a device that falls outside the scope of our patent protection. If the patent protection provided by the patents and patent applications we hold or pursue with respect to our product candidates is not sufficiently broad to impede such competition, our ability to successfully commercialize our product candidates could be negatively affected, which would harm our business. Although we currently own all of our patents and our patent applications, similar risks would apply to any patents or patent applications that we may in-license in the future.

Patent positions of life sciences companies can be uncertain and involve complex factual and legal questions. No consistent policy governing the scope of claims allowable in the field of antibodies has emerged in the United States. The scope of patent protection in jurisdictions outside of the United States is also uncertain. Changes in either the patent laws or their interpretation in any jurisdiction that we seek patent protection may diminish our ability to protect our inventions, maintain and enforce our intellectual property rights; and, more generally, may affect the value of our intellectual property, including the narrowing of the scope of our patents and any that we may license.

The patent prosecution process is complex, expensive, time-consuming and inconsistent across jurisdictions. We may not be able to file, prosecute, maintain, enforce, or license all necessary or desirable patent rights at a commercially reasonable cost or in a timely manner. In addition, we may not pursue or obtain patent protection in all relevant markets. It is possible that we will fail to identify important patentable aspects of our research and development efforts in time to obtain appropriate or any patent protection. While we enter into non-disclosure and confidentiality agreements with parties who have access to confidential or patentable aspects of our research and development efforts, including for example, our employees, corporate collaborators, external academic 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 endangering our ability to seek patent protection. In addition, publications of discoveries in the scientific and scholarly 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. Consequently, we cannot be certain that we were the first to file for patent protection on the inventions claimed in our patents or pending patent applications.

The issuance, scope, validity, enforceability and commercial value of our patent rights are highly uncertain. Further, the scope of the invention claimed in a patent application can be significantly reduced before the patent is issued, and this scope can be reinterpreted after issuance. Even where patent applications we currently own or that we may license in the future issue as patents, they may not issue in a form that will provide us with adequate protection to prevent competitors or other third parties from competing with us, or otherwise provide us with a competitive advantage. Any patents that eventually issue may be challenged, narrowed or invalidated by third parties. Consequently, we do not know whether

any of our product candidates will be protectable or remain protected by valid and enforceable patent rights. Our competitors or other third parties may be able to evade our patent rights by developing new antibodies, biosimilar antibodies, or alternative technologies or products in a non-infringing manner.

The issuance or grant of a patent is not irrefutable as to its inventorship, scope, validity or enforceability, and our patents may be challenged in the courts or patent offices in the United States and abroad. 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 are aware, but which we 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. We may in the future, become subject to a third-party pre-issuance submission of prior art or opposition, derivation, revocation, re-examination, post-grant and *inter partes* review, or interference proceeding and other similar proceedings challenging our patent rights or the patent rights of others in the U.S. Patent and Trademark Office (USPTO) or other foreign patent office. An unfavorable determination in any such submission, proceeding or litigation could reduce the scope of, or invalidate, our patent rights, allow third parties to commercialize our technology or products and compete directly with us, without payment to us, or extinguish our ability to manufacture or commercialize products without infringing third-party patent rights.

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 with third parties. 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 or our licensors may need the cooperation of any such co-owners of our owned and in-licensed patents in order to enforce such patents against third parties, and such cooperation may not be provided to us or our licensors. Any of the foregoing could have a material adverse effect on our competitive position, business, financial conditions, results of operations and prospects.

We depend on intellectual property licensed from third parties and termination of any of these licenses could result in the loss of significant rights, which would harm our business.

We are dependent on patents, know-how and proprietary technology, both our own and licensed from others. For example, we have a non-exclusive license for the mesothelin binder incorporated into the TRuC construct for TC-210 from Harpoon. Harpoon has the ability to terminate our license in the event we materially breach our agreement with Harpoon and fail to cure this breach within sixty days. If the license with Harpoon is terminated, we would need to partner for another mesothelin binder or independently develop our own mesothelin binder. In addition, we cannot prevent Harpoon from also licensing the mesothelin binder we use in TC-210 to a third-party. If Harpoon licenses the mesothelin binder to another immuno-oncology company, that company could develop a competitive product to TC-210.

We are currently, and expect in the future to be, party to material license or collaboration agreements. These agreements typically impose numerous obligations, such as diligence and payment obligations. Any termination of these licenses could result in the loss of significant rights and could harm our ability to commercialize our product candidates. These licenses do and future licenses may include provisions that impose obligations and restrictions on us. This could delay or otherwise negatively impact a transaction that we may wish to enter into.

Disputes may also arise between us and our licensors regarding intellectual property subject to a license agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- whether and the extent to which our technology and processes infringe on intellectual property of the licensor that is not subject to the licensing agreement;
- our right to sublicense patent and other rights to third parties under collaborative development relationships;
- our diligence obligations 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; and
- the ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and us and our partners.

If disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on acceptable terms, we may be unable to successfully develop and commercialize the affected product candidates.

We are generally also subject to all of the same risks with respect to protection of intellectual property that we license, as we are for intellectual property that we own, which are described below. If we or our licensors fail to adequately protect this intellectual property, our ability to commercialize products could suffer.

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

We are a party to a license agreement with Harpoon, pursuant to which we in-license key patent and patent applications for use in one or more of our product candidates. This existing license imposes various diligence, milestone payment, royalty, insurance and other obligations on us. If we fail to comply with these obligations, Harpoon may have the right to terminate the license, in which event we would not be able to develop or market the products covered by such licensed intellectual property.

We rely on certain of our licensors to file and prosecute patent applications and maintain patents and otherwise protect the intellectual property we license from them and may continue to do so in the future. We have limited control over these activities or any other intellectual property that may be related to our in-licensed intellectual property. For example, we cannot be certain that such activities by these licensors have been or will be conducted in compliance with applicable laws and regulations or will result in valid and enforceable patents and other intellectual property rights. We have limited control over the manner in which our licensors initiate an infringement proceeding against a third-party infringer of the intellectual property rights, or defend certain of the intellectual property that is licensed to us. It is possible that any licensors' infringement proceeding or defense activities may be less vigorous than had we conducted them ourselves.

Our proprietary position depends upon patents that are manufacturing, formulation or method-of-use patents, which may not prevent a competitor or other third party from using the same product candidate for another use.

Composition-of-matter patents on the active pharmaceutical ingredient (API) in prescription drug products are generally considered to be the strongest form of intellectual property protection for drug products because such patents provide protection without regard to any particular method of use or manufacture or formulation of the API used. We do not currently have any claims in our owned or in-licensed issued U.S. patents that cover the composition-of-matter of our other product candidates. We are pursuing claims in our pending owned or in-licensed patent applications that cover the composition-of-matter of our product candidates. We cannot be certain that claims in any future patents issuing from our pending owned or in-

licensed patent applications or our future owned or in-licensed patent applications will cover the composition-of-matter of our current or future product candidates.

If our efforts to protect the proprietary nature of the intellectual property related to our technologies are not adequate, we may not be able to compete effectively in our market.

Biotechnology and pharmaceutical companies generally, and we in particular, compete in a crowded competitive space characterized by rapidly evolving technologies and aggressive defense of intellectual property. The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other provisions during the patent process. There are situations in which noncompliance can result in abandonment or lapse of a patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. In such an event, competitors might be able to enter the market earlier than would otherwise have been the case.

We rely upon a combination of patents, confidentiality agreements, trade secret protection and license agreements to protect the intellectual property related to our technologies. Any disclosure to or misappropriation by third parties of our confidential proprietary information could enable competitors to quickly duplicate or surpass our technological achievements, thus eroding our competitive position in our market. We, or any future partners, collaborators, or licensees, may fail to identify patentable aspects of inventions made in the course of development and commercialization activities before it is too late to obtain patent protection on them. Therefore, we may miss potential opportunities to strengthen our patent position.

It is possible that defects of form in the preparation or filing of our patents or patent applications may exist, or may arise in the future, for example with respect to proper priority claims, inventorship, claim scope, or requests for patent term adjustments. If we or our partners, collaborators, licensees or licensors fail to establish, maintain or protect such patents and other intellectual property rights, such rights may be reduced or eliminated. If our partners, collaborators, licensees or licensors are not fully cooperative or disagree with us as to the prosecution, maintenance or enforcement of any patent rights, such patent rights could be compromised. If there are material defects in the form, preparation, prosecution, or enforcement of our patents or patent applications, such patents may be invalid and/or unenforceable, and such applications may never result in valid, enforceable patents. Any of these outcomes could impair our ability to prevent competition from third parties, which may have an adverse impact on our business.

Currently, our patents and patent applications are directed to our TRuC-T cells and accompanying technologies. We seek or plan to seek patent protection for our TRuC-T cell platform and product candidates by filing and prosecuting patent applications in the United States and other countries as appropriate. As of March 15, 2019, our patent portfolio included one issued U.S. patent, at least 15 pending U.S. provisional or non-provisional patent applications, at least five pending Patent Cooperation Treaty (PCT) international applications, and at least 31 pending foreign patent applications, which patent applications we owned or in-licensed. The claims of these patent applications are directed toward various aspects of our product candidates and research programs including compositions of matter, methods of use, and processes. These patent applications, if issued, are expected to expire on various dates from 2036 through 2039, in each case without taking into account any possible patent term adjustments or extensions.

We anticipate additional patent applications will be filed both in the United States and in other countries, as appropriate. However, we cannot predict:

- if and when patents will issue;
- the degree and range of protection any issued patents will afford us against competitors including whether third parties will find ways to invalidate or otherwise circumvent our patents;
- whether any of our intellectual property will provide any competitive advantage;

- whether any of our patents that may be issued may be challenged, invalidated, modified, revoked, circumvented, found to be unenforceable or otherwise may not provide any competitive advantage;
- whether or not others will obtain patents claiming aspects similar to those covered by our patents and patent applications; or
- whether we will need to initiate or defend litigation or administrative proceedings which may be costly regardless of whether we win or lose.

Additionally, we cannot be certain that the claims in our pending patent applications covering composition of matter of our product candidates will be considered patentable by the USPTO, or by patent offices in foreign countries, or that the claims in any of our issued patents will be considered patentable by courts in the United States or foreign countries.

Method of use patents protect the use of a product for the specified method. These types of patents do not prevent a competitor from making and marketing a product that is identical to our product for an indication that is outside the scope of the patented method. Moreover, even if competitors do not actively promote their product for our targeted indications, physicians may prescribe these products “off-label.” Although off-label prescriptions may induce or contribute to the infringement of method of use patents, the practice is common and such infringement is difficult to prevent or prosecute.

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. Even if the patents do successfully issue, third parties may challenge the validity, enforceability or scope thereof, which may result in such patents being narrowed, invalidated or held unenforceable. 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 hold with respect to our 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 our clinical trials, the period of time during which we could market our product candidates under patent protection would be reduced. Since patent applications in the United States and most other countries are confidential for a period of time after filing, we cannot be certain that we were the first to file any patent application related to our product candidates. Furthermore, for U.S. applications in which all claims are entitled to a priority date before March 16, 2013, an interference proceeding can be provoked by a third-party or instituted by the USPTO to determine who was the first to invent any of the subject matter covered by the patent claims of our applications. We cannot be certain that we are the first to invent the inventions covered by pending patent applications and, if we are not, we may be subject to priority disputes. We may be required to disclaim part or all of the term of certain patents or all of the term of certain patent applications. Various post grant review proceedings, such as *inter partes* review and post grant review, are available for any interested third party to challenge the patentability of claims issued in patents to us. While these post grant review proceedings have been used less frequently to invalidate biotech patents, they have been successful regarding other technologies, and these relatively new procedures are still changing, and those changes might affect future results. No assurance can be given that if challenged, our patents would be declared by a court 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, which block our efforts or may potentially result in our product candidates or our activities infringing such claims. The possibility exists that others will develop products which have the same effect as our products on an independent basis which do not infringe our patents or other intellectual property rights, or will design around the claims of patents that we have had issued that cover our products.

Recent or future patent reform legislation could increase the uncertainties and costs surrounding the prosecution of our patent applications and the enforcement or defense of our issued patents. In March 2013, under the recently enacted Leahy-Smith America Invents Act, or America Invents Act, the United States moved from a “first to invent” to a “first-to-file” system. Under a “first-to-file” system, assuming the other requirements for patentability are met, the first inventor to file a patent application generally will be entitled to a patent on the invention regardless of whether another inventor had made the invention earlier. The America Invents Act includes a number of other significant changes to U.S. patent law, including provisions that affect the way patent applications are prosecuted, redefine prior art and establish a new post-grant review system. The effects of these changes are currently unclear as the USPTO only recently developed 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 specific patents discussed herein 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, all of which could have a material adverse effect on our business and financial condition.

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

- others may be able to make or use compounds or cells that are similar to the biological compositions of our product candidates but that are not covered by the claims of our patents;
- the active biological ingredients in our current product candidates will eventually become commercially available in biosimilar drug products, and no patent protection may be available with regard to formulation or method of use;
- we or our licensors, as the case may be, may fail to meet our obligations to the U.S. government in regards to any in-licensed patents and patent applications funded by U.S. government grants, leading to the loss of patent rights;
- we or our licensors, as the case may be, might not have been the first to file patent applications for these inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technologies;
- it is possible that our pending patent applications will not result in issued patents;
- it is possible that there are prior public disclosures that could invalidate our or our licensors’ patents, as the case may be, or parts of our or their patents;
- it is possible that others may circumvent our owned or in-licensed patents;
- it is possible that there are unpublished applications or patent applications maintained in secrecy that may later issue with claims covering our products or technology similar to ours;
- the laws of foreign countries may not protect our or our licensors’, as the case may be, proprietary rights to the same extent as the laws of the United States;
- the claims of our owned or in-licensed issued patents or patent applications, if and when issued, may not cover our product candidates;
- our owned or in-licensed issued patents may not provide us with any competitive advantages, may be narrowed in scope, or be held invalid or unenforceable as a result of legal challenges by third parties;
- the inventors of our owned or in-licensed patents or patent applications may become involved with competitors, develop products or processes which design around our patents, or become hostile to us or the patents or patent applications on which they are named as inventors;
- 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;

- we have engaged in scientific collaborations in the past and will continue to do so in the future, and such collaborators may develop adjacent or competing products to ours that are outside the scope of our patents;
- we may not develop additional proprietary technologies for which we can obtain patent protection;
- it is possible that product candidates or diagnostic tests we develop may be covered by third parties' patents or other exclusive rights; or
- the patents of others may have an adverse effect on our business.

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

In addition to the protection afforded by patents, we seek to rely on trade secret protection, confidentiality agreements, and license agreements to protect proprietary know-how that is not patentable, processes for which patents are difficult to enforce and any other elements of our product discovery and development processes that involve proprietary know-how, information, or technology that is not covered by patents. Although we require all of our employees to assign their inventions to us, and require all of our employees, consultants, advisors and any third parties who have access to our proprietary know-how, information, or technology to enter into confidentiality agreements, we cannot be certain that our trade secrets and other confidential proprietary information will not be disclosed or that competitors will not otherwise gain access to our trade secrets or independently develop substantially equivalent information and techniques. Furthermore, the laws of some foreign countries do not protect proprietary rights to the same extent or in the same manner as the laws of the United States. As a result, we may encounter significant problems in protecting and defending our intellectual property both in the United States and abroad. If we are unable to prevent unauthorized material disclosure of our intellectual property to third parties, we will not be able to establish or maintain a competitive advantage in our market, which could materially adversely affect our business, operating results and financial condition.

Courts outside the United States are sometimes less willing 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. These lawsuits may consume our time and other resources even if we are successful. For example, significant elements of our products, including aspects of sample preparation, methods of manufacturing, cell culturing conditions, computational-biological algorithms, and related processes and software, are based on unpatented trade secrets that are not publicly disclosed. Although we take steps to protect our proprietary information and trade secrets, including through contractual means with our employees and consultants, third parties may independently develop substantially equivalent proprietary information and techniques or otherwise gain access to our trade secrets or disclose our technology.

Thus, we may not be able to meaningfully protect our trade secrets. It is our policy to require our employees, consultants, outside scientific collaborators, sponsored researchers and other advisors 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 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 specific circumstances. In the case of employees, the agreements provide that all inventions conceived by the individual, and which 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 addition, we take other appropriate precautions, such as physical and technological security measures, to guard against misappropriation of our proprietary technology by third parties. We have also adopted policies and conduct training that provides guidance on our expectations, and our advice for best practices, in protecting our trade secrets.

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

Our commercial success depends in part on our avoiding infringement of the patents and proprietary rights of third parties. There is a substantial amount of litigation involving patents and other intellectual property rights in the biotechnology and pharmaceutical industries, as well as administrative proceedings for challenging patents, including interference, reexamination, and post grant review proceedings before the USPTO or oppositions and other comparable proceedings in foreign jurisdictions. We may be exposed to, or threatened with, future litigation by third parties having patent or other intellectual property rights alleging that our product candidates and/or proprietary technologies infringe their intellectual property rights. Numerous U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in the fields in which we are developing our product candidates. As the biotechnology and pharmaceutical industries expand and more patents are issued, the risk increases that our 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 drugs, products or their methods of use or manufacture. Thus, because of the large number of patents issued and patent applications filed in our fields, there may be a risk that third parties may allege they have patent rights encompassing our product candidates, technologies or methods.

If a third party claims that we infringe its intellectual property rights, we may face a number of issues, including, but not limited to:

- infringement and other intellectual property claims which, regardless of merit, may be expensive and time-consuming to litigate and may divert our management's attention from our core business;
- substantial damages for infringement, which we may have to pay if a court decides that the product candidate or technology at issue infringes on or violates the third-party's rights, and, if the court finds that the infringement was willful, we could be ordered to pay treble damages and the patent owner's attorneys' fees;
- a court prohibiting us from developing, manufacturing, marketing or selling our product candidates, or from using our proprietary technologies, unless the third-party licenses its product rights to us, which it is not required to do;
- if a license is available from a third-party, we may have to pay substantial royalties, upfront fees and other amounts, and/or grant cross-licenses to intellectual property rights for our products; and
- redesigning our product candidates or processes so they do not infringe third-party intellectual property rights, which may not be possible or may require substantial monetary expenditures and time.

Some of our competitors may be able to sustain the costs of complex patent litigation more effectively than we can because they have substantially greater resources. In addition, any uncertainties resulting from the initiation and continuation of any litigation could have a material adverse effect on our ability to raise the funds necessary to continue our operations or could otherwise have a material adverse effect on our business, results of operations, financial condition and prospects.

Third parties may assert that we are employing their proprietary technology without authorization. Generally, conducting preclinical and clinical trials and other development activities in the United States is not considered an act of infringement. If TC-210, TC-110 or another product candidate is licensed by the FDA, a third party may then seek to enforce its patent by filing a patent infringement lawsuit against us. While we do not believe that any claims that could otherwise have a materially adverse effect on the commercialization of our product candidates, if licensed, are valid and enforceable, we may be incorrect in this belief, or we may not be able to prove it in litigation. In this regard, patents issued in the United States by law enjoy a presumption of validity that can be rebutted only with evidence that is "clear and convincing," a heightened standard of proof. There may be issued third-party patents of which we are

currently unaware with claims to compositions, formulations, methods of manufacture or methods for treatment related to the use or manufacture of our product candidates. Patent applications can take many years to issue. There may be currently pending patent applications which 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. Moreover, we may fail to identify relevant patents or incorrectly conclude that a patent is invalid, not enforceable, exhausted, or not infringed by our activities. If any third-party patents were held by a court of competent jurisdiction to cover the manufacturing process of our product candidates, constructs or molecules used in or formed during the manufacturing process, or any final product itself, the holders of any such patents may be able to block our ability to commercialize the product candidate unless we obtained a license under the applicable patents, or until such patents expire or they are finally determined to be held invalid or unenforceable. Similarly, if any third-party patent were held by a court of competent jurisdiction to cover aspects of our formulations, processes for manufacture or methods of use, including combination therapy or patient selection methods, the holders of any such patent may be able to block our ability to develop and commercialize the product candidate unless we obtained a license or until such patent expires or is finally determined to be held invalid or unenforceable. In either case, such a license may not be available on commercially reasonable terms or at all. If we are unable to obtain a necessary license to a third-party patent on commercially reasonable terms, or at all, our ability to commercialize our product candidates may be impaired or delayed, which could in turn significantly harm our business. Even if we obtain a license, it may be non-exclusive, thereby giving our competitors access to the same technologies licensed to us. In addition, if the breadth or strength of protection provided by our patents and patent applications is threatened, it could dissuade companies from collaborating with us to license, develop or commercialize current or future product candidates.

Parties making claims against us may seek and obtain injunctive or other equitable relief, which could effectively block our ability to further develop and commercialize our product candidates. Defense of these claims, regardless of their merit, could involve substantial litigation expense and would be a substantial diversion of employee resources from our business. In the event of a successful claim of infringement against us, we may have to pay substantial damages, including treble damages and attorneys' fees for willful infringement, obtain one or more licenses from third parties, pay royalties or redesign our infringing products, which may be impossible or require substantial time and monetary expenditure. We cannot predict whether any such license would be available at all or whether it would be available on commercially reasonable terms. Furthermore, even in the absence of litigation, we may need or may choose to obtain licenses from third parties to advance our research or allow commercialization of our product candidates. We may fail to obtain any of these licenses at a reasonable cost or on reasonable terms, if at all. In that event, we would be unable to further develop and commercialize our product candidates, which could harm our business significantly.

We may not be successful in obtaining or maintaining necessary rights to product components and processes for our development pipeline through acquisitions and in-licenses.

Presently we have rights to certain intellectual property, through licenses from third parties and under patent applications that we own or will own, related to TC-210, TC-110 and certain other product candidates. Because additional product candidates may require the use of proprietary rights held by third parties, the growth of our business will likely depend in part on our ability to acquire, in-license or use these proprietary rights. In addition, while we have patent rights directed to certain TRuC constructs we may not be able to obtain intellectual property to broad TRuC-T cell or engineered TCR-T cell constructs.

Our product candidates may also require specific formulations to work effectively and efficiently and these rights may be held by others. Similarly, efficient production or delivery of our product candidates may also require specific compositions or methods, and the rights to these may be owned by third parties. We may be unable to acquire or in-license any compositions, methods of use, processes or other third-party intellectual property rights from third parties that we identify as necessary or important to our business operations. We may fail to obtain any of these licenses at a reasonable cost or on reasonable terms, if at

all, which would harm our business. We may need to cease use of the compositions or methods covered by such third-party intellectual property rights, and may need to seek to develop alternative approaches that do not infringe on such intellectual property rights which may entail additional costs and development delays, even if we were able to develop such alternatives, which may not be feasible. Even if we are able to obtain a license, it may be non-exclusive, thereby giving our competitors access to the same technologies licensed to us. In that event, we may be required to expend significant time and resources to develop or license replacement technology. Moreover, the specific antibodies that will be used with our product candidates may be covered by the intellectual property rights of others.

Additionally, we sometimes 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. Regardless of such option, we may be unable to negotiate a license 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. If we are unable to successfully obtain rights to required third-party intellectual property or to maintain the existing intellectual property rights we have, we may have to abandon development of such program and our business and financial condition could suffer.

The licensing and acquisition of third-party intellectual property rights is a competitive area, and companies, which may be more established, or have greater resources than we do, may also be pursuing strategies to license or acquire third-party intellectual property rights that we may consider necessary or attractive in order to commercialize our product candidates. More established companies may have a competitive advantage over us due to their size, cash resources and greater clinical development and commercialization capabilities.

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

Competitors may infringe our patents or the patents of our licensors. To counter infringement or unauthorized use, we may be required to file infringement claims, which can be expensive and time-consuming. In addition, in an infringement proceeding, a court may decide that one or more of our patents is not valid or is unenforceable, or may refuse to stop the other party from using the technology at issue on the grounds that our patents do not cover the technology in question. An adverse result in any litigation or defense proceedings could put one or more of our patents at risk of being invalidated, held unenforceable, or interpreted narrowly and could put our patent applications at risk of not issuing. Defense of these claims, regardless of their merit, would involve substantial litigation expense and would be a substantial diversion of employee resources from our business. In the event of a successful claim of infringement against us, we may have to pay substantial damages, including treble damages and attorneys' fees for willful infringement, obtain one or more licenses from third parties, pay royalties or redesign our infringing products, which may be impossible or require substantial time and monetary expenditure.

Post-grant proceedings provoked by third parties or brought by the USPTO may be necessary to determine the validity or priority of inventions with respect to our patents or patent applications or those of our licensors. An unfavorable outcome could result in a loss of our current patent rights and could require us to cease using the related technology or to attempt to license rights to it from the prevailing party. Our business could be harmed if the prevailing party does not offer us a license on commercially reasonable terms. Litigation or post-grant proceedings may result in a decision adverse to our interests and, even if we are successful, may result in substantial costs and distract our management and other employees. We may not be able to prevent, alone or with our licensors, misappropriation of our trade secrets or confidential information, particularly in countries where the laws may not protect those rights as fully as in the United States.

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. 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.

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

Some of our patent applications have been allowed or may be allowed in the future. We cannot be certain that an allowed patent application will become an issued patent. There may be events that cause withdrawal of the allowance of a patent application. For example, after a patent application has been allowed, but prior to being issued, material that could be relevant to patentability may be identified. In such circumstances, the applicant may pull the application from allowance in order for the USPTO to review the application in view of the new material. We cannot be certain that the USPTO will re-allow the application in view of the new material. Further, periodic maintenance fees on any issued patent are due to be paid to the USPTO and foreign patent agencies in several stages over the lifetime of the patent. The USPTO and various foreign governmental patent agencies require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process and following the issuance of a patent. While an inadvertent lapse can in many cases be cured by payment of a late fee or by other means in accordance with the applicable rules, there are situations in which noncompliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. Noncompliance events that could result in abandonment or lapse of a patent or patent application include, but are not limited to, failure to respond to official actions within prescribed time limits, non-payment of fees and failure to properly legalize and submit formal documents. In such an event, our competitors might be able to enter the market, which would have a material adverse effect on our business.

Issued patents covering our product candidates could be found invalid or unenforceable if challenged in court or the USPTO.

If we or one of our licensing partners initiate legal proceedings against a third party to enforce a patent covering one of our product candidates, the defendant could counterclaim that the patent covering our product candidate, as applicable, is invalid and/or unenforceable. 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. Such mechanisms include re-examination, *inter partes* review, post grant review and equivalent proceedings in foreign jurisdictions (such as opposition proceedings). Such proceedings could result in revocation or amendment to our patents in such a way that they no longer

cover our product candidates. The outcome 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 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 product candidates. Such a loss of patent protection could have a material adverse impact on our business and our ability to commercialize or license our technology and product candidates.

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

As is the case with other biopharmaceutical companies, our success is heavily dependent on intellectual property, particularly patents. Obtaining and enforcing patents in the biopharmaceutical industry involve both technological and legal complexity, and is therefore costly, time-consuming and inherently uncertain. In addition, the United States continues to adapt to wide-ranging patent reform legislation that became effective starting in 2012. Moreover, 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 value of patents, once obtained. Depending on decisions by the U.S. Congress, the federal courts, and the USPTO, the laws and regulations governing patents could change in unpredictable ways that would weaken our ability to obtain new patents or to enforce our existing patents and patents that we might obtain in the future. 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. While we do not believe that any of the patents owned or licensed by us will be found invalid based on this decision, we cannot predict how future decisions by the courts, Congress or the USPTO may impact the value of our patents. Similarly, any adverse changes in the patent laws of other jurisdictions could have a material adverse effect on our business and financial condition. Changes in the laws and regulations governing patents in other jurisdictions could similarly have an adverse effect on our ability to obtain and effectively enforce our patent rights.

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

Certain of our key patent families have been filed in the United States, however, we have less robust intellectual property rights outside the United States, and, in particular, we may not be able to pursue generic coverage of the TRuC-T cell platform outside of 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 some foreign countries do not protect intellectual property rights to the same extent as federal and state laws in the United States. 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 enforcement is not as strong as that in the United States. These products may compete with our products and our patents or other intellectual property rights may not be effective or sufficient to prevent them from competing. Most of our patent portfolio is at the very early stage. We will need to decide whether and in which jurisdictions to pursue protection for the various inventions in our portfolio prior to applicable deadlines.

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 biopharmaceutical products, which could make it difficult for us to stop the infringement of our patents or marketing of competing products in violation of our proprietary rights generally. Proceedings to enforce our patent 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. Accordingly, our efforts to enforce our intellectual property rights around the world may be inadequate to obtain a significant commercial advantage from the intellectual property that we develop or license.

We may be subject to claims challenging the inventorship or ownership of our patents and other intellectual property.

We generally enter into confidentiality and intellectual property assignment agreements with our employees, consultants, and contractors. These agreements generally provide that inventions conceived by the party in the course of rendering services to us will be our exclusive property. However, those agreements may not be honored and may not effectively assign intellectual property rights to us. Moreover, there may be some circumstances, where we are unable to negotiate for such ownership rights. Disputes regarding ownership or inventorship of intellectual property can also arise in other contexts, such as collaborations and sponsored research. If we are subject to a dispute challenging our rights in or to patents or other intellectual property, such a dispute could be expensive and time consuming. If we were unsuccessful, we could lose valuable rights in intellectual property that we regard as our own.

The intellectual property landscape around adoptive cell therapy is crowded, 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 could have a material adverse effect on the success of our business. We are aware of certain third-party patents and third-party patent applications in this landscape that may, if issued as patents, be asserted to encompass our technology.

We may be subject to claims that our employees, consultants or independent contractors have wrongfully used or disclosed confidential information of third parties.

We have received confidential and proprietary information from third parties. In addition, we employ individuals who were previously employed at other biotechnology or pharmaceutical companies. We may be subject to claims that we or our employees, consultants or independent contractors have inadvertently or otherwise used or disclosed confidential information of these third parties or our employees' former employers or our consultants' or contractors' current or former clients or customers. Litigation may be necessary to defend against these claims. Even if we are successful in defending against these claims, litigation could result in substantial cost and be a distraction to our management and employees. If we are not successful, we could lose access or exclusive access to valuable intellectual property.

We may be subject to damages resulting from claims that we or our employees have wrongfully used or disclosed alleged trade secrets of our competitors or are in breach of non-competition or non-solicitation agreements with our competitors.

Many of our employees were previously employed at other pharmaceutical companies, including our competitors or potential competitors, in some cases until recently. We may be subject to claims that we or our employees have inadvertently or otherwise used or disclosed trade secrets or other proprietary information of these former employers or competitors. In addition, we have been and may in the future be subject to claims that we caused an employee to breach the terms of his or her non-competition or non-solicitation agreement. Litigation may be necessary to defend against these claims. Even if we are successful in defending against these claims, litigation could result in substantial costs and could be a

distraction to management. If our defense to those claims fails, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Any litigation or the threat thereof may adversely affect our ability to hire employees. A loss of key personnel or their work product could hamper or prevent our ability to commercialize product candidates, which could have an adverse effect on our business, results of operations and financial condition.

If we do not obtain patent term extension and data exclusivity for any of our current or future product candidates, our business may be materially harmed.

Depending upon the timing, duration and specifics of any FDA marketing approval of any of our current or future product candidates, one or more of our U.S. patents may be eligible for limited patent term extension under the Drug Price Competition and Patent Term Restoration Act of 1984, or the Hatch-Waxman Amendments. The Hatch-Waxman Amendments permit a patent extension term of up to five years as compensation for patent term lost during the FDA regulatory review process. A patent term extension cannot extend the remaining term of a patent beyond a total of 14 years from the date of product approval, only one patent 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, we may not be granted an extension because of, for example, failing to exercise due diligence during the testing phase or regulatory review process, failing to apply within applicable deadlines, failing to apply prior to expiration of relevant patents, or otherwise failing to satisfy applicable requirements. Moreover, the applicable time period or the scope of patent protection afforded could be less than we request. If we are unable to obtain patent term extension or 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 our trademarks and trade names are not adequately protected, then we may not be able to build name recognition in our marks of interest and our business may be adversely affected.

Our trademarks or trade names may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. We rely on both registration and common law protection for our trademarks. We may not be able to protect our rights to these trademarks and trade names or may be forced to stop using these names, which we need for name recognition by potential partners or customers in our markets of interest. During the trademark registration process, we may receive Office Actions from the USPTO objecting to the registration of our trademark. Although we would be given an opportunity to respond to those objections, we may be unable to overcome such rejections. In addition, in the USPTO and in comparable agencies in many foreign jurisdictions, third parties are given an opportunity to oppose pending trademark applications and/or to seek the cancellation of registered trademarks. Opposition or cancellation proceedings may be filed against our trademarks, and our trademarks may not survive such proceedings. If we are unable to establish name recognition based on our trademarks and trade names, we may not be able to compete effectively and our business may be adversely affected.

The U.S. government may exercise its march-in rights with regards to certain patents.

Pursuant to the Bayh-Dole Act, the U.S. government has march-in rights with regards to government-funded technology. The U.S. government can exercise its march-in rights if it determines that action is necessary because we fail to achieve practical application of the 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 inventions may be subject to certain requirements to manufacture products embodying such inventions in the United States. Any exercise by the government of any of the foregoing rights could harm our competitive position, business, financial condition, results of operations, and prospects.

Numerous factors may limit any potential competitive advantage provided by our intellectual property rights.

The degree of future protection afforded by our intellectual property rights, whether owned or in-licensed, is uncertain because intellectual property rights have limitations, and may not adequately protect our business, provide a barrier to entry against our competitors or potential competitors, or permit us to maintain our competitive advantage. Moreover, if a third party has intellectual property rights that cover the practice of our technology, we may not be able to fully exercise or extract value from our intellectual property rights. The following examples are illustrative:

- pending patent applications that we own or license may not lead to issued patents;
- patents, should they issue, that we own or license, may not provide us with any competitive advantages, or may be challenged and held invalid or unenforceable;
- others may be able to develop and/or practice technology that is similar to our technology or aspects of our technology but that is not covered by the claims of any of our owned or in-licensed patents, should any such patents issue;
- third parties may compete with us in jurisdictions where we do not pursue and obtain patent protection;
- we (or our licensors) might not have been the first to make the inventions covered by a pending patent application that we own or license;
- we (or our licensors) might not have been the first to file patent applications covering a particular invention;
- others may independently develop similar or alternative technologies without infringing our intellectual property rights;
- we may not be able to obtain and/or maintain necessary licenses on reasonable terms or at all;
- third parties may assert an ownership interest in our intellectual property and, if successful, such disputes may preclude us from exercising exclusive rights, or any rights at all, over that intellectual property;
- we may not be able to maintain the confidentiality of our trade secrets or other proprietary information;
- we may not develop or in-license additional proprietary technologies that are patentable; and
- the patents of others may have an adverse effect on our business.

Should any of these events occur, they could significantly harm our business and results of operation.

Risks Related to Our Reliance On Third Parties

We plan to rely on third parties to conduct our clinical trials. If these third parties do not properly and successfully carry out their contractual duties or meet expected deadlines, we may not be able to obtain regulatory approval of or commercialize our product candidates.

We plan to utilize and depend upon independent investigators and collaborators, such as medical institutions, CROs, CMOs and strategic partners to conduct our preclinical studies and clinical trials under agreements with us. We expect to have to negotiate budgets and contracts with CROs, trial sites and CMOs which may result in delays to our development timelines and increased costs. We will rely heavily on these third parties over the course of our clinical trials, and we control only certain aspects of their activities. As a result, we will have less direct control over the conduct, timing and completion of these clinical trials and the management of data developed through clinical trials than would be the case if we were relying entirely upon our own staff. Nevertheless, we are responsible for ensuring that each of our studies is conducted in accordance with applicable protocol, legal and regulatory requirements and scientific standards, and our reliance on third parties does not relieve us of our regulatory responsibilities. We and these third parties are required to comply with GCPs, which are regulations and guidelines enforced by the FDA and comparable foreign regulatory authorities for product candidates in clinical development. Regulatory authorities enforce these GCPs through periodic inspections of trial sponsors,

principal investigators and trial sites. If we or any of these third parties fail to comply with applicable GCP regulations, the clinical data generated in our clinical trials may be deemed unreliable and the FDA or comparable foreign regulatory authorities may require us to perform additional clinical trials before approving our marketing applications. We cannot assure you that, upon inspection, such regulatory authorities will determine that any of our clinical trials comply with the GCP regulations. In addition, our clinical trials must be conducted with biologic product produced under cGMP regulations, including cGTP regulations, and will require a large number of test patients. Our failure or any failure by these third parties to comply with these regulations or to recruit a sufficient number of patients may require us to repeat clinical trials, which would delay the regulatory approval process. Moreover, our business may be implicated if any of these third parties violates federal or state fraud and abuse or false claims laws and regulations or healthcare privacy and security laws.

Any third parties conducting our clinical trials are not and will not be our employees and, except for remedies available to us under our agreements with such third parties, we cannot control whether or not they devote sufficient time and resources to our ongoing, clinical and non-clinical product candidates. These third parties may also have relationships with other commercial entities, including our competitors, for whom they may also be conducting clinical trials or other drug development activities, which could affect their performance on our behalf. If these third parties do not successfully carry out their contractual duties or obligations or meet expected deadlines, if they need to be replaced or if the quality or accuracy of the clinical data they obtain is compromised due to the failure to adhere to our clinical protocols or regulatory requirements or for other reasons, our clinical trials may be extended, delayed or terminated and we may not be able to complete development of, obtain regulatory approval of or successfully commercialize our product candidates. As a result, our financial results and the commercial prospects for our product candidates would be harmed, our costs could increase and our ability to generate revenue could be delayed.

Switching or adding third parties to conduct our clinical trials involves substantial cost and requires extensive management time and focus. In addition, there is a natural transition period when a new third party commences work. As a result, delays occur, which can materially impact our ability to meet our desired clinical development timelines.

We may form or seek collaborations or strategic alliances or enter into additional licensing arrangements in the future, and we may not realize the benefits of such collaborations, alliances or licensing arrangements.

We may form or seek strategic alliances, create joint ventures or collaborations, or enter into additional licensing arrangements with third parties that we believe will complement or augment our development and commercialization efforts with respect to our product candidates and any future product candidates that we may develop. Any of these relationships 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 face significant competition in seeking appropriate strategic partners and the negotiation process is time-consuming and complex. Moreover, we may not be successful in our efforts to establish a strategic partnership or other alternative arrangements for our product candidates because they may be deemed to be at too early of a stage of development for collaborative effort and third parties may not view our product candidates as having the requisite potential to demonstrate safety, potency and purity and obtain marketing approval.

Further, collaborations involving our product candidates are subject to numerous risks, which may include the following:

- collaborators have significant discretion in determining the efforts and resources that they will apply to a collaboration;

- collaborators may not pursue development and commercialization of our product candidates or may elect not to continue or renew development or commercialization of our product candidates based on clinical trial results, changes in their strategic focus due to the acquisition of competitive products, availability of funding or other external factors, such as a business combination that diverts resources or creates competing priorities;
- collaborators may delay clinical trials, provide insufficient funding for a clinical trial, stop a clinical trial, 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 product candidates;
- a collaborator with marketing and distribution rights to one or more products may not commit sufficient resources to their marketing and distribution;
- collaborators may not properly maintain or defend our intellectual property rights or may use our intellectual property or proprietary information in a way that gives rise to actual or threatened litigation that could jeopardize or invalidate our intellectual property or proprietary information or expose us to potential liability;
- disputes may arise between us and a collaborator that cause the delay or termination of the research, development or commercialization of our product candidates, or that result in costly litigation or arbitration that diverts management attention and resources;
- 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; and
- collaborators may own or co-own intellectual property covering our products that results from our collaborating with them, and in such cases, we would not have the exclusive right to commercialize such intellectual property.

As a result, if we enter into additional collaboration agreements and strategic partnerships or license our product candidates, 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, which could delay our timelines or otherwise adversely affect our business. We also cannot be certain that, following a strategic transaction or license, we will achieve the revenue or specific net income that justifies such transaction. Any delays in entering into new collaborations or strategic partnership agreements related to our product candidates could delay the development and commercialization of our product candidates in certain geographies for certain indications, which would harm our business prospects, financial condition and results of operations.

If or until we develop our own manufacturing facility, we expect to rely on the use of manufacturing suites in third-party GMP facilities or third parties to manufacture our product candidates. Our business could be harmed if we are unable to use third-party manufacturing suites or if the third-party manufacturers fail to provide us with sufficient quantities of our product candidates or fail to do so at acceptable quality levels or prices.

We do not currently own any facility that may be used as our clinical-scale manufacturing and processing facility and must currently rely on outside vendors to manufacture and process our product candidates, which is and will need to be done on a patient-by-patient basis. We are in the process of adding manufacturing capacity at a suite in Catapult's GMP manufacturing center, which we expect to be operational in the second half of 2019, but the build-out and staffing of the manufacturing suite may be delayed and the suite may never become operational. We have not yet caused our product candidates to be manufactured or processed on a commercial scale and may not be able to do so for any of our product candidates.

Although in the future we plan to build our own manufacturing facility, we also intend to use the manufacturing suite at Catapult and other third parties as part of our manufacturing process and may, in any event, never be successful in developing our own manufacturing facility. Our anticipated reliance on a limited number of third-party manufacturers exposes us to the following risks:

- we may be unable to identify manufacturers on acceptable terms or at all because the number of potential manufacturers is limited and the FDA must inspect any manufacturers for current cGMP and cGTP compliance as part of our marketing application;
- a new manufacturer would have to be educated in, or develop substantially equivalent processes for, the production of our product candidates;
- our manufacturers may have little or no experience with autologous cell products, which are products made from a patient's own cells, and therefore may require a significant amount of support from us in order to implement and maintain the infrastructure and processes required to manufacture our product candidates;
- our third-party manufacturers might be unable to timely manufacture our product candidates or produce the quantity and quality required to meet our clinical and commercial needs, if any;
- our third-party suppliers or collaborators from whom we receive our antibodies used in combination with our product candidates may be unable to timely manufacture or provide the applicable antibody or produce the quantity and quality required to meet our clinical and commercial needs;
- contract manufacturers may not be able to execute our manufacturing procedures and other logistical support requirements appropriately;
- our future contract manufacturers may not perform as agreed, may not devote sufficient resources to our product candidates or may not remain in the contract manufacturing business for the time required to supply our clinical trials or to successfully produce, store, and distribute our products, if any;
- manufacturers are subject to ongoing periodic unannounced inspection by the FDA and corresponding state agencies to ensure strict compliance with cGMP, cGTP and other government regulations and corresponding foreign standards. We do not have control over third-party manufacturers' compliance with these regulations and standards;
- we may not own, or may have to share, the intellectual property rights to any improvements made by our third-party manufacturers in the manufacturing process for our product candidates;
- our third-party manufacturers could breach or terminate their agreements with us;
- raw materials and components used in the manufacturing process, particularly those for which we have no other source or supplier, may not be available or may not be suitable or acceptable for use due to material or component defects;
- our contract manufacturers and critical reagent suppliers may be subject to inclement weather, as well as natural or man-made disasters; and
- our contract manufacturers may have unacceptable or inconsistent product quality success rates and yields, and we have no direct control over our contract manufacturers' ability to maintain adequate quality control, quality assurance and qualified personnel.

Each of these risks could delay or prevent the completion of our clinical trials or the approval of any of our product candidates by the FDA, result in higher costs or adversely impact commercialization of our product candidates. In addition, we will rely on third parties to perform certain specification tests on our product candidates prior to delivery to patients. If these tests are not appropriately done and test data are not reliable, patients could be put at risk of serious harm and the FDA could place significant restrictions on our company until deficiencies are remedied.

The manufacture of biological drug products is complex and requires significant expertise and capital investment, including the development of advanced manufacturing techniques and process controls. Manufacturers of biologic products often encounter difficulties in production, particularly in scaling up or out, validating the production process and assuring high reliability of the manufacturing process (including the absence of contamination). These problems include logistics and shipping, difficulties with production

costs and yields, quality control, including stability of the product, product testing, operator error and availability of qualified personnel, as well as compliance with strictly enforced federal, state and foreign regulations. Furthermore, if contaminants are discovered in our supply of our product candidates or in the manufacturing facilities, such manufacturing facilities may need to be closed for an extended period of time to investigate and remedy the contamination. We cannot assure you that any stability failures or other issues relating to the manufacture of our product candidates will not occur in the future.

We may fail to manage the logistics of collecting and shipping patient material to the manufacturing site and shipping the product candidate back to the patient. Logistical and shipment delays and problems caused by us, our vendors or other factors not in our control, such as weather, could prevent or delay the delivery of product candidates to patients. Additionally, we have to maintain a complex chain of identity and chain of custody with respect to patient material as it moves to the manufacturing facility, through the manufacturing process and back to the patient. Failure to maintain chain of identity and chain of custody could result in patient death, loss of product or regulatory action.

Our product candidates rely on the availability of specialty raw materials, which may not be available to us on acceptable terms or at all.

Our product candidates require many specialty raw materials, some of which are manufactured by small companies with limited resources and experience to support a commercial product. In addition, those suppliers normally support blood-based hospital businesses and generally do not have the capacity to support commercial products manufactured under cGMP by biopharmaceutical firms. The suppliers may be ill-equipped to support our needs, especially in non-routine circumstances like an FDA inspection or medical crisis, such as widespread contamination. We also do not have contracts with many of these suppliers and may not be able to contract with them on acceptable terms or at all. Accordingly, we may experience delays in receiving key raw materials to support clinical or commercial manufacturing.

In addition, some of our raw materials are currently available from a single supplier, or a small number of suppliers. The type of cell culture media and cryopreservation buffer that we currently use in our manufacturing process for the TRuC-T cells for TC-210 and TC-110 are each only available from a single supplier. In addition, the cell processing equipment and tubing that we use in our current manufacturing process is only available from a single supplier. We also use certain biologic materials, including certain activating antibodies, that are available from multiple suppliers, but each version may perform differently, requiring us to characterize them and potentially modify some of our protocols if we change suppliers. We cannot be sure that these suppliers will remain in business, or that they will not be purchased by one of our competitors or another company that is not interested in continuing to produce these materials for our intended purpose. Accordingly, if we no longer have access to these suppliers, we may experience delays in our clinical or commercial manufacturing which could harm our business or results of operations.

Our manufacturing process needs to comply with FDA regulations relating to the quality and reliability of such processes. Any failure to comply with relevant regulations could result in delays in or termination of our clinical programs and suspension or withdrawal of any regulatory approvals.

In order to commercially produce our products either at our own facility or at a third party's facility, we will need to comply with the FDA's cGMP regulations and guidelines, including cGTPs. We may encounter difficulties in achieving quality control and quality assurance and may experience shortages in qualified personnel. We are subject to inspections by the FDA and comparable foreign regulatory authorities to confirm compliance with applicable regulatory requirements. Any failure to follow cGMP, cGTP or other regulatory requirements or delay, interruption or other issues that arise in the manufacture, fill-finish, packaging, or storage of our TRuC-T cells as a result of a failure of our facilities or the facilities or operations of third parties to comply with regulatory requirements or pass any regulatory authority inspection could significantly impair our ability to develop and commercialize our TRuC-T cell programs, including leading to significant delays in the availability of our TRuC-T cells for our clinical trials or the

termination of or suspension of a clinical trial, or the delay or prevention of a filing or approval of marketing applications for our TRuC-T cell product candidates. Significant non-compliance could also result in the imposition of sanctions, including warning or untitled letters, fines, injunctions, civil penalties, failure of regulatory authorities to grant marketing approvals for our TRuC-T cell product candidates, delays, suspension or withdrawal of approvals, license revocation, seizures or recalls of products, operating restrictions and criminal prosecutions, any of which could damage our reputation and our business.

If our third-party manufacturers use hazardous and biological materials in a manner that causes injury or violates applicable law, we may be liable for damages.

Our research and development activities involve the controlled use of potentially hazardous substances, including chemical and biological materials, by our third-party manufacturers. Our manufacturers are subject to federal, state and local laws and regulations in the United States governing the use, manufacture, storage, handling and disposal of medical and hazardous materials. Although we believe that our manufacturers' procedures for using, handling, storing and disposing of these materials comply with legally prescribed standards, we cannot completely eliminate the risk of contamination or injury resulting from medical or hazardous materials. As a result of any such contamination or injury, we may incur liability or local, city, state or federal authorities may curtail the use of these materials and interrupt our business operations. In the event of an accident, we could be held liable for damages or penalized with fines, and the liability could exceed our resources. We do not have any insurance for liabilities arising from medical or hazardous materials. Compliance with applicable environmental laws and regulations is expensive, and current or future environmental regulations may impair our research, development and production efforts, which could harm our business, prospects, financial condition or results of operations.

Risks Related to Employee Matters and Managing Growth

We are highly dependent on our key personnel, and if we are not successful in attracting and retaining highly qualified personnel, we may not be able to successfully implement our business strategy.

Our ability to compete in the highly competitive biotechnology and pharmaceutical industries depends upon our ability to attract and retain highly qualified managerial, scientific and medical personnel. We are highly dependent on our management, scientific and medical personnel, including our Chief Executive Officer and President, our Chief Financial Officer, our Chief Scientific Officer and our Chief Medical Officer. The loss of the services of any of our executive officers, other key employees and other scientific and medical advisors, and an inability to find suitable replacements could result in delays in product development and harm our business.

We conduct our operations at our facility in Cambridge, Massachusetts. This region is headquarters to many other biopharmaceutical companies and many academic and research institutions. Competition for skilled personnel in our market is intense and may limit our ability to hire and retain highly qualified personnel on acceptable terms or at all. Changes to U.S. immigration and work authorization laws and regulations, including those that restrain the flow of scientific and professional talent, can be significantly affected by political forces and levels of economic activity. Our business may be materially adversely affected if legislative or administrative changes to immigration or visa laws and regulations impair our hiring processes and goals or projects involving personnel who are not U.S. citizens.

To encourage valuable employees to remain at our company, in addition to salary and cash incentives, we have provided stock options that vest over time. The value to employees of stock options that vest over time may be significantly affected by movements in our stock price that are beyond our control, and may at any time be insufficient to counteract more lucrative offers from other companies. Despite our efforts to retain valuable employees, members of our management, scientific and development teams may terminate their employment with us on short notice. Although we have employment agreements with our

key employees, these employment agreements provide for at-will employment, which means that any of our employees could leave our employment at any time, with or without notice. Our success also depends on our ability to continue to attract, retain and motivate highly skilled junior, mid-level and senior managers as well as junior, mid-level and senior scientific and medical personnel.

We will need to grow the size of our organization, and we may experience difficulties in managing this growth.

As of March 15, 2019, we had 47 full-time employees and one part-time employee. As our development and commercialization plans and strategies develop, and as we transition into operating as a public company, we expect to need additional managerial, operational, sales, marketing, financial and other personnel, as well as additional facilities to expand our operations. Future growth would impose significant added responsibilities on members of management, including:

- identifying, recruiting, integrating, maintaining and motivating additional employees;
- managing our internal development efforts effectively, including the clinical and FDA review process for our product candidates, while complying with our contractual obligations to contractors and other third parties; and
- improving our operational, financial and management controls, reporting systems and procedures.

Our future financial performance and our ability to commercialize our product candidates will depend, in part, on our ability to effectively manage any future growth, and our management may also have to divert a disproportionate amount of its attention away from day-to-day activities in order to devote a substantial amount of time to managing these growth activities.

We currently rely, and for the foreseeable future will continue to rely, in substantial part on certain independent organizations, advisors and consultants to provide certain services, including substantially all aspects of regulatory approval, clinical trial management and manufacturing. There can be no assurance that the services of independent organizations, advisors and consultants will continue to be available to us on a timely basis when needed, or that we can find qualified replacements. In addition, if we are unable to effectively manage our outsourced activities or if the quality or accuracy of the services provided by consultants is compromised for any reason, our clinical trials may be extended, delayed or terminated, and we may not be able to obtain regulatory approval of our product candidates or otherwise advance our business. There can be no assurance that we will be able to manage our existing consultants or find other competent outside contractors and consultants on economically reasonable terms, or at all.

If we are not able to effectively expand our organization by hiring new employees and expanding our groups of consultants and contractors, or we are not able to effectively build out new facilities to accommodate this expansion, we may not be able to successfully implement the tasks necessary to further develop and commercialize our product candidates and, accordingly, may not achieve our research, development and commercialization goals.

Our internal computer systems, or those used by our third-party CROs or other contractors or consultants, may fail or suffer security breaches, which could result in a material disruption of the development programs of our product candidates.

Despite the implementation of security measures, our internal computer systems and those of our current and future CROs and other contractors and consultants are vulnerable to damage from computer viruses, unauthorized access, natural disasters, and telecommunication and electrical failures. While we have not experienced any such material system failure or security breach to date, if such an event were to occur and cause interruptions in our operations, it could result in a material disruption of our development programs and our business operations. For example, the loss of data from completed or future preclinical

studies and clinical trials could result in delays in our regulatory approval efforts and significantly increase our costs to recover or reproduce the data. Likewise, we rely on third parties for the manufacture of our product candidates and to conduct clinical trials, and similar events relating to their computer systems could also have a material adverse effect on our business. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability and the further development and commercialization of our product candidates could be delayed.

Business disruptions could seriously harm our future revenue and financial condition and increase our costs and expenses.

Our operations, and those of our CROs, CMOs and other contractors and consultants, could be subject to earthquakes, power shortages, telecommunications failures, water shortages, floods, hurricanes, typhoons, fires, extreme weather conditions, medical epidemics and other natural or man-made disasters or business interruptions, for which we are predominantly self-insured. The occurrence of any of these business disruptions could seriously harm our operations and financial condition and increase our costs and expenses. We rely on third-party manufacturers to produce and process our product candidates on a patient-by-patient basis. Our ability to obtain clinical supplies of our product candidates could be disrupted if the operations of these suppliers are affected by a man-made or natural disaster or other business interruption.

Even if we obtain regulatory approval of our product candidates, the products may not gain market acceptance among physicians, patients, hospitals, cancer treatment centers and others in the medical community.

The use of engineered T cells as a potential cancer treatment is a recent development and may not become broadly accepted by physicians, patients, hospitals, cancer treatment centers and others in the medical community. Various factors will influence whether our product candidates are accepted in the market, including:

- the clinical indications for which our product candidates are licensed;
- physicians, hospitals, cancer treatment centers and patients considering our product candidates as a safe and effective treatment;
- the potential and perceived advantages of our product candidates over alternative treatments;
- our ability to demonstrate the advantages of our product candidates over other engineered TCR-T cell and CAR-T cell therapies;
- the prevalence and severity of any side effects;
- the prevalence and severity of any side effects for other adoptive cell therapies, engineered TCR-T cell and CAR-T cell products and public perception of other adoptive cell therapies, engineered TCR-T cell and CAR-T cell products;
- product labeling or product insert requirements of the FDA or other regulatory authorities;
- limitations or warnings contained in the labeling approved by the FDA;
- the timing of market introduction of our product candidates as well as competitive products;
- the cost of treatment in relation to alternative treatments;
- the availability of adequate coverage, reimbursement and pricing by third-party payors and government authorities;
- the willingness of patients to pay out-of-pocket in the absence of coverage by third-party payors and government authorities;
- relative convenience and ease of administration, including as compared to alternative treatments and competitive therapies; and
- the effectiveness of our sales and marketing efforts.

In addition, although we are not utilizing embryonic stem cells or replication competent vectors, adverse publicity due to the ethical and social controversies surrounding the therapeutic use of such technologies,

and reported side effects from any clinical trials using these technologies or the failure of such clinical trials to demonstrate that these therapies are safe and effective may limit market acceptance of our product candidates. If our product candidates are licensed but fail to achieve market acceptance among physicians, patients, hospitals, cancer treatment centers or others in the medical community, we will not be able to generate significant revenue.

In addition, although our product candidates differ in certain ways from other engineered TCR-T cell and CAR-T cell approaches, serious adverse events or deaths in other clinical trials involving engineered TCR, CAR-T or other T cell products or with our use of licensed engineered TCR-T cell or CAR-T cell products, even if not ultimately attributable to our product or product candidates, could result in increased government regulation, unfavorable public perception and publicity, potential regulatory delays in the testing or licensing of our product candidates, stricter labeling requirements for those product candidates that are licensed, and a decrease in demand for any such product candidates.

Even if our products achieve market acceptance, we may not be able to maintain that market acceptance over time if new products or technologies are introduced that are more favorably received than our products, are more cost effective or render our products obsolete.

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

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

- decreased demand for our product candidates or products that we may develop;
- injury to our reputation;
- withdrawal of clinical trial participants;
- initiation of investigations by regulators;
- costs to defend the related litigation;
- a diversion of management’s time and our resources;
- substantial monetary awards to trial participants or patients;
- product recalls, withdrawals or labeling, marketing or promotional restrictions;
- loss of revenue;
- exhaustion of any available insurance and our capital resources;
- the inability to commercialize any product candidate; and
- a decline in our share price.

Failure to obtain or retain sufficient product liability insurance at an acceptable cost to protect against potential product liability claims could prevent or inhibit the commercialization of products we develop, alone or with corporate collaborators. Although we have clinical trial insurance, our insurance policies also have various exclusions, and we may be subject to a product liability claim for which we have no coverage. We may have to pay any amounts awarded by a court or negotiated in a settlement that exceed our coverage limitations or that are not covered by our insurance, and we may not have, or be able to obtain, sufficient capital to pay such amounts. Even if our agreements with any future corporate collaborators entitle us to indemnification against losses, such indemnification may not be available or adequate should any claim arise.

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

On December 22, 2017, President Trump signed into law the TCJA, which significantly reformed the Internal Revenue Code of 1986, as amended. The TCJA, among other things, contains significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense, limitation of the deduction for net operating losses and elimination of net operating loss carrybacks, in each case, for losses arising in taxable years beginning after December 31, 2017 (though any such tax losses may be carried forward indefinitely), and modifying or repealing many business deductions and credits, including reducing the business tax credit for certain clinical testing expenses incurred in the testing of certain drugs for rare diseases or conditions generally referred to as “orphan drugs”. We continue to examine the impact this tax reform legislation may have on our business. However, the effect of the TCJA on us and our affiliates, whether adverse or favorable, is uncertain and may not become evident for some period of time. You are urged to consult your tax adviser regarding the implications of the TCJA on an investment in our common stock.

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

Under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended, if a corporation undergoes an “ownership change” (generally defined as a greater than 50% change (by value) in its equity ownership over a three-year period), the corporation’s ability to use its pre-change net operating loss carryforwards and other pre-change tax attributes to offset its post-change taxable income may be limited. As a result of our most recent private placements and other transactions that have occurred over the past three years, we may have experienced, and, may experience, an “ownership change.” We may also experience ownership changes in the future as a result of subsequent shifts in our stock ownership. At December 31, 2018, we have cumulative net operating loss carryforwards of approximately $19.2 million and $18.3 million available to reduce federal and state taxable income, respectively, of which $17.4 million of federal net operating losses will carryforward indefinitely, with the remaining federal and state losses beginning to expire in 2035. In addition, we have cumulative federal and state tax credit carryforwards of $1.2 million and $0.8 million, respectively, available to reduce federal and state income taxes which will begin to expire in 2035 and 2031, respectively. Our net operating loss carryforwards and tax credit carryforwards may be limited as a result of certain ownership changes, as defined under Sections 382 and 383 of the Internal Revenue Code. This limits the annual amount of these tax attributes that can be utilized to offset future taxable income or tax liabilities. The amount of the annual limitation is determined based on our value immediately prior to an ownership change. Subsequent ownership changes may affect the limitation in future years. The reduction of the corporate tax rate under the TCJA may cause a reduction in the economic benefit of our net operating loss carryforwards and other deferred tax assets available to us. Under the TCJA, federal net operating losses generated after December 31, 2017 will not be subject to expiration.

Unstable market and economic conditions may have serious adverse consequences on our business, financial condition and stock price.

As widely reported, global credit and financial markets have experienced extreme volatility and disruptions in the past several years, including severely diminished liquidity and credit availability, declines in consumer confidence, declines in economic growth, increases in unemployment rates and uncertainty about economic stability. There can be no assurance that further deterioration in credit and financial markets and confidence in economic conditions will not occur. Our general business strategy may be adversely affected by any such economic downturn, volatile business environment or continued unpredictable and unstable market conditions. If the current equity and credit markets deteriorate, or do not improve, it may make any necessary debt or equity financing more difficult, more costly, and more dilutive. Failure to secure any necessary financing in a timely manner and on favorable terms could have a material adverse effect on our growth strategy, financial performance and stock price and could require us to delay or abandon clinical development plans. In addition, there is a risk that one or more of our current service providers, manufacturers and other partners may not survive these difficult economic times, which could directly affect our ability to attain our operating goals on schedule and on budget.

As of December 31, 2018, we had cash, cash equivalents and short-term investments of $123.2 million. In addition, in February 2019, we raised approximately $80.2 million in our IPO. While we are not aware of any downgrades, material losses, or other significant deterioration in the fair value of our cash equivalents and short-term investments since December 31, 2018, no assurance can be given that further deterioration of the global credit and financial markets would not negatively impact our current portfolio of cash equivalents or our ability to meet our financing objectives. Furthermore, our stock price may decline due in part to the volatility of the stock market and the general economic downturn.

We currently have no marketing and sales organization and have no experience in marketing products. If we are unable to establish marketing and sales capabilities or enter into agreements with third parties to market and sell our product candidates, if licensed, we may not be able to generate product revenue.

We currently have no sales, marketing or distribution capabilities and have no experience in marketing products. We intend to develop an in-house marketing organization and sales force, which will require significant capital expenditures, management resources and time. We will have to compete with other pharmaceutical and biotechnology companies to recruit, hire, train and retain marketing and sales personnel.

If we are unable or decide not to establish internal sales, marketing and distribution capabilities, we will pursue collaborative arrangements regarding the sales and marketing of our products, if licensed. However, there can be no assurance that we will be able to establish or maintain such collaborative arrangements, or if we are able to do so, that they will have effective sales forces. Any revenue we receive will depend upon the efforts of such third parties, which may not be successful. We may have little or no control over the marketing and sales efforts of such third parties and our revenue from product sales may be lower than if we had commercialized our product candidates ourselves. We also face competition in our search for third parties to assist us with the sales and marketing efforts of our product candidates.

There can be no assurance that we will be able to develop in-house sales and distribution capabilities or establish or maintain relationships with third-party collaborators to commercialize any product in the United States or overseas.

Risks Related to our Common Stock

An active, liquid and orderly trading market may not be sustained.

In February 2019, we closed our IPO. Prior to our IPO, there was no public trading market for shares of our common stock. Although we completed our IPO and our common stock is listed and trading on The Nasdaq Global Select Market, an active trading market for our shares may not be sustained. If an active market for our common stock does not continue, it may be difficult for our stockholders to sell their shares without depressing the market price for the shares or sell their shares at or above the prices at which they acquired their shares or sell their shares at the time they would like to sell. Further, any inactive trading market for our common stock may also impair our ability to raise capital by selling shares of our common stock and may impair our ability to enter into strategic partnerships or acquire companies or products by using our shares of common stock as consideration.

The trading price of our stock may be volatile. Securities class action or other litigation involving our company or members of our management team could also substantially harm our business, financial condition and results of operations.

The trading price of our common stock is likely to be highly volatile and could be subject to wide fluctuations in response to various factors, some of which are beyond our control, including limited trading volume. The market price of our common stock may be influenced by many factors, including:

- the results of our ongoing, planned or any future preclinical studies, clinical trials or clinical development programs;
- the commencement, enrollment, or results of clinical trials of our product candidates or any future clinical trials we may conduct, or changes in the development status of our product candidates;
- adverse results or delays in preclinical studies and clinical trials;
- our decision to initiate a clinical trial, not to initiate a clinical trial, or to terminate an existing clinical trial;
- any delay in our regulatory filings or any adverse regulatory decisions, including failure to receive regulatory approval of our product candidates;
- changes in laws or regulations applicable to our products, including but not limited to clinical trial requirements for approvals;
- adverse developments concerning our manufacturers or our manufacturing plans;
- our inability to obtain adequate product supply for any licensed product or inability to do so at acceptable prices;
- our inability to establish collaborations if needed;
- our failure to commercialize our product candidates;
- additions or departures of key scientific or management personnel;
- unanticipated serious safety concerns related to the use of our product candidates;
- introduction of new products or services offered by us or our competitors;
- announcements of significant acquisitions, strategic partnerships, joint ventures or capital commitments by us or our competitors;
- our ability to effectively manage our growth;
- the size and growth of our initial cancer target markets;
- our ability to successfully treat additional types of cancers or at different stages;
- actual or anticipated variations in quarterly operating results;
- our cash position;
- our failure to meet the estimates and projections of the investment community or that we may otherwise provide to the public;

- publication of research reports about us or our industry, or immunotherapy in particular, or positive or negative recommendations or withdrawal of research coverage by securities analysts;
- changes in the market valuations of similar companies;
- overall performance of the equity markets;
- sales of our common stock by us or our stockholders in the future;
- trading volume of our common stock;
- changes in accounting practices;
- ineffectiveness of our internal controls;
- disputes or other developments relating to proprietary rights, including patents, litigation matters and our ability to obtain patent protection for our technologies;
- significant lawsuits, including patent or stockholder litigation;
- general political and economic conditions; and
- other events or factors, many of which are beyond our control.

In addition, the stock market in general, and The Nasdaq Global Select Market and biopharmaceutical companies in particular, have experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of these companies. Broad market and industry factors may negatively affect the market price of our common stock, regardless of our actual operating performance. If the market price of our common stock does not exceed your purchase price, you may not realize any return on your investment in us and may lose some or all of your investment. In the past, securities class action litigation has often been instituted against companies following periods of volatility in the market price of a company's securities. This type of litigation, if instituted, could result in substantial costs and a diversion of management's attention and resources, which would harm our business, operating results, or financial condition.

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

We may seek additional capital through a combination of public and private equity offerings, debt financings, strategic partnerships and alliances and licensing arrangements. To the extent that we raise additional capital through the sale of equity or convertible debt securities, your ownership interest will be diluted, and the terms may include liquidation or other preferences that adversely affect your rights as a stockholder. The incurrence of indebtedness would result in increased fixed payment obligations and could involve certain restrictive covenants, such as limitations on our ability to incur additional debt, limitations on our ability to acquire or license intellectual property rights and other operating restrictions that could adversely impact our ability to conduct our business. If we raise additional funds through strategic partnerships and alliances and licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies or product candidates, or grant licenses on terms unfavorable to us.

We do not intend to pay dividends on our common stock, so any returns will be limited to the value of our stock.

We currently anticipate that we will retain future earnings for the development, operation, and expansion of our business and do not anticipate declaring or paying any cash dividends for the foreseeable future. In addition, we may enter into agreements that prohibit us from paying cash dividends without prior written consent from our contracting parties, or which other terms prohibiting or limiting the amount of dividends that may be declared or paid on our common stock. Any return to stockholders will therefore be limited to the appreciation of their stock, which may never occur.

Our principal stockholders and management own a significant percentage of our stock and will be able to exert significant influence over matters subject to stockholder approval.

As of March 1, 2019, our executive officers, directors, and 5% stockholders beneficially owned approximately 68% of our voting stock. Therefore, these stockholders will have the ability to influence us through this ownership position. These stockholders may be able to determine all matters requiring stockholder approval. For example, these stockholders may be able to control elections of directors, amendments of our organizational documents, or approval of any merger, sale of assets, or other major corporate transaction. This may prevent or discourage unsolicited acquisition proposals or offers for our common stock that you may feel are in your best interest as one of our stockholders.

We are an emerging growth company, and we cannot be certain if the reduced reporting requirements applicable to emerging growth companies will make our common stock less attractive to investors.

We are an emerging growth company, as defined in the Jumpstart Our Business Startups Act (JOBS Act) enacted in April 2012. For as long as we continue to be an emerging growth company, we may take advantage of exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002, as amended (Sarbanes-Oxley Act), reduced disclosure obligations regarding executive compensation in this Annual Report, our other periodic reports and proxy statements, and exemptions from the requirements of holding nonbinding advisory votes on executive compensation and stockholder approval of any golden parachute payments not previously approved. We could be an emerging growth company for up to five years following our IPO, although circumstances could cause us to lose that status earlier. We will remain an emerging growth company until the earlier of (1) the last day of the fiscal year (a) following the fifth anniversary of the closing of our IPO, (b) in which we have total annual gross revenue of at least $1.07 billion or (c) in which we are deemed to be a large accelerated filer, which requires the market value of our common stock that is held by non-affiliates to exceed $700 million as of the prior June 30th, and (2) the date on which we have issued more than $1 billion in non-convertible debt during the prior three-year period.

Under the JOBS Act, emerging growth companies can also delay adopting new or revised accounting standards until such time as those standards apply to private companies. We have elected to avail ourselves of this exemption from complying with new or revised accounting standards and, therefore, will not be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

Even after we no longer qualify as an emerging growth company, we may still qualify as a “smaller reporting company,” which would allow us to take advantage of many of the same exemptions from disclosure requirements, including not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act and reduced disclosure obligations regarding executive compensation in this Annual Report, our other periodic reports and proxy statements. We cannot predict if investors will find our common stock less attractive because we may 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.

We will incur significant increased costs as a result of operating as a public company, and our management will be required to devote substantial time to new compliance initiatives.

As a public company, we will incur significant legal, accounting, and other expenses that we did not incur as a private company. We will be subject to the reporting requirements of the Securities Exchange Act of 1934, as amended, which will require, among other things, that we file with the Securities and Exchange Commission (SEC), annual, quarterly, and current reports with respect to our business and financial

condition. In addition, the Sarbanes-Oxley Act, as well as rules subsequently adopted by the SEC and The Nasdaq Global Select Market to implement provisions of the Sarbanes-Oxley Act, impose significant requirements on public companies, including requiring establishment and maintenance of effective disclosure and financial controls and changes in corporate governance practices. Further, in July 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act (the Dodd-Frank Act) was enacted. There are significant corporate governance and executive compensation related provisions in the Dodd-Frank Act that require the SEC to adopt additional rules and regulations in these areas, such as “say on pay” and proxy access. Recent legislation permits emerging growth companies to implement many of these requirements over a longer period and up to five years from the pricing of our IPO. We intend to take advantage of this new legislation but cannot guarantee that we will not be required to implement these requirements sooner than budgeted or planned and thereby incur unexpected expenses. Stockholder activism, the current political environment, and the current high level of government intervention and regulatory reform may lead to substantial new regulations and disclosure obligations, which may lead to additional compliance costs and impact the manner in which we operate our business in ways we cannot currently anticipate.

We expect the rules and regulations applicable to public companies to substantially increase our legal and financial compliance costs and to make some activities more time-consuming and costly. If these requirements divert the attention of our management and personnel from other business concerns, they could have a material adverse effect on our business, financial condition, and results of operations. The increased costs will decrease our net income or increase our net loss and may require us to reduce costs in other areas of our business or increase the prices of our products or services. For example, we expect these rules and regulations to make it more difficult and more expensive for us to obtain director and officer liability insurance and we may be required to incur substantial costs to maintain the same or similar coverage. We cannot predict or estimate the amount or timing of additional costs we may incur to respond to these requirements. The impact of these requirements could also make it more difficult for us to attract and retain qualified persons to serve on our board of directors, our board committees, or as executive officers.

Sales of a substantial number of shares of our common stock by our existing stockholders in the public market could cause our stock price to fall.

In connection with our IPO, our officers, directors and substantially all of our stockholders have agreed to be subject to a contractual lock-up with the underwriters, which will expire 180 days after the date of the IPO. Jefferies LLC, SVB Leerink LLC and BMO Capital Markets Corp., however, may, in their sole discretion, permit our officers, directors and other stockholders who are subject to these lock-up agreements to sell shares prior to the expiration of the lock-up agreements.

If our existing stockholders sell, or indicate an intention to sell, substantial amounts of our common stock in the public market after the lock-up and other legal restrictions on resale lapse, the trading price of our common stock could decline. As of March 25, 2019, we have a total of 23,939,901 shares of common stock outstanding. Of these shares, only the shares of common stock sold in our initial public offering and any shares sold following the underwriters’ exercise of their option to purchase additional shares, are freely tradable without restriction in the public market, unless purchased by our affiliates.

In addition, shares of common stock that are either subject to outstanding options or reserved for future issuance under our 2018 Plan and our 2018 Employee Stock Purchase Plan adopted in connection with the IPO will become eligible for sale in the public market to the extent permitted by the provisions of various vesting schedules, the lock-up agreements and Rule 144 and Rule 701 under the Securities Act of 1933, as amended (the Securities Act). If these additional shares of common stock are sold, or if it is perceived that they will be sold, in the public market, the trading price of our common stock could decline.

The holders of 17,276,913 shares of our common stock are entitled to rights with respect to the registration of their shares under the Securities Act, subject to the 180-day lock-up agreements described above. Registration of these shares under the Securities Act would result in the shares becoming freely tradable without restriction under the Securities Act, except for shares held by affiliates, as defined in Rule 144 under the Securities Act. Any sales of securities by these stockholders could have a material adverse effect on the trading price of our common stock.

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

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

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

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

Our bylaws designate certain courts as the sole and 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 bylaws provide that, unless we consent in writing to an alternative forum, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for (i) any derivative action or proceeding

brought on our behalf, (ii) any action asserting a claim of breach of fiduciary duty owed by any of our directors, officers, and employees to us or our stockholders, (iii) any action asserting a claim arising pursuant to any provision of the Delaware General Corporation Law, our amended and restated certificate of incorporation or our amended and restated bylaws or (iv) any action asserting a claim that is governed by the internal affairs doctrine, in each case subject to the Court of Chancery having personal jurisdiction over the indispensable parties named as defendants therein. This exclusive forum provision will not apply to any causes of action arising under the Exchange Act. In addition, our amended and restated bylaws will provide that any person or entity purchasing or otherwise acquiring any interest in shares of our common stock is deemed to have notice of and consented to the foregoing provisions. We recognize that the forum selection clause in our bylaws may impose additional litigation costs on stockholders in pursuing any such claims, particularly if the stockholders do not reside in or near the State of Delaware. Additionally, the forum selection clauses in our amended and restated bylaws may limit our stockholders' ability to bring a claim in a forum that they find favorable for disputes with us or our directors, officers or employees, which may discourage such lawsuits against us and our directors, officers and employees even though an action, if successful, might benefit our stockholders. The Court of Chancery of the State of Delaware may also reach different judgments or results than would other courts, including courts where a stockholder considering an action may be located or would otherwise choose to bring the action, and such judgments may be more or less favorable to us than our stockholders.

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. We have begun the process of documenting, reviewing, and improving our internal controls and procedures for compliance with Section 404 of the Sarbanes-Oxley Act, which will require annual management assessment of the effectiveness of our internal control over financial reporting. We have begun recruiting additional finance and accounting personnel with certain skill sets that we will 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 stock price and make it more difficult for us to effectively market and sell our service to new and existing customers.

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

The trading market for our common stock will depend in part on the research and reports that securities or industry analysts publish about us or our business. Securities and industry analysts do not currently, and may never, publish research on our company. If no securities or industry analysts commence coverage of our company, the trading price for our stock would likely be negatively impacted. In the event securities or industry analysts initiate coverage, if one or more of the analysts who cover us downgrades our stock or publishes inaccurate or unfavorable research about our business, our stock price may decline. If one or more of these analysts ceases coverage of our company or fails to publish reports on us regularly, demand for our stock could decrease, which might cause our stock price and trading volume to decline.

Item 1B. Unresolved Staff Comments

Not Applicable.

Item 2. Properties.

Our headquarters are located at 100 Binney Street, Cambridge, Massachusetts 02142, where we occupy approximately 23,000 square feet. Our lease expires in June of 2025. We believe that our office and laboratory space is sufficient to meet our needs for the foreseeable future.

Item 3. Legal Proceedings

From time to time, we may be subject to legal proceedings and claims in the ordinary course of business. We are not currently aware of any such proceedings or claims that we believe will have, individually or in the aggregate, a material adverse effect on our business, financial condition or results of operations.

Item 4. Mine Safety Disclosure

Not Applicable.

Part II

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

Certain Information Regarding the Trading of Our Common Stock
Our common stock trades under the symbol "TCRR" on the Nasdaq Global Select Market and has been publicly traded since February 14, 2019. Prior to this time, there was no public market for our common stock.

Holders of Our Common Stock
As of March 15, 2019, there were approximately 62 holders of record of shares of our common stock. This number does not include stockholders for whom shares are held in "nominee" or "street" name.

Dividend Policy
We have never declared or paid any cash dividends on our capital stock. We currently intend to retain any future earnings to fund the development and expansion of our business, and therefore we do not anticipate paying cash dividends on our common stock in the foreseeable future. Any future determination to pay dividends will be at the discretion of our board of directors and will depend on our results of operations, financial condition, capital requirements, contractual restrictions and other factors deemed relevant by our board of directors.

Recent sales of unregistered securities
Set forth below is information regarding shares of our common stock, shares of our preferred stock issued, and stock options granted by us during the period covered by this Annual Report on Form 10-K that were not registered under the Securities Act. Included is the consideration, if any, we received for such shares and options and information relating to the section of the Securities Act, or rule of the Securities and Exchange Commission, under which exemption from registration was claimed.

Issuances of Capital Stock
In February 2018, with subsequent offerings in March 2018 and April 2018, investors purchased an aggregate of 62,500,000 shares of Series B preferred stock for approximately $125,000,000 at $2.00 per share.

No underwriters were involved in the foregoing sales of securities. The sales of securities described above were deemed to be exempt from registration pursuant to Section 4(a)(2) of the Securities Act, including Regulation D and Rule 506 promulgated thereunder, as transactions by an issuer not involving a public offering. All of the purchasers in these transactions represented to us in connection with their purchase that they were acquiring the securities for investment and not distribution, that they could bear the risks of the investment and could hold the securities for an indefinite period of time. Such purchasers received written disclosures that the securities had not been registered under the Securities Act and that any resale must be made pursuant to a registration or an available exemption from such registration. All of the foregoing securities are deemed restricted securities for the purposes of the Securities Act.

Grants and Exercises of Stock Options Under Equity Plans
During the period covered by this Annual Report on Form 10-K, we granted stock options to purchase an aggregate of 1,185,119 shares of our common stock, with exercise prices ranging from $5.88 to $8.05 per share, to employees, directors and consultants pursuant to the 2015 Stock Option and Grant Plan, as amended (the 2015 Plan). In 2018, 145,618 shares of common stock were issued upon the exercise of stock options pursuant to the 2015 Plan.

The issuances of the securities described above were deemed to be exempt from registration pursuant to Section 4(a)(2) of the Securities Act or Rule 701 promulgated under the Securities Act as transactions

pursuant to compensatory benefit plans. The shares of common stock issued upon the exercise of options are deemed to be restricted securities for purposes of the Securities Act.

Use of Proceeds from Initial Public Offering

In February 2019, we completed the initial public offering of our common stock (the IPO) pursuant to which we issued and sold 5,750,000 shares of our common stock at a price to the public of $15.00 per share.

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- 229066), which was declared effective by the SEC on February 13, 2019. Following the sale of all shares, including shares sold pursuant to the underwriters' option to purchase an additional 750,000 shares exercised in February 2019, in connection with the closing of our IPO, the offering terminated. Jefferies, SVB Leerink and BMO Capital Markets acted as joint book-running managers and Wedbush PacGrow and China Renaissance acted as lead manager of our initial public offering.

We received aggregate gross proceeds from our IPO of approximately $86.3 million, or aggregate net cash proceeds of approximately $80.2 million after deducting underwriting discounts and commissions and offering expenses. None of the underwriting discounts and commissions or offering expenses were incurred or paid to directors or officers of ours or their associates or to persons owning 10% or more of our common stock or to any of our affiliates.

Information related to use of proceeds from registered securities is incorporated herein by reference to the “Use of Proceeds” section of our final prospectus related to the IPO. There has been no material change in the planned use of proceeds from our IPO as described in our final prospectus.

Issuer Purchases of Equity Securities

None.

Item 6. Selected Financial Data

You should read the following selected financial data together with our consolidated financial statements and the related notes appearing at the end of this Annual Report on Form 10-K and the "Management's Discussion and Analysis of Financial Condition and Results of Operations" section.

We have derived the consolidated statements of operations data for the years ended December 31, 2018 and 2017 and the consolidated balance sheet data as of December 31, 2018 and 2017 from our audited consolidated financial statements appearing elsewhere in this Annual Report. The consolidated statement of operations for the year ended December 31, 2016 and consolidated balance sheet data as of December 31, 2016 is derived from our audited consolidated financial statements not included in this Annual Report. Our historical results are not necessarily indicative of the results that may be expected in any future period.

	Years Ended December 31,		
	2018	2017	2016
	(in thousands, except share and per share data)		
Consolidated Statements of Operations			
Operating expenses			
Research and development	$ 19,673	$ 9,569	$ 7,670
General and Administrative	6,780	3,611	2,260
Total operating expenses	26,453	13,180	9,930
Net loss	(24,251)	(13,070)	(9,915)
Accretion of redeemable convertible preferred stock to redemption value	(37,298)	(1,794)	(787)
Net loss attributable to common stockholders	$ (61,549)	$ (14,864)	$ (10,702)
Net loss per share attributable to common stockholders – basic and diluted (1)	$ (98.53)	$ (39.94)	$ (38.64)
Weighted average shares of common stock outstanding – basic and diluted	624,659	372,116	276,976
(1) All potentially dilutive securities, on an as converted basis have been excluded from the computation of diluted weighted-average shares outstanding as they would be antidilutive			

	Years Ended December 31,		
	2018	2017	2016
	(in thousands)		
Consolidated Balance Sheet data			
Cash and cash equivalents	$ 47,674	$ 19,811	$ 7,992
Investments	75,493	—	8,348
Working capital (2)	120,028	19,472	16,349
Total assets	129,433	22,039	18,251
Redeemable convertible preferred stock	209,230	47,102	29,169
Accumulated deficit	(85,590)	(26,324)	(11,882)
Total stockholders' equity (deficit)	(85,696)	(26,324)	(11,884)
(2) Working capital is calculated as current assets less current liabilities.			

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

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our consolidated financial statements and related notes appearing at the end of this Annual Report on Form 10-K. Some of the information contained in this discussion and analysis or set forth elsewhere in this Annual Report on Form 10-K, including information with respect to our plans and strategy for our business, includes forward looking statements that involve risks and uncertainties. As a result of many factors, including those factors set forth in the "Risk Factors" section of this Annual Report on Form 10-K, our actual results could differ materially from the results described in, or implied by, the forward-looking statements contained in the following discussion and analysis.

Overview

We are a clinical-stage immunotherapy company developing the next generation of novel T cell therapies for patients suffering from cancer. Our proprietary TCR Fusion Construct T cells (TRuC-T cells) specifically recognize and kill cancer cells by harnessing the entire T cell receptor (TCR) signaling complex, which we believe is essential for T cell therapies to be effective in patients with solid tumors. We have also designed our TRuC-T cells so that tumor cell recognition does not require human leukocyte antigens (HLA), which provides two important additional benefits. First, in contrast to current engineered T cell therapies that use the full TCR (TCR-T cells), our technology is designed so that it can be applied to all patients that express the cancer surface antigen irrespective of HLA subtype, which we believe will allow us to address a significantly larger patient population. Second, HLA is downregulated or lost in many tumors which can prevent their recognition by T cells and lead to diminished response rates and higher relapse rates. We therefore believe our approach will allow us to deliver the first HLA-independent TCR-T cell therapy for patients with solid tumors. We also believe that our product candidates have the potential to improve upon the efficacy and safety of currently approved chimeric antigen receptor T (CAR-T) cell therapies in CD19-positive B-cell hematological malignancies. This belief is based on preclinical studies comparing our product candidates to CAR-T cells that we engineered.

Since our inception in May 2015, we have focused significant efforts and financial resources on developing our TRuC platform, establishing and protecting our intellectual property portfolio, conducting research and development of our product candidates, manufacturing drug product material for use in preclinical studies, staffing our company and raising capital. We do not have any products approved for sale and have not generated any revenue from product sales. To date, we have funded our operations with proceeds from the sale of our preferred stock. Through December 31, 2018 we have received gross proceeds of $169.8 million from the sale of our preferred stock, stock option exercises and warrant exercises.

Since our inception, we have incurred significant operating losses. Our ability to generate product revenue sufficient to achieve profitability will depend heavily on the successful development and eventual commercialization of one or more of our product candidates. As of December 31, 2018, we had an accumulated deficit of $85.6 million. We expect to continue to incur significant expenses and increasing operating losses for at least the next several years. We expect that our expenses and capital requirements will increase substantially in connection with our ongoing activities, particularly if and as we:

- conduct additional preclinical studies for our product candidates;
- initiate and conduct clinical trials for our product candidates;
- continue to discover and develop additional product candidates;
- acquire or in-license other product candidates and technologies;
- maintain, expand, and protect our intellectual property portfolio;
- hire additional clinical and scientific personnel;
- expand our manufacturing capabilities with third parties and establish manufacturing capabilities in-house;

- seek regulatory approvals for any product candidates that successfully complete clinical trials; and
- add operational, financial, and management information systems and personnel, including personnel to support our product development and planned future commercialization efforts, as well as to support our transition to a public reporting company.

We will not generate revenue from product sales unless and until we successfully complete clinical development and obtain regulatory approval for our product candidates. If we obtain regulatory approval for any of our product candidates and do not enter into a commercialization partnership, we expect to incur significant expenses related to developing our internal commercialization capability to support product sales, marketing and distribution. Additionally, we expect to incur significant expenses if we acquire and establish our own commercial manufacturing facility, which will be a costly and time-consuming process, and in our operations as a public company.

As a result, we will need substantial additional funding 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 marketing, distribution or licensing arrangements. We may be unable to raise additional funds or enter into such other agreements or arrangements when needed on favorable terms, or at all. If we fail to raise capital or enter into such agreements as, and when, needed, we may have to significantly delay, scale back or discontinue the development and commercialization of one or more of our product candidates.

Components of Our Results of Operations

Operating Expenses

Research and Development Expenses

Research and development expenses consist primarily of costs incurred for our research activities, including our drug discovery efforts and the development of our product candidates, which include:

- employee-related expenses, including salaries, benefits and stock-based compensation;
- expenses incurred in connection with the preclinical and clinical development of our product candidates, including under agreements with third parties, such as consultants, contractors and contract research organizations (CROs);
- the cost of acquiring and manufacturing preclinical and clinical trial materials, including under agreements with third parties, such as consultants, contractors and contract manufacturing organizations (CMOs);
- consultant fees and expenses associated with outsourced professional scientific development services;
- facilities, depreciation and other expenses, which include direct and allocated expenses for rent and maintenance of facilities and insurance; and
- payments made under third-party licensing agreements.

We expense research and development costs as incurred. Any nonrefundable 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 related goods are delivered or the services are performed.

We typically use our employee, consultant and infrastructure resources across our development programs. We track certain outsourced development costs by product candidate, but we do not allocate personnel costs or other internal costs to specific product candidates.

Product candidates in later stages of clinical development generally have higher development costs than those in earlier stages of clinical development, primarily due to the increased size and duration of later-stage clinical trials. We expect that our research and development expenses will increase substantially in connection with our planned preclinical and clinical development and manufacturing activities in the near term and in the future. At this time, we cannot reasonably estimate or know the nature, timing, and costs of the efforts that will be necessary to complete the preclinical and clinical development of any of our product candidates. The successful development and commercialization of our product candidates is highly uncertain. This is due to the numerous risks and uncertainties associated with product development and commercialization, including the following:

- the timing and progress of our preclinical studies and clinical trials, which may be significantly slower or cost more than we currently anticipate and will depend substantially upon the performance of third-party contractors;
- the number and scope of preclinical and clinical programs we decide to pursue;
- the progress of the development efforts of parties with whom we may enter into collaboration arrangements;
- our ability to maintain our current research and development programs and to establish new ones;
- our ability to establish licensing or collaboration arrangements;
- our ability to complete investigational new drug application (IND)-enabling studies and successfully submit IND or comparable applications;
- whether we are required by the U.S. Food and Drug Administration (FDA) or similar foreign regulatory authorities to conduct additional clinical trials or other studies beyond those planned to support the approval and commercialization of our product candidates or any future product candidates;
- the timely receipt of necessary marketing approvals from the FDA and similar foreign regulatory authorities;
- our ability and the ability of third parties with whom we contract to manufacture adequate clinical and commercial supplies of our product candidates or any future product candidates, remain in good standing with regulatory agencies and develop, validate and maintain commercially viable manufacturing processes that are compliant with current good manufacturing practices (cGMP);
- our ability to demonstrate to the satisfaction of the FDA and similar foreign regulatory authorities the safety, potency, purity and acceptable risk to benefit profile of our product candidates or any future product candidates;
- the prevalence, duration and severity of potential side effects or other safety issues experienced with our product candidates or future product candidates, if any;
- our ability to establish and enforce intellectual property rights in and to our product candidates or any future product candidates;
- our ability to successfully develop a commercial strategy and thereafter commercialize our product candidates or any future product candidates in the United States and internationally, if licensed for marketing, reimbursement, sale and distribution in such countries and territories, whether alone or in collaboration with others;
- the willingness of physicians, operators of clinics and patients to utilize or adopt any of our product candidates or future product candidates to treat solid and hematologic cancers;
- patient demand for our product candidates and any future product candidates, if licensed;
- competition with other products; and
- continued acceptable safety profile of our therapies following approval.

A change in the outcome of any of these variables with respect to the development of any of our product candidates could significantly change the costs and timing associated with the development of that product candidate. We may never succeed in obtaining regulatory approval for any of our product candidates.

General and Administrative Expenses

General and administrative expenses consist primarily of salaries and related costs, including stock-based compensation, for personnel in executive, finance and administrative functions. General and administrative expenses also include direct and allocated facility-related costs as well as professional fees for legal, patent, consulting, investor and public relations, accounting and audit services. We anticipate that our general and administrative expenses will increase in the future as we increase our headcount to support our continued research activities and development of our product candidates. We also anticipate that we will incur increased accounting, audit, legal, regulatory, compliance, and director and officer insurance costs as well as investor and public relations expenses associated with operating as a public company.

Other Income, net
Other income, net consists of interest earned on our cash equivalents and investment balances, net of investment charges

Consolidated Statements of Operations

	Years Ended December 31,	
	2018	**2017**
	(in thousands)	
Operating expenses		
Research and development	$ 19,673	$ 9,569
General and administrative	6,780	3,611
Total operating expenses	(26,453)	(13,180)
Loss from operations	(26,453)	(13,180)
Other income, net	2,202	110
Net loss	(24,251)	(13,070)
Accretion of redeemable convertible preferred stock to redemption value	(37,298)	(1,794)
Net loss attributable to common stockholders	$ (61,549)	$ (14,864)

Comparison of the years ended December 31, 2018 and 2017

Research and development expenses

Research and development expenses were $19.7 million for the year ended December 31, 2018 compared to $9.6 million for the year ended December 31, 2017. The following table summarizes our research and development expenses for the years ended December 31, 2018 and 2017.

	Years Ended December 31,		
	2018	2017	change
	(in thousands)		
TC-210 preclinical expenses	$ 5,821	$ 929	$ 4,892
Platform development (preclinical)	1,951	2,197	(246)
Personnel expenses	8,753	4,769	3,984
Allocated facilities costs	2,696	1,422	1,274
Other expenses	452	252	200
Total research and development expenses	$ 19,673	$ 9,569	$ $ 10,104

The $10.1 million increase in expense is primarily attributable to the $4.9 million increase in expenses to third parties progressing the preclinical development of our lead solid tumor product candidate, TC-210. During 2018, there was an increase in personnel expenses of $4.0 million due to our increase in headcount, an increase in allocated facilities costs of $1.3 million and an increase in other research and development expenses of $0.2 million, primarily attributable to an increase in scientific advisory board fees and equipment maintenance contracts. These increases were offset by a decrease of $0.2 million in preclinical expenses related to our platform development. The decrease in platform development costs is the result of us shifting our focus and resources to the advancement of our lead product candidate, TC-210.

General and Administrative Expenses

General and administrative expenses were $6.8 million for the year ended December 31, 2018, compared to $3.6 million for the year ended December 31, 2017. The increase in general and administrative expenses was primarily due to an increase in personnel costs of $2.3 million due to our increase in headcount, an increase in professional service expenses of $0.6 million and an increase in facility and other expenses of $0.3 million.

Other Income, net

Interest income, net was $2.2 million for the year ended December 31, 2018, compared to $0.1 million for the year ended December 31, 2017. The increase was due to interest income as a result of a higher average cash balance in our commercial and investment accounts in 2018.

Liquidity and Capital Resources

Since our inception, we have incurred net losses and generated negative cash flows from operations. Since inception, we have funded our operations with proceeds from the sale of our Series A and Series B preferred stock. We have received aggregate gross cash proceeds of approximately $44.5 million in connection with the sale of our Series A preferred stock and $125.0 million in connection with the sale of our Series B preferred stock. As of December 31, 2018, we had cash, cash equivalents and investments of $123.2 million.

In February 2019, we completed our initial public stock offering which provided net cash proceeds of $80.2 million.

Cash flows

The following table summarizes our sources and uses of cash for each of the periods presented:

	Years Ended December 31,	
(in thousands)	2018	2017
Operating activities	$ (18,778)	$ (12,015)
Investing activities	(76,339)	7,672
Financing activities	122,980	16,163

Operating Activities

During the year ended December 31, 2018, we used $18.8 million of cash in operating activities, resulting primarily from our net loss of $24.3 million offset by non-cash charges of $2.3 million, which related to depreciation and amortization, stock-based compensation, interest receivable, and a net decrease in operating assets and liabilities of $3.2 million. The net decreases in operating assets and liabilities were primarily attributable to the timing in which we paid our vendors.

During the year ended December 31, 2017, we used $12.0 million of cash in operating activities, primarily resulting from our net loss of $13.1 million offset by non-cash charges of $0.7 million, which primarily consisted of depreciation and stock-based compensation, and a net decrease in operating assets and liabilities of $0.3 million.

Investing Activities

During the year ended December 31, 2018, cash used in investing activities was $76.3 million, consisting primarily of purchases of investments net of maturities of $75.3 million and purchases of property and equipment of $1.0 million.

During the year ended December 31, 2017, cash provided by investing activities was $7.7 million, consisting primarily of maturities of investments of $14.8 million, offset by related purchases of short-term investments of $6.5 million, purchases of property and equipment of $0.4 million and an increase in restricted cash of $0.3 million.

Financing Activities

During the year ended December 31, 2018 and 2017, net cash provided by financing activities was $123.0 and $16.1 million, respectively, in each case consisting primarily of net cash proceeds from the sale and issuance of our Series A and Series B preferred stock. We also received proceeds of $0.1 million and $44 during the years ended December 31, 2018 and 2017, respectively, in connection with the exercise of stock options, including options that were unvested and remain subject to repurchase until vesting.

Funding Requirements

We expect our expenses to increase substantially in connection with our ongoing activities, particularly as we advance the preclinical studies and clinical trials of our product candidates in development and we will incur additional costs associated with operating as a public reporting company. In addition, if we obtain marketing approval for any of our product candidates, we expect to incur significant commercialization expenses related to establishing sales, marketing, distribution and other commercial infrastructure to commercialize such products.

In addition, our expenses will increase as we:

- commence enrollment of clinical trials for our product candidates;
- seek regulatory approval for any product candidates that successfully complete preclinical and clinical trials;
- establish manufacturing capabilities in-house for the production of preclinical and clinical supply;
- hire additional clinical, medical, research and operational personnel; and
- maintain, expand, and protect our intellectual property portfolio.

As of December 31, 2018, we had cash, cash equivalents and short-term investments of $123.2 million. In February 2019, we completed our IPO which generated net cash proceeds of $80.2 million. We believe that the net proceeds from the IPO, together with our existing cash, cash equivalents and investments, will enable us to fund our operating expenses and capital expenditure requirements at least into 2022. We have based this estimate on assumptions that may prove to be wrong, and we could utilize our available capital resources sooner than we expect. Additionally, changing circumstances may cause us to consume capital significantly faster than we currently anticipate, and we may need to spend more money than currently expected because of circumstances beyond our control. Accordingly, we will need to obtain substantial additional funding in connection with our continuing operations.

Until such time, if ever, as we can generate substantial product revenue, we expect to finance our operations through a combination of equity offerings, debt financings, collaborations, strategic alliances, and marketing, distribution, or licensing arrangements. 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 and preferred equity financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making acquisitions or capital expenditures, or declaring dividends. If we raise additional funds through collaborations, strategic alliances, or marketing, distribution, or licensing arrangements with third parties, we may have to relinquish valuable rights to our technologies, future revenue streams, research programs or drug candidates, or grant licenses on terms that may not be favorable to us. If we are unable to raise additional funds through equity or debt financings or other arrangements when needed, we may be required to delay, limit, reduce, or terminate our research, product development, or future commercialization efforts, or grant rights to develop and market drug candidates that we would otherwise prefer to develop and market ourselves.

Critical Accounting Policies and Significant Judgments and Estimates

Our consolidated financial statements are prepared in accordance with generally accepted accounting principles in the United States (GAAP). The preparation of our consolidated financial statements and related disclosures requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, and expenses, and the disclosure of contingent assets and liabilities in our consolidated financial statements. 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 3 to our consolidated financial statements appearing elsewhere in this Annual Report, we believe that the following accounting policies are those most critical to the judgments and estimates used in the preparation of our consolidated financial statements.

Research and Development Expenses

Research and development expenses consist primarily of costs incurred in connection with the development of our product candidates. We expense research and development costs as incurred.

As part of the process of preparing our consolidated financial statements, we are required to estimate our accrued research and development expenses. This process involves reviewing open contracts and purchase orders, communicating with our applicable personnel to identify services that have been performed on our behalf, and estimating the level of service performed and the associated cost incurred for the service when we have not yet been invoiced or otherwise notified of actual costs. The majority of our service providers invoice us in arrears for services performed, on a pre-determined schedule or when contractual milestones are met; however, some require advance payments. We make estimates of our accrued expenses as of each balance sheet date in the consolidated financial statements based on facts and circumstances known to us at that time. We periodically confirm the accuracy of the estimates with the service providers and make adjustments, if necessary. Examples of estimated accrued research and development expenses include fees paid to:

- vendors in connection with preclinical development activities;
- CMOs in connection with the production of preclinical and clinical trial materials; and
- CROs in connection with preclinical studies and clinical trials.

We base our expenses related to preclinical studies and clinical trials on our estimates of the services received and efforts expended pursuant to quotes and contracts with multiple CMOs and CROs that supply, conduct, and manage preclinical studies on our behalf. The financial terms of these agreements are subject to negotiation, vary from contract to contract, and may result in uneven payment flows. There may be instances in which payments made to our vendors will exceed the level of services provided and result in a prepayment of the expense. In accruing service fees, we estimate the time period over which services will be performed and the level of effort to be expended in each period. If the actual timing of the performance of services or the level of effort varies from the estimate, we adjust the accrual or prepaid expense accordingly. Although we do not expect our estimates to be materially different from amounts actually incurred, our understanding of the status and timing of services performed relative to the actual status and timing of services performed may vary and may result in reporting amounts that are too high or too low in any particular period.

Stock-Based Compensation

We measure stock options and other stock-based awards granted to employees based on their fair value on the date of the grant and recognize compensation expense of those awards over the requisite service period, which is generally the vesting period of the respective award. We apply the straight-line method of expense recognition to all awards with service-based vesting conditions.

For stock-based awards granted to non-employees, compensation expense is recognized over the period during which services are rendered by such non-employees until completed. At the end of each financial reporting period prior to the completion of the service, the fair value of these awards is remeasured using the then-current fair value of our common stock and updated assumption inputs in the Black-Scholes option-pricing model for options and warrants.

We estimate the fair value of restricted stock at the then-current fair value of our common stock and for other stock-based awards we use the Black-Scholes option-pricing model, which requires subjective assumptions, including the fair value of our common stock, volatility, the expected term of our common stock options, the risk-free interest rate for a period that approximates the expected term of our common stock options, and our expected dividend yield. The assumptions used in our Black-Scholes option-pricing model represent management’s best estimates and involve a number of variables, uncertainties and

assumptions and the application of management's judgment, as they are inherently subjective. If any assumptions change, our stock-based compensation expense could be materially different in the future.

We do not estimate and apply a forfeiture rate as we have elected to account for forfeitures as they occur.

These assumptions are estimated as follows:

- *Fair Market Value of Common Stock.* As our common stock has not historically been publicly traded, we have periodically estimated the fair market value of common stock. See "*—Common and Preferred Stock Valuation Methodology*"
- *Volatility.* The expected volatility was based on the historical stock volatility of several comparable publicly traded companies over a period of time equal to the expected term of the options, as we do not have any trading history to use the volatility of our own common stock.
- *Expected Term.* The expected term represents the period that our stock options are expected to be outstanding. We calculated the expected term using the simplified method based on the average of each option's vesting term and the contractual period during which the option can be exercised, which is typically 10 years following the date of grant.
- *Risk-Free Interest Rate.* The risk-free interest rate was based on the yields of U.S. Treasury securities with maturities commensurate with the expected term of the award.
- *Expected Dividend Yield.* We have not paid dividends on our common stock nor do we expect to pay dividends in the foreseeable future.

Common and Preferred Stock Valuation Methodology

Our common and preferred stock valuations were prepared using a hybrid between the option pricing method (OPM) and the probability-weighted expected return method (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, a merger or initial public offering. The common stock has a claim on the equity value at an exercise price equal to the remaining value immediately after the preferred stock is liquidated. The OPM is appropriate to use when the range of possible future outcomes is so difficult to predict that forecasts would be highly speculative. The OPM commonly uses the Black-Scholes option pricing model to determine the price of the call option.

In the OPM, the backsolve method can be used to infer the total equity value implied by the pricing and terms of our Series A and Series B preferred stock financing transactions by making assumptions regarding the expected time to liquidity, expected volatility and risk-free interest rate, and then solve for the value of equity such that the implied value for the most recent financing equals the amount paid. At certain valuation dates, the equity value inferred from the OPM backsolve method was adjusted for company and market specific events that occurred between the financing date and the valuation date.

The PWERM involves a forward-looking analysis of the possible future outcomes, estimation of ranges of future and present value under each outcome and application of a probability factor to each outcome as of the valuation date. Under this method, discrete future outcomes, including an IPO, and non-IPO scenarios, are weighted based on the estimated probability of each scenario.

The hybrid method is generally appropriate to use when the time to a liquidity event is short, making the range of possible future outcomes relatively easy to predict. In the IPO scenario, all shares of preferred stock were assumed to convert to common stock. Accordingly, the estimated equity value was allocated pro rata among our preferred stock and common stock on an as converted basis, which caused the common stock to have a higher relative value per share than under the scenarios captured by the OPM.

The weighting between the PWERM and OPM employed in the hybrid method was based on our board of directors' estimate of the probability of each scenario as of each valuation date. These third-party valuations were performed at various dates, which resulted in valuations of our common stock of $0.74 per share as of September 30, 2016, $1.73 per share as of December 31, 2017, $5.88 per share as of February 28, 2018, $8.05 per share as of August 31, 2018 and $9.23 per share as of December 31, 2018. The fair value of our Series A preferred stock was $1.50 per share as of August 31, 2018 and $1.64 per share as of December 31, 2018. The fair value of our Series B preferred stock was $2.22 per share as of August 31, 2018 and $2.18 per share as of December 31, 2018.

The assumptions underlying these valuations represented management's best estimate, which involved inherent uncertainties and the application of management's judgment. As a result, if we had used significantly different assumptions or estimates, the fair value of our common stock and our stock-based compensation expense could have been materially different.

Upon the closing of the IPO, all of our outstanding preferred stock converted to common stock and it is no longer necessary for our board of directors to estimate the fair value of our common stock in connection with our accounting for granted stock options and other such awards we may grant, as the fair value of our common stock will be determined based on the quoted market price of our common stock.

Royalty transfer agreement

In connection with the sale of Series A redeemable convertible preferred stock (see Note 9), certain investors are entitled to receive, in the aggregate, a royalty from the Company equal to one percent of (i) all global net sales of any Company products and (ii) any license income on intellectual property that was in existence at the time of the Series A preferred stock financing. The Company has elected to account for this liability at fair value with changes recognized in earnings. Given the early stage nature of the underlying technology and inherent risks associated with obtaining regulatory approval and achieving commercialization, the Company ascribed no value to the royalty agreement at inception and at December 31, 2018 and 2017. The Company continues to evaluate our scientific progress to assess our obligations under this agreement. There is substantial judgment involved in our assessment.

Off-Balance Sheet Arrangements

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

Recently Issued and Adopted Accounting Pronouncements

A description of recently issued accounting pronouncements that may potentially impact our financial position and results of operations is disclosed in Note 3 to our consolidated financial statements appearing elsewhere in this Annual Report.

Emerging Growth Company Status

We are an "emerging growth company," as defined in the Jumpstart Our Business Startups Act of 2012 (JOBS Act), and are eligible to take advantage of certain exemptions from various reporting requirements that are applicable to other public companies that are not emerging growth companies. Section 107 of the JOBS Act provides that an emerging growth company may take advantage of the extended transition period provided in Section 7(a)(2)(B) of the Securities Act of 1933 for complying with new or revised accounting standards issued subsequent to the enactment of the JOBS Act until such time as those standards apply to private companies. Section 107 of the JOBS Act provides that we can elect to opt out of the extended transition period at any time, which election is irrevocable. We have elected to avail ourselves of this exemption from complying with new or revised accounting standards and, therefore, will

not be subject to the same new or revised accounting standards as other public companies that are not emerging growth companies.

We are in the process of evaluating the benefits of relying on other exemptions and reduced reporting requirements under the JOBS Act. Subject to certain conditions, as an emerging growth company, we may rely on certain of these exemptions, including without limitation (i) providing an auditor's attestation report on our system of internal controls over financial reporting pursuant to Section 404(b) of the Sarbanes-Oxley Act and (ii) complying 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 consolidated financial statements, known as the auditor discussion and analysis. We will remain an emerging growth company until the earlier of (a) the last day of the fiscal year in which we have total annual gross revenue of $1.07 billion or more; (b) the last day of the fiscal year following the fifth anniversary of the date of the completion of our initial public offering; (c) the date on which we have issued more than $1.0 billion in nonconvertible debt during the previous three years; or (d) the date on which we are deemed to be a large accelerated filer under the rules of the SEC.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

Not Applicable.

Item 8. Financial Statements

TCR^2 THERAPEUTICS INC.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and Board of Directors
TCR^2 Therapeutics Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of TCR^2 Therapeutics Inc. and subsidiary (the Company) as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive loss, redeemable convertible preferred stock and stockholders' equity (deficit), and cash flows for each of the years then ended, and the related notes (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the years then ended, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated 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 consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We have served as the Company's auditor since 2017.

Cambridge, Massachusetts
March 29, 2019

TCR² THERAPEUTICS INC.

CONSOLIDATED BALANCE SHEETS
(amounts in thousands, except share data)

	December 31,	
	2018	2017
Assets		
Current assets		
Cash and cash equivalents	$ 47,674	$ 19,811
Investments	75,493	—
Prepaid expenses and other current assets	2,326	892
Total current assets	125,493	20,703
Property and equipment, net	1,638	1,026
Restricted cash	290	290
Deferred offering costs	2,012	20
Total assets	$ 129,433	$ 22,039
Liabilities, redeemable convertible preferred stock and stockholders' equity (deficit)		
Accounts payable	$ 2,663	$ 427
Accrued expenses and other current liabilities	2,802	804
Total current liabilities	5,465	1,231
Other liabilities	434	30
Total liabilities	5,899	1,261
Commitments and contingencies (Note 7)		
Redeemable convertible preferred stock, $0.0001 par value		
Series A preferred stock shares 45,000,000 authorized; 44,500,001 shares issued and outstanding at December 31, 2018 and 2017 (liquidation preference of $49.8 million at December 31, 2018)	72,980	47,102
Series B preferred stock: 62,500,000 and no shares authorized at December 31, 2018 and 2017, respectively; 62,500,000 shares and no shares authorized and outstanding as of December 31, 2018 and 2017, respectively (liquidation value of $130.9 million at December 31, 2018).	136,250	—
Total redeemable convertible preferred stock	209,230	47,102
Stockholders' equity (deficit)		
Common stock, $0.0001 par value; 20,988,730 and 13,239,045 shares authorized at December 31, 2018 and 2017, respectively; 914,602 and 612,962 shares issued at December 31, 2018 and 2017, respectively; 726,994 and 435,630 shares outstanding at December 31, 2018 and 2017, respectively.	—	—
Additional paid-in capital	—	—
Accumulated other comprehensive loss	(106)	—
Accumulated deficit	(85,590)	(26,324)
Total stockholders' equity (deficit)	(85,696)	(26,324)
Total liabilities, redeemable preferred stock and stockholders' equity (deficit)	$ 129,433	$ 22,039

See accompanying notes to consolidated financial statements

TCR² THERAPEUTICS INC.

CONSOLIDATED STATEMENTS OF OPERATIONS
(amounts in thousands, except share and per share data)

	Years Ended December 31,	
	2018	**2017**
Operating expenses		
Research and development	$ 19,673	$ 9,569
General and administrative	6,780	3,611
Total operating expenses	26,453	13,180
Loss from operations	(26,453)	(13,180)
Other income, net	2,202	110
Net loss	(24,251)	(13,070)
Accretion of redeemable convertible preferred stock to redemption value	(37,298)	(1,794)
Net loss attributable to common stockholders	$ (61,549)	$ (14,864)
Per share information		
Net loss per share of common stock, basic and diluted	$ (98.53)	$ (39.94)
Weighted average shares outstanding, basic and diluted	624,659	372,116

See accompanying notes to consolidated financial statements

TCR² THERAPEUTICS INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(amounts in thousands)

	Years Ended December 31,	
	2018	**2017**
Net loss	$ (24,251)	$ (13,070)
Unrealized (loss) gain on investments	(106)	2
Comprehensive loss	$ (24,357)	$ (13,068)

See accompanying notes to consolidated financial statements

CONSOLIDATED STATEMENTS OF REDEEMABLE CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' EQUITY (DEFICIT)

(amounts in thousands, except share data)

	Redeemable Convertible Preferred Stock									
	Series A		Series B		Common Stock		Additional Paid-In Capital	Accumulated Deficit	Accumulated Other Comprehensive Income (Loss)	Total Stockholders' Equity (Deficit)
Description	Shares	Amount	Shares	Amount	Shares	Amount				
Balance at December 31, 2016	28,333,334	$ 29,169	—	$ —	326,870	$ —	$ —	$ (11,882)	$ (2)	$ (11,884)
Sale of Series A preferred stock, net of issuance costs of $24	16,166,667	16,139	—	—	—	—	—	—	—	—
Reclassification of shares issued and previously subject to repurchase	—	—	—	—	89,645	—	—	—	—	—
Exercise of stock options	—	—	—	—	19,115	—	14	—	—	14
Stock-based compensation	—	—	—	—	—	—	408	—	—	408
Unrealized gain on investments	—	—	—	—	—	—	—	—	2	2
Accretion of Series A preferred stock to redemption value	—	1,794	—	—	—	—	(422)	(1,372)	—	(1,794)
Net loss	—	—	—	—	—	—	—	(13,070)	—	(13,070)
Balance at December 31, 2017	44,500,001	$ 47,102	—	$ —	435,630	$ —	$ —	$ (26,324)	$ —	$ (26,324)
Sale of Series B preferred stock, net of issuance costs of $170	—	—	62,500,000	124,830	—	—	—	—	—	—
Reclassification of shares issued and previously subject to repurchase	—	—	—	—	89,284	—	—	—	—	—
Exercise of stock options and warrants	—	—	—	—	202,080	—	150	—	—	150
Stock-based compensation expense	—	—	—	—	—	—	2,133	—	—	2,133
Unrealized loss on investments	—	—	—	—	—	—	—	—	(106)	(106)
Accretion of redeemable preferred stock to redemption value	—	25,878	—	11,420	—	—	(2,283)	(35,015)	—	(37,298)
Net loss	—	—	—	—	—	—	—	(24,251)	—	(24,251)
Balance at December 31, 2018	44,500,001	$ 72,980	62,500,000	$ 136,250	726,994	$ —	$ —	$ (85,590)	$ (106)	$ (85,696)

See accompanying notes to consolidated financial statements

TCR² THERAPEUTICS INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS
(amounts in thousands)

	YEARS ENDED DECEMBER 31,	
	2018	**2017**
Operating activities:		
Net loss	$ (24,251)	$ (13,070)
Adjustments to reconcile net loss to cash used in operating activities:		
Depreciation and amortization	419	298
Stock-based compensation expense	2,133	408
Loss on fixed asset disposal	2	—
Accretion on investments	(280)	—
Changes in operating assets and liabilities:		
Interest receivable on investments	(390)	—
Prepaid expenses and other current assets	(1,043)	103
Accounts payable	2,224	(101)
Accrued expenses and other liabilities	2,408	347
Cash used in operating activities	(18,778)	(12,015)
Investing activities:		
Purchase of investments	(97,810)	(6,480)
Proceeds from maturity of investments	22,490	14,830
Change in restricted cash	—	(290)
Purchases of equipment	(1,019)	(388)
Cash (used in) provided by investing activities	(76,339)	7,672
Financing activities:		
Proceeds from the sale of Series A preferred stock	—	16,167
Proceeds from the sale of Series B preferred stock	125,000	—
Proceeds from the exercise of stock options	140	44
Deferred offering costs	(1,990)	(20)
Payment of issuance costs	(170)	(28)
Cash provided by financing activities	122,980	16,163
Net increase in cash and cash equivalents	27,863	11,820
Cash and cash equivalents at beginning of year	19,811	7,991
Cash and cash equivalents at end of year	$ 47,674	$ 19,811
Supplemental disclosure of noncash financing activities:		
Accretion of redeemable convertible preferred stock to redemption value	$ 37,298	$ 1,794
Deferred offering costs included in accounts payable	558	20
Property and equipment additions in accounts payable	14	—
Reclassification of early exercise liability upon vesting of options	10	—

See accompanying notes to consolidated financial statements

1. Organization and Description of Business

TCR² Therapeutics Inc. (the Company) is a clinical-stage immunotherapy company developing the next generation of novel T cell therapies for patients suffering from cancer. The Company was incorporated under the laws of the State of Delaware on May 29, 2015 under the name TCR², Inc. In November 2016, the Company changed its name to TCR² Therapeutics Inc. The Company's principal operations are located in Cambridge, Massachusetts.

2. Liquidity

The Company's operations to date have focused on organization and staffing, business planning, raising capital, acquiring technology and assets, manufacturing and conducting preclinical studies. The Company does not have any product candidates approved for sale and has not generated any revenue from product sales. The Company's product candidates are subject to long development cycles and the Company may be unsuccessful in its efforts to develop, obtain regulatory approval for or market its product candidates.

The Company is subject to a number of risks including, but not limited to, the need to obtain adequate additional funding for the ongoing and planned clinical development of its product candidates. Because of the numerous risks and uncertainties associated with pharmaceutical products and development, the Company is unable to accurately predict the timing or amount of funds required to complete development of its product candidates, and costs could exceed the Company's expectations for a number of reasons, including reasons beyond the Company's control.

The Company is also subject to a number of other risks including possible failure of preclinical studies or clinical trials, the need to obtain marketing approval for its product candidates, the development of new technological innovations by competitors, the need to successfully commercialize and gain market acceptance of any of the Company's products that are approved and uncertainty around intellectual property matters. If the Company does not successfully commercialize any of its products, it will be unable to generate product revenue or achieve profitability.

In February 2019, the Company completed its initial public offering (IPO) pursuant to which it issued and sold 5,750,000 shares of its common stock (inclusive of 750,000 shares of common stock sold by the Company pursuant to the full exercise of an overallotment option granted to the underwriters in connection with the offering) at a price of $15.00 per share. The shares began trading on The Nasdaq Global Select Market on February 14, 2019. The aggregate net proceeds received by the Company from the offering were approximately $80.2 million, after deducting underwriting discounts and commissions and other offering expenses payable by the Company. As of December 31, 2018, the Company had incurred $2.0 million of costs related to the IPO which have been deferred. Upon the closing of the IPO, all outstanding shares of redeemable convertible preferred stock converted into shares of common stock.

Prior to its IPO, the Company had funded its operations primarily with proceeds from the sales of redeemable convertible preferred stock.The Company has incurred net losses from operations since inception, including net losses of $24.3 million and $13.1 million, respectively, for the years ended December 31, 2018 and 2017. As of December 31, 2018, the Company had an accumulated deficit of $85.6 million. The Company expects to continue to generate losses for the foreseeable future. The Company expects that its cash, cash equivalents and investments as of December 31, 2018 of $123.2 million along with the aggregate net proceeds of $80.2 million from its IPO will be sufficient to fund its operating expenses and capital expenditure requirements through at least twelve months from the date of issuance of these consolidated financial statements.

3. Summary of Significant Accounting Policies

Principles of Consolidation and Basis of Presentation

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

Use of estimates

The preparation of the accompanying consolidated financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the consolidated financial statements and reported amounts of revenues and expenses during the reporting period. Significant estimates and assumptions reflected in these consolidated financial statements include, but are not limited to, the fair value of the royalty transfer agreement obligations, the valuation of preferred and common stock prior to the IPO, and the fair value of stock-based compensation awards granted under the Company's equity-based compensation plans. Due to the uncertainty of factors surrounding the estimates or judgments used in the preparation of the consolidated financial statements, actual results may materially vary from these estimates. Estimates and assumptions are periodically reviewed and the effects of revisions are reflected in the consolidated financial statements in the period they are determined to be necessary.

Concentrations of credit risk and of manufacturing risk

Financial instruments that potentially subject the Company to a concentration of credit risk consist of cash, cash equivalents and investments. The Company's cash, cash equivalents and investments are held by financial institutions in the United States. Amounts on deposit may at times exceed federally insured limits. Management believes that the financial institution is financially sound, and accordingly, minimal credit risk exists with respect to the financial institution.

As of December 31, 2018, the Company had manufacturing arrangements with vendors for the supply of materials for use in preclinical and clinical studies. If the Company were to experience any disruptions in either party's ability or willingness to continue to provide manufacturing services, the Company may experience significant delays in its product development timelines and may incur substantial costs to secure alternative sources of manufacturing.

Fair value of financial instruments

At December 31, 2018 and 2017, the Company's financial instruments consist of money market funds, commercial paper, agency and corporate bonds are included in investments. The carrying value of investments is the estimated fair value. Fair value is defined as the exchange price that would be received for an asset or paid to transfer a liability in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date.

Cash equivalents

The Company considers all highly liquid investments purchased with an original maturity of three months or less to be cash equivalents. As of December 31, 2018 and 2017, cash equivalents consisted of U.S treasuries, corporate bonds and government-backed money market funds.

Investments

As of December 31, 2018, all investments were classified as available-for-sale and were carried at their estimated fair value. Unrealized gains and losses are recorded as a component of accumulated other comprehensive income (loss) until realized. The Company determines the appropriate classification of its investments in debt securities at the time of purchase and re-evaluates such determination at each balance sheet date. The Company periodically reviews its investments in debt securities for impairment and adjusts these investments to their fair value when a decline in market value is deemed to be other than temporary. If losses on these securities are considered to be other than temporary, the loss is recognized in earnings.

Property and equipment

Property and equipment are recorded at cost. Depreciation and amortization is determined using the straight-line method over the estimated useful lives. Expenditures for maintenance and repairs are expensed as incurred while renewals and betterments are capitalized. When property and equipment is sold or otherwise disposed of, the cost and related accumulated depreciation are eliminated from the accounts and any resulting gain or loss is reflected in the consolidated statements of operations.

	Estimated Useful Lives
Laboratory equipment	5 years
Computer hardware and equipment	3 years
Furniture and fixtures	5 - 7 years
Leasehold improvements	Lesser of lease term or estimated useful life.

Impairment of long-lived assets

Long-lived assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset 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 future undiscounted net cash flows expected to be generated. Impairment charges are recognized at the amount by which the carrying amount of an asset exceeds the fair value of the asset. Assets to be disposed of are reported at the lower of the carrying amount or the fair value less costs to sell. The Company has not recognized any impairment of long-lived assets for the years ended December 31, 2018 and 2017.

Deferred offering costs

The Company capitalizes costs that are directly associated with in-process equity financings until such financings are consummated at which time such costs are recorded against the gross proceeds of the offering. Should the in-process equity financing be abandoned, the deferred offering costs will be expensed immediately as a charge to operating expenses in the consolidated statements of operations.

Restricted cash

Cash accounts that are restricted as to withdrawal or usage are presented as restricted cash. Restricted cash includes amounts held as a security deposit in the form of a letter of credit for the Company's leased facility.

Classification and accretion of redeemable convertible preferred stock

The Company has classified redeemable convertible preferred stock outside of stockholders' equity (deficit) because the shares contain certain redemption features that are not solely within the control of the Company. The carrying value of the preferred stock is being accreted to redemption value at the end of each reporting period as if the end of the reporting period were the redemption date. Increases to the carrying value of redeemable convertible preferred stock are charged to additional paid-in capital or, in the absence of additional paid-in capital, charged to accumulated deficit.

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 future expenditure. Amounts incurred are classified as general and administrative expenses.

Stock-based compensation

The Company measures employee stock-based awards at grant-date fair value and records compensation expense on a straight-line basis over the requisite service period, which is generally the vesting period of the respective award. Generally, the Company issues awards with only service-based vesting conditions. The Company accounts for forfeitures as they occur.

The Company measures the fair value of stock-based awards granted to non-employees on the date at which the related service is complete. Compensation expense is recognized over the period during which services are rendered by such non-employee consultants until completed. At the end of each financial reporting period prior to completion of the service, the fair value of these awards is remeasured using the then-current fair value of its common stock and updated assumption inputs in the Black-Scholes option-pricing model for options or the then current fair value of its common stock for restricted stock. Exercised but unvested stock-based awards are subject to repurchase by the Company at the lesser of the initial exercise price and the fair market value of the Company's common stock at the time of repurchase. The proceeds from the shares subject to repurchase are classified as a liability and reclassified to equity as the shares vest.

Estimating the fair value of stock-based awards requires the input of subjective assumptions, including the fair value of the Company's common stock, and, for stock options and warrants, the expected life of the options and stock price volatility. The Company uses the Black-Scholes option pricing model to value its stock option awards and warrants. The assumptions used in calculating the fair value of stock-based awards represent management's estimates and involve inherent uncertainties and the application of management's judgment. As a result, if factors change and management uses different assumptions, stock-based compensation expense could be materially different for future awards.

The Company classifies stock-based compensation expense in its statements of operations in the same manner in which the award recipient's payroll costs are classified or in which the award recipient's service payments are classified.

Research and development expenses

Research and development costs are expensed as incurred and consist primarily of funds paid to third parties for the provision of services for product candidate development, clinical and preclinical development and related supply and manufacturing costs, and regulatory compliance costs. At the end of the reporting period, the Company compares payments made to third party service providers to the estimated progress toward completion of the research or development objectives. Such estimates are

subject to change as additional information becomes available. Depending on the timing of payments to the service providers and the progress that the Company estimates has been made as a result of the service provided, the Company may record net prepaid or accrued expense relating to these costs.

Upfront milestone payments made to third parties who perform research and development services on the Company's behalf are expensed as services are rendered.

Income taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date. A reduction in the carrying value of the deferred tax assets is required when it is not more likely than not that such deferred tax assets are not realizable.

The Tax Cuts and Jobs Act ("the TCJA") was enacted on December 22, 2017. The TCJA, among other things, contains significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense, limitation of the deduction for net operating losses and elimination of net operating loss carrybacks, in each case, for losses arising in taxable years beginning after December 31, 2017 (though any such tax losses may be carried forward indefinitely), and modifying or repealing many business deductions and credits, including reducing the business tax credit for certain clinical testing expenses incurred in the testing of certain drugs for rare diseases or conditions generally referred to as "orphan drugs". On December 22, 2017, the Securities and Exchange Commission issued guidance under Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act ("SAB 118") directing taxpayers to consider the impact of the U.S. legislation as "provisional" when it does not have the necessary information available, prepared or analyzed (including computations) in reasonable detail to complete its accounting for the change in tax law.

As of December 31, 2018, we have completed our accounting for the tax effects of enactment of the Act, including the impacts described below.

The impacts of the Act relate to the reduction in the U.S. corporate income tax rate to 21%, which resulted in re-measuring our deferred tax assets and liabilities using the new 21% federal tax rate. This did not result in any net tax expense or benefit as there were corresponding and offsetting impacts to our deferred tax asset valuation allowance. During the year ended December 31, 2018 we recognized no changes to the 2017 enactment-date provisional amounts.

Net loss per share

Basic and diluted net loss per common share is determined by dividing net loss attributable to common stockholders by the weighted-average shares of common stock outstanding during the period. The Company's outstanding redeemable convertible preferred stock contractually entitles the holders of such shares to participate in distributions but contractually does not require the holders of such shares to participate in losses of the Company. Similarly, restricted stock awards granted by the Company entitle the holder of such awards to dividends declared or paid by the board of directors, regardless of whether such awards are unvested, as if such shares were outstanding shares of common stock at the time of the dividend. However, the unvested restricted stock awards are not entitled to share in the residual net

(Amounts in thousands, excluding share and per share items or as otherwise noted)

assets (deficit) of the Company. Accordingly, 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 shares of common stock are not assumed to have been issued if their effect is anti-dilutive. Therefore, the weighted-average shares used to calculate both basic and diluted loss per share are the same.

The following potentially dilutive securities, on an as converted basis have been excluded from the computation of diluted weighted-average shares outstanding as of December 31, 2018 and 2017, as they would be antidilutive:

	Years Ended December 31,	
	2018	2017
Series A redeemable convertible preferred stock	7,184,588	7,184,588
Series B redeemable convertible preferred stock	10,090,711	—
Stock options	2,121,551	1,215,727
Unvested shares of restricted stock	47,960	137,244
Common stock warrants	203,676	373,061
Total	19,648,486	8,910,620

Comprehensive loss

Comprehensive loss is defined as the change in equity of a business enterprise during a period from transactions and other events and circumstances from non-owner sources (which excludes investments from owners). The Company's only element of other comprehensive loss is unrealized gains and losses on investments.

Segment information

Operating segments are defined as components of an enterprise about which separate discrete information is available for evaluation by the chief operating decision maker, or decision-making group, in deciding how to allocate resources and in assessing performance. The Company views its operations and manages its business in one segment.

JOBS Act accounting election

The Company is an emerging growth company, as defined in the Jumpstart Our Business Startups Act of 2012 (the JOBS Act). Under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards issued subsequent to the enactment of the JOBS Act until such time as those standards apply to private companies. The Company has elected to use this extended transition period for complying with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date that it is (i) no longer an emerging growth company or (ii) affirmatively and irrevocably opt out of the extended transition period provided in the JOBS Act. As a result, these consolidated financial statements may not be comparable to companies that comply with the new or revised accounting pronouncements as of public company effective dates.

Recently issued accounting pronouncements

In June 2018, the FASB issued ASU 2018-07, Compensation — Stock Compensation (Topic 718) Improvements to Non-employee Share-Based Payment Accounting. The amendments in this update expand the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from non-employees. Under this ASU, an entity should apply the requirements of Topic 718 to

non-employee awards except for specific guidance on inputs to an option pricing model and the attribution of costs (that is, the period of time over which share-based payment awards vest and the pattern of cost recognition over that period). The guidance is applicable to public business entities for fiscal years beginning after December 15, 2018 including interim periods within that fiscal year. For all other entities, the amendments are effective for fiscal years beginning after December 15, 2019, and interim periods within fiscal years beginning after December 15, 2020. The Company is currently evaluating the effect that this guidance will have on its consolidated financial statements and related disclosures.

In November 2016, the FASB issued ASU 2016-18, Statement of Cash Flows (Topic 230) Restricted Cash, which requires entities to show the changes in the total of cash, cash equivalents, restricted cash and restricted cash equivalents in the statement of cash flows. Entities will no longer present transfers between cash and cash equivalents and restricted cash and restricted cash equivalents in the statement of cash flows. The guidance is applicable to public business entities for fiscal years beginning after December 15, 2017 and interim periods within those fiscal years. For all other entities, the amendments are effective for fiscal years beginning after December 15, 2018, and interim periods within fiscal years beginning after December 15, 2019 with early adoption permitted. The Company is currently evaluating the effect that this guidance will have on its consolidated financial statements and related disclosures.

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842). The FASB issued the update to require the recognition of lease assets and liabilities on the balance sheet of lessees. The standard will be effective for public business entities for fiscal years beginning after December 15, 2018 and interim periods within those fiscal years. For all other entities, the amendments are effective for fiscal years beginning after December 15, 2019, and interim periods within fiscal years beginning after December 15, 2020. This ASU requires a modified retrospective transition method with the option to elect a package of practical expedients. Early adoption is permitted. The Company is currently evaluating the potential impact of the adoption of this standard on its consolidated financial statements and related disclosures.

(Amounts in thousands, excluding share and per share items or as otherwise noted)

4. Investments and Fair Value Measurements

As of December 31, 2018, investments were comprised of the following:

	AMORTIZED COST	UNREALIZED GAINS	UNREALIZED LOSSES	FAIR VALUE
Corporate bonds	$ 58,029	$ 1	$ (94)	$ 57,936
Agency bonds	9,966	—	(9)	9,957
Commercial paper	7,214	—	(4)	7,210
Asset backed securities	390	—	—	390
	$ 75,599	$ 1	$ (107)	$ 75,493

As of December 31, 2017, there were no investments outstanding.

The Company follows FASB's accounting guidance on fair value measurements for financial assets and liabilities measured on a recurring basis. Fair value is defined as the price at which an asset could be exchanged in a current transaction between knowledgeable, willing parties. Where available, fair value is based on observable market prices, or parameters derived from such prices. Where observable prices or inputs are not available, valuation models are applied. This hierarchy requires the use of observable market data when available and to minimize the use of unobservable inputs when determining fair value. These valuation techniques involve some level of management estimation and judgment. The degree of management estimation and judgment is dependent on the price transparency for the instruments, or market, and the instruments' complexity.

The guidance requires fair value measurements to be classified and disclosed in one of the following three categories:

Level 1—Quoted prices (unadjusted in active markets for identical assets or liabilities)
Level 2—Inputs other than quoted prices in active markets that are observable either directly or indirectly
Level 3—Unobservable inputs in which there is little or no market data, which require the Company to develop its own assumptions

(Amounts in thousands, excluding share and per share items or as otherwise noted)

The Company has classified assets measured at fair value on a recurring basis as follows:

	DECEMBER 31, 2018				
			FAIR VALUE MEASUREMENT BASED ON		
	AMORTIZED COST	FAIR VALUE	QUOTED PRICES IN ACTIVE MARKETS (LEVEL 1)	SIGNIFICANT OTHER OBSERVABLE INPUTS (LEVEL 2)	SIGNIFICANT UNOBSERVABLE INPUTS (LEVEL 3)
Assets					
Cash equivalents [1]	$ 45,974	$ 45,974	$ 45,108	$ 866	$ —
Corporate bonds	58,029	57,936	—	57,936	—
Agency bonds	9,966	9,957	—	9,957	—
Commercial paper	7,214	7,210	—	7,210	—
Asset backed securities	390	390	—	390	—
	$ 121,573	$ 121,467	$ 45,108	$ 76,359	$ —

[1] Includes cash sweep accounts, U.S. Treasury money market mutual fund, bank certificates of deposit, U.S. Treasury bills and corporate bonds that have a maturity of three months or less from the original acquisition date.

	DECEMBER 31, 2017				
			FAIR VALUE MEASUREMENT BASED ON		
	AMORTIZED COST	FAIR VALUE	QUOTED PRICES IN ACTIVE MARKETS (LEVEL 1)	SIGNIFICANT OTHER OBSERVABLE INPUTS (LEVEL 2)	SIGNIFICANT UNOBSERVABLE INPUTS (LEVEL 3)
Cash equivalents (2)	$ 19,107	$ 19,107	$ 18,107	$ 1,000	$ —

[2] Includes cash sweep accounts, U.S. Treasury money market mutual fund, bank certificates of deposit, U.S. Treasury bills and corporate bonds that have a maturity of three months or less from the original acquisition date.

During the years ended December 31, 2018 and 2017, there were no transfers among the Level 1, Level 2 and Level 3 categories.

5. Property and Equipment

Property and equipment, net, consisted of:

	DECEMBER 31,	
	2018	2017
Laboratory equipment	$ 2,118	$ 1,312
Computer hardware and equipment	105	105
Furniture and fixtures	326	—
Leasehold improvements	34	—
Construction in-process	—	136
	2,583	1,553
Less: Accumulated depreciation and amortization	(945)	(527)
	$ 1,638	$ 1,026

Depreciation expense was $0.4 million and $0.3 million for the years ended December 31, 2018 and 2017, respectively.

6. Accrued Expenses and Other Current Liabilities

Accrued expenses and other current liabilities consisted of:

	DECEMBER 31,	
	2018	2017
Employee compensation and related benefits	$ 1,676	$ 686
Professional fees	342	37
Contract manufacturing organization fees	173	—
Contract research organization fees	232	—
University partnerships	162	—
Other	217	81
	$ 2,802	$ 804

7. Commitments and Contingencies

Leases

The Company recognizes rent expense on a straight-line basis over the lease period and has accrued for rent expense incurred but not yet paid. Landlord allowances for tenant improvements are deferred and recognized as a reduction to rent expense on a straight-line basis and over the remaining lease term.

During March 2018, the Company entered into a lease for larger office and laboratory facilities that expires in July 2025. Under the terms of the lease, the Company placed $0.3 million letter into a restricted cash account as security for the facility. Rent expense was $1.9 million and $1.2 million for the years ended December 31, 2018 and 2017, respectively.

The following table presents future minimum rent payments under non-cancellable operating leases with initial terms in excess of one year at December 31, 2018:

(Amounts in thousands, excluding share and per share items or as otherwise noted)

	Minimum Rent Payments
2019	2,392
2020	2,482
2021	2,194
2022	1,965
2023	2,002
Thereafter	3,116
Total minimum payments required	$ 14,151

Litigation

The Company is not currently party to any material legal proceedings. At each reporting date, the Company evaluates whether or not a potential loss amount or a potential range of loss is probable and reasonably estimable under the provisions of the authoritative guidance that addresses accounting for contingencies. The Company expenses as incurred the costs related to such legal proceedings.

Royalty transfer agreement

In connection with the sale of Series A redeemable convertible preferred stock (see Note 9), certain investors are entitled to receive, in the aggregate, a royalty from the Company equal to one percent of (i) all global net sales of any Company products and (ii) any license income on intellectual property that was in existence at the time of the Series A preferred stock financing. The Company has elected to account for this liability at fair value with changes recognized in earnings. Given the early stage nature of the underlying technology and inherent risks associated with obtaining regulatory approval and achieving commercialization, the Company ascribed no value to the royalty agreement at inception and at December 31, 2018 and 2017. The Company currently does not have any net sales or license income and as a result has paid no royalties under this obligation as of December 31, 2018 or 2017 nor has the Company accrued any liability as of December 31, 2018 or 2017.

8. Employee benefit plan

The Company maintains a defined contribution 401(k) plan (the 401(k) Plan) in which employees may contribute a portion of their compensation, subject to statutory maximum contribution amounts. The Company assumes all administrative costs of the 401(k) Plan. For the years ended December 31, 2018 and 2017, the expense relating to the matching contribution was $0.1 million and $61, respectively.

9. Common Stock and Redeemable Convertible Preferred Stock

Common stock

Each share of common stock entitles the holder to one vote on all matters submitted to a vote of the Company's stockholders. Subject to the rights of holders of redeemable convertible preferred stock, common stockholders are entitled to receive dividends, as may be declared by the board of directors, if any. No dividends had been declared through December 31, 2018.

Redeemable Convertible Preferred Stock

The Company has elected to accrete the carrying value of the Series A and B preferred stock to redemption value at the end of each reporting period as if the end of the reporting period were the

redemption date, increases to the carrying value of redeemable convertible preferred stock are charged to additional paid-in capital or, in the absence of additional paid-in capital, charged to accumulated deficit.

Series A preferred stock and Series B preferred stock may be redeemed at a price equal to the greater of (a) the original issuance price, plus any cumulative dividends accrued but unpaid thereon, whether or not declared, or (b) the fair market value as of the date of the redemption, in three annual installments commencing not more than 60 days after receipt of notice by holders of the Series A stock and B stock after February 2023.

The fair value of the Series A preferred stock was determined to be $1.64 per share and the fair value of the Series B preferred stock was determined to be $2.18 per share as of December 31, 2018.

Upon completion of the IPO on February 19, 2019, all redeemable convertible preferred stock was converted to common stock.

Series A Redeemable Convertible Preferred Stock

In 2015, the Company entered into a Series A preferred stock purchase agreement and initially sold 5,823,530 shares. During the years ended December 31, 2016 and 2017, the Company sold 22,509,804 and 16,166,667 shares, respectively, of its Series A preferred stock at a price of $1.00 per share in exchange for gross cash proceeds of $22.5 million and $16.2 million, respectively. Included in the Series A preferred stock purchase agreement, the investor is required to purchase additional shares upon the achievement of certain Company milestones. The Company evaluated the future commitment obligations at original issuance and determined they were not freestanding instruments as they were not legally detachable. The future commitment obligations were also evaluated as embedded derivatives and determined they did not meet the definition of a derivative instrument for which bifurcation would be required.

Conversion

Each share of Series A preferred stock is convertible, at the option of the holder, into shares of common stock. As of December 31, 2018 prior to the common stock reverse stock split in February 2019, the shares were convertible on a one-to-one basis. Post-split the Series A stock were convertible at 1-to-0.1615 basis. The Series A conversion rights were subject to adjustment for certain dilutive events. The conversion price may be adjusted to prevent dilution of the Series A preferred stock.

The preferred stock is also mandatorily convertible upon the closing of an initial public offering and proceeds exceeding $50.0 million or by a written election by the majority of the Series A stockholders.

Redemption

At the election of a majority of the Series A stockholders, the Series A preferred stock is redeemable at any time on or after October 16, 2020. The Series A preferred stock may be redeemed at a price equal to the greater of (a) the original issuance price, plus any cumulative dividends accrued but unpaid thereon, whether or not declared, or (b) the fair market value as of the date of the redemption.

Dividends

The holders of shares of Series A preferred stock are entitled to receive cumulative dividends of 6% from the date of issuance. Accumulated dividends are payable only when and if declared by the Board of Directors, in preference to dividends paid to holders of common stock. The dividend preference for Series

A preferred stock is $0.06 per share, as adjusted for recapitalizations. No dividends have been declared through December 31, 2017.

Liquidation

In the event of a liquidation, dissolution or winding up of the Company, either voluntary or involuntary, or in the event of a deemed liquidation event, which includes a sale of the Company as defined in the Company's certificate of incorporation, holders of Series A preferred stock are entitled to receive, in preference to all other stockholders, an amount equal to their original investment amount plus any declared and unpaid dividends. If upon the occurrence of such event, the assets and funds available for distribution are insufficient to pay such holders the full amount to which they are entitled, then the entire assets and funds legally available for distribution shall be distributed ratably among the holders of the Series A preferred stock in proportion to the full amounts to which they would otherwise be entitled.

After payment of the liquidation preference on shares of Series A preferred stock has been made, any remaining assets would be distributed ratably to common and Series A stockholders, on an as-converted basis.

Series B Redeemable Convertible Preferred Stock

In 2018, the Company issued an aggregate of 62.5 million shares of Series B preferred stock in exchange for gross cash proceeds of $125.0 million.

The Series B preferred stock is classified outside of stockholders' equity (deficit) as the preferred holders may, at their option, elect to have their shares redeemed upon written notice by a majority of the preferred shareholders and at any time after February 2023.

Certain provisions of the outstanding Series B preferred stock are as follows:

Conversion

Each share of Series B preferred stock is convertible, at the option of the holder, into shares of common stock. As of December 31, 2018 prior to the common stock reverse stock split in February 2019, the shares were convertible on a one-to-one basis. Post-split the Series B stock were convertible at 1-to-0.1615 basis. The Series A conversion rights were subject to adjustment for certain dilutive events. The conversion price may be adjusted to prevent dilution of the Series B preferred stock.

The Series B preferred stock is also mandatorily convertible upon the closing of an initial public offering and proceeds exceeding $50.0 million or by a written election by the majority of the Series B stockholders.

Redemption

At the election of a majority of the Series B stockholders, the Series B preferred stock is redeemable at any time on or after February 2023. The Series B preferred stock may be redeemed at a price equal to the greater of (a) the original issuance price, plus any cumulative dividends accrued but unpaid thereon, whether or not declared, or (b) the fair market value as of the date of the redemption.

Dividends

The holders of shares of Series B preferred stock are entitled to receive cumulative dividends of 6% from the date of issuance. Accumulated dividends are payable only when and if declared by the Board of

(Amounts in thousands, excluding share and per share items or as otherwise noted)

Directors, in preference to dividends paid to holders of Series A preferred stock and common stock. The dividend preference for Series B preferred stock is $0.12 per share, as adjusted for recapitalizations. No dividends have been declared through December 31, 2018.

Liquidation

In the event of a liquidation, dissolution or winding up of the Company, either voluntary or involuntary, or in the event of a deemed liquidation event, which includes a sale of the Company as defined in the Company's articles of incorporation, holders of Series B preferred stock are entitled to receive, in preference to the holders of Series A preferred stock or Common Stock, an amount equal to their original investment amount plus any declared and unpaid dividends. If upon the occurrence of such event, the assets and funds available for distribution are insufficient to pay such holders the full amount to which they are entitled, then the entire assets and funds legally available for distribution shall be distributed ratably among the holders of the Series B preferred stock in proportion to the full amounts to which they would otherwise be entitled.

After payment of the liquidation preference on shares of Series B preferred stock has been made, any remaining assets shall be distributed ratably to Series A stockholders an amount equal to their original investment amount plus any accrued dividends, whether or not declared, together with any other dividends declared but unpaid thereon.

10. Stock-based Compensation

The Company issues stock-based awards pursuant to its 2015 Stock Option and Grant Plan, as amended (the Plan). The amount, terms of grants, and exercisability provisions are determined and set by the Company's board of directors. The maximum number of authorized shares to be issued under the Plan was 2,554,723. As of December 31, 2018, there were 268,439 shares of common stock available for future issuance. The term of the options may be up to 10 years, and options are exercisable in cash or as otherwise determined by the board of directors. Generally, options and restricted stock awards vest over a four-year period.

The Company recorded stock-based compensation expense in the following expense categories of its accompanying consolidated statements of operations for the years ended December 31, 2018 and 2017:

	DECEMBER 31,	
	2018	2017
Research and development	$ 559	$ 43
General and administrative	1,574	365
	$ 2,133	$ 408

(Amounts in thousands, excluding share and per share items or as otherwise noted)

Stock options

The following table summarizes the activity related to stock option grants to employees and non-employees for the years ended December 31, 2018 and 2017:

	SHARES	WEIGHTED AVERAGE EXERCISE PRICE PER SHARE	WEIGHTED AVERAGE REMAINING CONTRACTUAL LIFE (IN YEARS)
Balance at January 1, 2017	596,141	$ 0.74	
Granted	682,706	0.74	
Exercised	(19,115)	0.74	
Forfeited	(44,005)	0.74	
Outstanding at December 31, 2017	1,215,727	0.74	9.5
Granted	1,185,119	6.14	
Exercised	(145,618)	0.74	
Forfeited	(133,677)	0.74	
Outstanding at December 31, 2018	2,121,551	$ 3.78	9.1
Exercisable at December 31, 2018	299,957	$ 0.87	8.5
Vested and expected to vest at December 31, 2018	2,121,551	$ 3.78	9.1

The table above includes 26,725 shares of common stock subject to repurchase by the Company, which were issued in 2017 upon the early exercise of unvested stock options. In addition, the above table excludes 8,017 options that were granted outside of the Plan.

The weighted average grant date fair value of options granted to employees, directors and non-employee consultants during the years ended December 31, 2018 and 2017 was $5.14 and $1.11, respectively. As of December 31, 2018, there was $6.6 million in unrecognized compensation cost that is expected to be recognized over an estimated weighted-average amortization period of 3.3 years. The aggregate intrinsic value of options outstanding and options exercisable as of December 31, 2018 was $19.3 million and $4.2 million, respectively. The aggregate intrinsic values of options exercised during the year ended December 31, 2018 was $66.

The fair value of options is estimated using the Black-Scholes option pricing model, which takes into account inputs such as the exercise price, the value of the underlying common stock at the grant date, expected term, expected volatility, risk-free interest rate and dividend yield. The fair value of each grant of options during the year ended December 31, 2018 and 2017 was determined using the methods and assumptions discussed below:

- The expected term of employee options is determined using the “simplified” method, as prescribed in the SEC Staff Accounting Bulletin (SAB) No. 107, whereby the expected life equals the arithmetic average of the vesting term and the original contractual term of the option due to the Company’s lack of sufficient historical data. The expected term of non-employee options is equal to the contractual term.
- The expected volatility is based on historical volatilities of similar entities within the Company’s industry which were commensurate with the expected term assumption as described in SAB No. 107.
- The estimated annual dividend yield is 0% because the Company has not historically paid, and does not expect for the foreseeable future to pay, a dividend on its common stock.

(Amounts in thousands, excluding share and per share items or as otherwise noted)

- The Company considered numerous objective and subjective factors in estimating the fair value of its common stock, including the estimated fair value of the Company's Series A preferred stock.

For the years ended December 31, 2018 and 2017, the grant date fair value of all option grants was estimated at the time of grant using the Black-Scholes option-pricing model using the following weighted average assumptions:

	DECEMBER 31,	
	2018	2017
Risk free interest rate	2.9%	2.1%
Expected term (in years)	6.1	6.6
Expected volatility	66.8%	65.7%
Annual dividend yield	—%	—%
Fair value of common stock	$ 7.62	$ 1.49

Restricted stock

For restricted stock awards granted to employees, the fair value of the award is the current fair value of the Company's common stock on the grant date, while for non-employees, the fair value of the award is re-measured each reporting period using the then-current fair value of the Company's common stock until performance is complete. All restricted stock grants were outside of the plan.

In the event of a termination of employment or consulting services arrangement, the unvested restricted stock awards are subject to repurchase by the Company at the lower of the purchase price paid by the holder and the then current fair value.

The following table summarizes the activity related to unvested restricted stock grants to employees and non-employees for the years ended December 31, 2018 and 2017:

	SHARES
Balance at January 1, 2017	227,614
Granted	—
Vested	(89,645)
Forfeited	(725)
Outstanding at December 31, 2017	137,244
Granted	—
Vested	(89,284)
Forfeited	—
Outstanding at December 31, 2018	47,960

As of December 31, 2018, there was $0.4 million in unrecognized compensation cost that is expected to be recognized over an estimated weighted-average amortization period of 0.5 years.

Warrants

Warrants issued to non-employees in connection with providing consulting services are issued outside of the Plan and are accounted for as stock-based compensation. The fair value of warrants is estimated using the Black-Scholes option pricing model each reporting period until vested.

(Amounts in thousands, excluding share and per share items or as otherwise noted)

The warrants have an initial exercise price of $0.74 per share and will expire at the earlier of ten years from the date of issuance or a change in control event as defined in the warrant agreements.

The following table summarizes the activity related to warrant grants to non-employees for the years ended December 31, 2018 and 2017:

	SHARES
Balance at January 1, 2017	42,761
Granted	330,300
Exercised	—
Forfeited	—
Outstanding at December 31, 2017	373,061
Granted	—
Exercised	(169,385)
Forfeited	—
Outstanding at December 31, 2018	203,676

The table above includes 112,923 shares of common stock subject to repurchase by the Company, which were issued in 2018 upon the early exercise of unvested warrants. As of December 31, 2018, there was $1.1 million in unrecognized compensation cost that is expected to be recognized over an estimated weighted-average amortization period of 1.9 years.

For the years ended December 31, 2018 and 2017, the fair value as of those dates was estimated using the Black-Scholes option-pricing model using the following weighted average assumptions:

	DECEMBER 31, 2018	DECEMBER 31, 2017
Risk free interest rate	2.5%	2.4%
Expected term (in years)	9.5	10.0
Expected volatility	68.3%	68.3%
Annual dividend yield	—%	—%
Fair value of common stock	$4.65	$1.73

11. Income taxes

For the years ended December 31, 2018 and 2017, the Company did not record a current or deferred income tax expense. The Company's consolidated loss before income taxes consists solely of a domestic loss.

A reconciliation of income tax expense (benefit) at the statutory federal income tax rate and income taxes as reflected in the consolidated financial statements is as follows:

	DECEMBER 31,	
	2018	2017
Federal income tax benefit at statutory rate	21.0 %	34.0 %
State income tax, net of federal benefit	7.3	6.1
Permanent differences	(1.3)	(0.9)
Research and development credit benefit	3.3	2.8
Federal rate change – Tax Act	—	(21.4)
Change in valuation allowance	(30.3)	(20.6)
Effective income tax rate	— %	— %

On December 22, 2017, the U.S. Government signed into law The Tax Cuts and Jobs Act (the TCJA). The Act, among other things, contains significant changes to corporate taxation, including reduction of the corporate tax rate from a marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense to 30% of adjusted earnings (except for certain small businesses), limitation of the deduction for net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks, one time taxation of offshore earnings at reduced rates regardless of whether they are repatriated, elimination of U.S. tax on foreign earnings (subject to certain important exceptions), immediate deductions for certain new investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits.

On December 22, 2017, the Securities and Exchange Commission issued guidance under Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act directing taxpayers to consider the impact of the U.S. legislation as "provisional" when it does not have the necessary information available, prepared or analyzed (including computations) in reasonable detail to complete its accounting for the change in tax law. As of December 31, 2018, the Company has completed its accounting for the change in tax law.

In connection with the TCJA, the Company remeasured certain deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, which is generally 21%. The remeasurement of the Company's deferred tax balance was offset by application of its valuation allowance. As of December 31, 2018, the Company had completed its accounting for all of the tax effects of the enactment of the Act;

including the effects on its existing deferred tax balances. The Company had not recognized any material adjustment to the provisional estimate of $2.8 million that was previously recorded related to the Act.

The Company has not yet conducted a study of its research and development credit carryforwards. This study may result in an increase or decrease to the Company's credit carryforwards; however, until a study is completed and any adjustment is known, no amounts are being presented as an uncertain tax position. A full valuation allowance has been provided against the Company's credits, and if an adjustment is required, this adjustment would be offset by an adjustment to the valuation allowance. As a result, there would be no impact to the consolidated statements of operations and comprehensive loss or consolidated statements of cash flows if an adjustment were required.

(Amounts in thousands, excluding share and per share items or as otherwise noted)

The components of net deferred income tax assets as of December 31, 2018 and 2017 are as follows:

	DECEMBER 31,	
	2018	2017
Deferred tax assets:		
Net operating loss carryforwards	$ 5,193	$ 471
Research and development credits	1,893	732
Capitalized costs	6,770	5,879
Accrued expenses and other	514	187
Stock compensation	172	—
Total deferred tax assets	14,542	7,269
Less: valuation allowance	(14,510)	(7,180)
Deferred tax liabilities:		
Depreciation	(32)	(15)
Other temporary differences	—	(74)
Total deferred tax liabilities	(32)	(89)
Total net deferred tax assets (liabilities)	$ —	$ —

In assessing the realizability of the net deferred tax asset, the Company considers all relevant positive and negative evidence in determining whether it is more likely than not that some portion or all of the deferred income tax assets will not be realized. The realization of the gross deferred tax assets is dependent on several factors, including the generation of sufficient taxable income prior to the expiration of the net operating loss carryforwards. Management believes that it is more likely than not that the Company's deferred income tax assets will not be realized. As such, there is a full valuation allowance against the net deferred tax assets as of December 31, 2017 and 2018. The valuation allowance increased by approximately $7.3 million during the year ended December 31, 2018 primarily as a result of the increase in net operating loss carryforwards. The valuation allowance increased by approximately $2.7 million during the year ended December 31, 2017 primarily as a result of the increase in our capitalized costs for start-up and research and development expenditures deferred tax assets offset by the re-measurement of our deferred tax balance following the TCJA.

Subject to the limitations described below, at December 31, 2018, the Company has cumulative net operating loss carryforwards of approximately $19.2 million and $18.3 million available to reduce federal and state taxable income, respectively, of which $17.4 million of federal net operating losses will carryforward indefinitely, with the remaining federal and state losses beginning to expire in 2035. In addition, we have cumulative federal and state tax credit carryforwards of $1.2 million and $0.8 million, respectively, available to reduce federal and state income taxes which will begin to expire in 2035 and 2031, respectively. Our net operating loss carryforwards and tax credit carryforwards may be limited as a result of certain ownership changes, as defined under Sections 382 and 383 of the Internal Revenue Code. This limits the annual amount of these tax attributes that can be utilized to offset future taxable income or tax liabilities. The amount of the annual limitation is determined based on our value immediately prior to an ownership change. Subsequent ownership changes may affect the limitation in future years. The Company has not performed an Internal Revenue Code Section 382 study in connection with changes in control.

At December 31, 2018 and 2017, we had no unrecognized tax benefits. As of December 31, 2018, and 2017, we had no accrued interest or penalties related to uncertain tax positions and no amounts have been recognized in our consolidated statements of operations. We will recognize interest and penalties related to uncertain tax positions in income tax expense.

The Company's income tax returns remain open and subject to examination for all tax years after 2015. We file income tax returns in the U.S. federal and Massachusetts. The statute of limitations for assessment by the Internal Revenue Service, or IRS, and state tax authorities is generally three years from the filing date, although carryforward attributes that were generated prior to this period may still be adjusted upon examination by the IRS or state tax authorities if they either have been or will be used in a future period. The Company is not currently under audit by any taxing authority.

12. Related party transactions

Consulting arrangements

On October 1, 2015, we entered into a consulting agreement with Dr. Patrick Baeuerle. Pursuant to the consulting agreement, Dr. Baeuerle agreed to perform such consulting, advisory and related services to and for us as may be reasonably requested. In exchange, we agreed to pay Dr. Baeuerle a consulting fee of €15 per month. On November 1, 2016, we amended the consulting agreement to revise Dr. Baeuerle's consulting fee to be €3 per month. Dr. Baeuerle is also eligible for an annual bonus equal to 33% of the annual fees paid under the consulting agreement, subject to the discretion of our board of directors based on Dr. Baeuerle's performance and our performance. The term of the agreement is one year, and automatically extends for additional one-year periods unless terminated. During the fiscal years ended December 31, 2018 and 2017, we incurred fees and travel related expenses to Dr. Baeuerle in the amount of $76 and $71, respectively, under the consulting agreement. Dr. Baeuerle is a member of our board of directors and is a managing director at MPM Capital, the beneficial owner of more than 5% of our voting securities.

On March 2, 2016, we entered into a consulting agreement with Dr. Mitchell Finer (the Original Finer Agreement), which was amended and restated on May 9, 2017 to, among other things, add Pattern Recognition Ventures as a party. Pursuant to the amended and restated consulting agreement, Pattern Recognition Ventures agreed to perform scientific consulting, advisory and related services to and for us as may be reasonably requested, including making Dr. Finer available to serve as Chairman of our Scientific Advisory Board. Pursuant to the amended and restated consulting agreement, we agreed (i) to pay Pattern Recognition Ventures a consulting fee of $19 per quarter for services provided under the agreement, commencing on July 1, 2017, (ii) to pay Pattern Recognition Ventures an amount equal to $38 for services performed from January 1, 2017 through July 1, 2017, and (iii) to grant Pattern Recognition Ventures an option to purchase 8,017 shares of our common stock, which option is subject to vesting. During the fiscal years ended December 31, 2018 and 2017, we incurred fees and travel-related expenses to Pattern Recognition Ventures in the amount of $76 and $77, respectively. Dr. Finer has a financial interest in Pattern Recognition Ventures and is its managing member. Dr. Finer is also a member of our board of directors and is an executive partner at MPM Capital, the beneficial owner of more than 5% of our voting securities.

On October 1, 2017, we entered into a consulting agreement with Globeways Holdings Limited. Dr. Morana Jovan-Embiricos has financial interests in Globeways Holdings Limited and is its founding director. Pursuant to the consulting agreement, Globeways Holdings Limited provides consulting, advisory and related services in exchange for consulting fees of $0.1 million per year. During the fiscal year ended December 31, 2018 and 2017, we incurred fees and travel-related expenses to Globeways Holdings Limited in the amount of $0.1 million for each period. Dr. Jovan is also a member of our board of directors and Globeways Holdings Limited is the appointed manager of certain affiliates of F2 Capital that collectively beneficially own more than 5% of our voting securities.

The majority investor in the Company is MPM Capital (MPM). In September 2015, the Company began receiving consulting and management services pursuant to agreements with three Managing Directors at MPM. For the years ended December 31, 2018 and 2017, the Company incurred approximately $0 and

$0.5 million, respectively, for management and advisory services in connection with those agreements. These amounts were recorded in general and administrative expenses in the consolidated statements of operations.

13. Subsequent Events

Collaboration Agreement with Cell Therapy Catapult Limited

In December 2018, the Company signed a collaboration agreement (the Collaboration Agreement) with Cell Therapy Catapult Limited (Catapult) to establish their manufacturing process in Catapult's GMP manufacturing facility in the United Kingdom. The Company paid a £200,000 non-refundable contribution to Catapult to reserve a GMP manufacturing cleanroom in October 2018. The non-refundable contribution will be applied against the Company's input contributions (or fees) once Catapult and the Company have determined the various inputs that Catapult will contribute to the collaboration in order to support the Company's manufacturing process under the Collaboration Agreement. The initial term of the Collaboration Agreement is three years and assumes an occupancy date of March 1, 2019. The Company can terminate the Collaboration Agreement earlier with twelve months' notice and continued payment for contributions during the twelve-month termination period. The only fee fixed over the three-year term is a specified facility input contribution. The total financial contribution from the Company under the Collaboration Agreement comprises the Company's portion of the shared costs for the infrastructure of the center and its operation as a licensed GMP facility. The Company's exact costs under the Collaboration Agreement are based on collaboration input-related contributions and will change year to year, and are partially dependent on the inputs the Company requires from Catapult to meet the collaboration aim of establishing the Company's manufacturing of autologous cell therapies.

Reverse Stock Split

On February 1, 2019, the Company effected a 1-for-6.1938 reverse stock split of its issued and outstanding shares of common stock and a proportional adjustment to the existing conversion ratios for each series of the Company's preferred stock. Accordingly, all share and per share amounts for all periods presented in the accompanying consolidated financial statements and notes thereto have been adjusted retroactively, where applicable, to reflect this reverse stock split and adjustment of the preferred stock conversion ratios.

In connection with the Company's IPO

In February 2019, the Company's Board of Directors and stockholders approved the 2018 Stock Option and Incentive Plan (the 2018 Plan), which replaced the 2015 Plan. The 2018 Plan provides for the grant of incentive stock options, nonstatutory stock options, restricted stock awards, restricted stock units, stock appreciation rights and other stock-based awards. The Company's officers, employees, directors and other key persons (including consultants) are eligible to receive awards under the 2018 Plan. The maximum number of authorized shares to be issued under the Plan is 3,000,000 shares of our common stock. The amount, terms of grants, and exercisability provisions are determined and set by the Compensation Committee of the Company's Board of Directors. The term of the options may be up to 10 years, and options are exercisable in cash or as otherwise determined by the Board of Directors.

In February 2019, the Company's Board of Directors adopted and the Company's stockholders approved the 2018 Employee Stock Purchase Plan (2018 ESPP). The 2018 ESPP enables eligible employees to purchase shares of the Company's common stock at the end of each six-month offering period at a price equal to 85% of the fair market value of the shares on the first business day or the last business day of the offering period, whichever is lower. Eligible employees generally included all employees. Offering

periods began on the first trading day September 1 and March 1 of each year and ended on the last trading day in February and August of each year. Share purchases are funded through payroll deductions of up to 15% of an employee's eligible compensation for each payroll period, or $25,000 each calendar year.

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

Not applicable.

Item 9A. Controls and Procedures

Disclosure Controls and Procedures

The term “disclosure controls and procedures,” as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the Exchange Act), refers to controls and procedures 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 such information is accumulated and communicated to a company’s management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure.

In designing and evaluating our disclosure controls and procedures, management recognizes that disclosure controls and procedures, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the disclosure controls and procedures are met. Additionally, in designing disclosure controls and procedures, our management necessarily was required to apply its judgment in evaluating the cost-benefit relationship of possible disclosure controls and procedures. The design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with policies or procedures may deteriorate. Because of the inherent limitations in a control system, misstatements due to error or fraud may occur and not be detected.

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, has evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2018. Based on that evaluation, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were effective as of the end of the period covered by this report at the reasonable assurance level.

Changes in Internal Control over Financial Reporting:

During the fourth quarter of 2018, we implemented a new enterprise resource planning system to record our financial transactions, summarize and produce our financial reports.

Management’s Report on Internal Control over Financial Reporting and Attestation Report of the Registered Public Accounting Firm

This Annual Report does not include a report of management’s assessment regarding internal control over financial reporting (as defined in Rule 13a-15(f) under the Exchange Act) or an attestation report of our independent registered public accounting firm due to a transition period established by the rules of the SEC for newly public companies.

Item 9B. Other Information

None.

Part III

Item 10. Directors, Executive Officers and Corporate Governance

The following table sets forth information about our directors, executive officers and other key employees as of March 15, 2019.

NAME	AGE	POSITION(S)
Executive Officers		
Garry Menzel	54	President, Chief Executive Officer and Director
Robert Hofmeister	51	Chief Scientific Officer
Alfonso Quintás Cardama	48	Chief Medical Officer
Mayur (Ian) Somaiya	45	Chief Financial Officer
Non-Employee Directors		
Ansbert Gadicke [2][3][4]	61	Chairman of the Board of Directors
Andrew Allen [2]	52	Director
Patrick Baeuerle	61	Director
Mitchell Finer [1][3]	60	Director
Neil Gibson [1][2][3]	62	Director
Morana Jovan-Embiricos [1][2][4]	52	Director

[1] Member of our audit committee
[2] Member of our compensation committee
[3] Member of our nominating and corporate governance committee
[4] Member of our finance and strategy committee

Executive Officers

Garry Menzel, Ph.D. Dr. Menzel joined our company in 2016 as a director and Chief Executive Officer. Dr. Menzel has also served on the board of directors and chairman of the audit committee of the oncology company Black Diamond Therapeutics Inc. since 2014. Previously, Dr. Menzel was the Chief Strategy Officer at Axcella Health Inc. from 2015 to 2016, the Chief Financial Officer at DaVita Healthcare Partners Inc. from 2013 to 2015, and the Chief Operating Officer at Regulus Therapeutics Inc. from 2008 to 2013. Dr. Menzel also had global leadership roles in running the biotechnology practices at Goldman Sachs & Co. LLC from 1994 to 2004 and Credit Suisse Group AG from 2004 to 2008. In addition, he was a consultant with Bain & Company and was a research assistant at SmithKline Beecham PLC (now GlaxoSmithKline PLC). Dr. Menzel received his Ph.D. from the University of Cambridge, where he studied the regulation of oncogenes in immune cells, and his M.B.A. from the Stanford University Graduate School of Business. We believe Dr. Menzel is qualified to serve as a member of our board of directors because of his scientific background and corporate leadership experience.

Robert Hofmeister, Ph.D. Dr. Hofmeister joined our company in September 2015 as Senior Vice President, Research and Development and became our Chief Scientific Officer in October 2016. From 2005 to 2015, Dr. Hofmeister held positions at EMD Serono Research and Development Institute, Inc., including as the Global Head of Translational Immunotherapy, Immuno-Oncology from 2012 to 2015. Previously, Dr. Hofmeister held positions at Micromet AG (now a part of Amgen, Inc.). Dr. Hofmeister received his Ph.D. from the University of Regensburg in Germany, where he studied the signaling of the cytokine interleukin-1.

Alfonso Quintás Cardama, M.D. Dr. Quintás joined our company in 2017 as Chief Medical Officer. Dr. Quintás was the Clinical Development Head of the Cell & Gene Therapies Unit at GlaxoSmithKline PLC in 2017. Between 2014 and 2016, he served as Global Clinical Leader, Cell & Gene Therapy, at

Novartis AG and was an Assistant Professor in the Department of Leukemia at The University of Texas, MD Anderson Cancer Center from 2009 to 2014. Dr. Quintás received his M.D. from the Universidad de Santiago de Compostela School of Medicine in Spain. He completed an internship and residency in the Department of Medicine of the Albert Einstein College of Medicine—Yeshiva University and a hematology and oncology fellowship and a leukemia fellowship at The University of Texas, MD Anderson Cancer Center.

Mayur (Ian) Somaiya. Mr. Somaiya joined our company in 2018 as Chief Financial Officer. From 2015 to 2018, Mr. Somaiya was Managing Director and Head of Biotechnology Research at BMO Capital Markets Corp. Previously, he served as a Managing Director and Equity Analyst at Nomura Securities Co. Ltd. from 2013 to 2015, Piper Jaffray Companies from 2009 to 2013, Thomas Weisel Partners Group, Inc. from 2003 to 2009 and Morgan Stanley from 2000 to 2003. Mr. Somaiya received his B.A in Biology from New York University.

Non-Employee Directors

Ansbert Gadicke, M.D. Dr. Gadicke joined our board of directors in May 2015. Dr. Gadicke co-founded MPM Capital's venture investing activities in 1997 and has since served as a Managing Director. Prior to that, Dr. Gadicke led MPM Capital's Advisory and Investment Banking business from 1992 to 1996 and was in Boston Consulting Group's Health Care Group from 1989 to 1992. He is a member of the board of directors of Cullinan Oncology, LLC and ElevateBio, LLC and formerly served as a member of the board of directors of Radius Health, Inc. and Chiasma, Inc. Dr. Gadicke received his M.D. from J.W. Goethe University and has held research positions at the Whitehead Institute and Harvard University. We believe Dr. Gadicke is qualified to serve as a member of our board of directors because of his extensive experience in the life sciences industry and in investment management.

Andrew Allen, M.D., Ph.D. Dr. Allen joined our board of directors in December 2018. Dr. Allen is a co-founder of Gritstone Oncology, Inc., and has served as its President and Chief Executive Officer since August 2015. Dr. Allen previously co-founded Clovis Oncology, Inc., a public pharmaceutical development company, and served as its executive vice president of clinical and preclinical development and chief medical officer from April 2009 to July 2015. Prior to that, he was chief medical officer at Pharmion Corporation from 2006 to 2008. Previously, Dr. Allen served in clinical development leadership roles at Chiron Corporation and Abbott Laboratories, and worked at McKinsey & Company, where he advised life science companies on strategic issues. He currently serves on the board of directors of Gritstone Oncology, Inc., Epizyme, Inc., Sierra Oncology, Inc., and Revitope Oncology, Inc. Dr. Allen previously served on the board of directors of Cell Design Labs, a private biotechnology company, from November 2015 until its acquisition by Gilead Sciences, Inc. in December 2017. Dr. Allen qualified in medicine at Oxford University and received a Ph.D. in immunology from Imperial College of Science, Technology and Medicine in London. We believe Dr. Allen is qualified to serve on our board of directors due to his educational experience and his experience as a founder and senior executive of biotechnology and pharmaceutical companies.

Patrick Baeuerle, Ph.D. Dr. Baeuerle has served on our board of directors since May 2015. Since 2015, Dr. Baeuerle has been a Managing Director of MPM Capital. From 2012 to 2015 he served as Vice President, Research, and General Manager at Amgen Research (Munich) GmbH. From 1998 to 2012, Dr. Baeuerle served as Chief Scientific Officer for Micromet, Inc. Dr. Baeuerle co-founded Harpoon Therapeutics, Inc. in 2015. Dr. Baeuerle also co-founded Cullinan Oncology, LLC, of which he is Chief Scientific Officer—Biologics, Maverick Therapeutics, Inc. and iOmx AG. He currently serves on the board of directors of Harpoon Therapeutics and the advisory boards of Amphivena Therapeutics, Inc., iOmx AG and Maverick Therapeutics, Inc. He is also an Honorary Professor of Immunology of the Medical Faculty at University of Munich. Dr. Baeuerle received his Ph.D. in biology from the University of Munich and performed post-doctoral research at the Whitehead Institute. We believe Dr. Baeuerle is qualified to serve as a member of our board of directors because of his scientific background, experience in the venture

capital industry, corporate leadership experience and his experience as a founder of numerous biopharmaceutical companies.

Mitchell Finer, Ph.D. Dr. Finer has served on our board of directors since October 2015. Dr. Finer has served as an Executive Partner of MPM Capital since August 2015. Dr. Finer previously served as Chief Executive Officer of Oncorus, Inc. from January 2016 to June 2018 and co-founded Adverum Biotechnologies, Inc. and CODA Biotherapeutics, Inc. Previously, he served as Chief Scientific Officer of bluebird bio, Inc., from March 2010 through July 2015. Dr. Finer serves on the boards of directors of Adverum Biotechnologies, Inc., Semma Therapeutics, Inc., Oncorus, Inc. and CODA Biotherapeutics, Inc. Dr. Finer received a Ph.D. in biochemistry and molecular biology from Harvard University and a B.A. in biochemistry and bacteriology from the University of California, Berkeley. He completed a postdoctoral fellowship at the Whitehead Institute for Biomedical Research. We believe Dr. Finer is qualified to serve as a member of our board of directors because of his operational, strategic and corporate leadership experience and his experience as a founder of numerous biopharmaceutical companies.

Neil Gibson, Ph.D. Dr. Gibson has served on our board of directors since February 2018. Since 2017, he has served as Senior Vice President to COI Pharmaceuticals, Inc. From 2015 to 2016, Dr. Gibson served as Senior Vice President and Chief Development Officer to BioAlta LLC. From 2011 to 2015, he served as Chief Scientific Officer of Regulus Therapeutics Inc. Prior to joining Regulus Dr. Gibson was the Chief Scientific Officer of the Pfizer Oncology Research Unit. Dr. Gibson also held leadership roles on Pfizer's Oncology Business Unit Executive team. Prior to Pfizer, Dr. Gibson was the Chief Scientific Officer of OSI Pharmaceuticals. Dr. Gibson received his Ph.D. from the University of Aston and his B.Sc. from the University of Strathclyde. We believe that Dr. Gibson is qualified to serve on our board of directors because of his extensive experience in the life sciences industry.

Morana Jovan-Embiricos, Ph.D. Dr. Jovan has served on our board of directors since October 2015. In 2003, Dr. Jovan co-founded F2 Ventures, a biotech venture capital fund and has since served as its Managing Partner. Prior to joining F2 Ventures, Dr. Jovan was a partner at MPM Capital. Dr. Jovan currently serves on the boards of directors of ElevateBio, LLC, TriNetX, Inc. and Cullinan Oncology, LLC. Dr. Jovan received her Ph.D. in biophysical chemistry from the University of Cambridge and was a post-doctoral fellow at Harvard University. We believe Dr. Jovan is qualified to serve as a member of our board of directors because of her scientific background and experience in the venture capital industry.

Family Relationships

There are no family relationships among any of our directors or executive officers.

Section 16(a) Beneficial Ownership Reporting Compliance

Section 16(a) of the Exchange Act requires our directors, executive officers and beneficial owners of more than 10% of our equity securities to file reports of holdings and transactions in securities of the Company with the SEC. Our directors, executive officers and beneficial owners of more than 10% of our equity securities did not become subject to such Section 16(a) reporting requirements until February 13, 2019, after the completion of our fiscal year ended December 31, 2018.

Code of Business Conduct and Ethics

Our board of directors has adopted a Code of Business Conduct and Ethics. The Code of Business Conduct and Ethics applies to all of our employees, officers (including our principal executive officer, principal financial officer, principal accounting officer or controller or persons performing similar functions), agents and representatives, including directors and consultants.

The full text of our Code of Business Conduct and Ethics is posted on our website at www.tcr2.com. We intend to disclose future amendments to certain provisions of our Code of Business Conduct and Ethics on our website. The inclusion of our website address in this Annual Report does not include or incorporate by reference the information on our website into this Annual Report, and you should not consider that information a part of this Annual Report.

Audit Committee

The members of our audit committee are Morana Jovan-Embiricos, Neil Gibson and Mitchell Finer, and Morana Jovan-Embiricos is the chair of the audit committee. Our board of directors has determined that all members of our audit committee will meet the requirements for financial literacy under the applicable rules and regulations of the SEC and the Nasdaq listing rules.

Item 11. Executive Compensation

Executive Compensation Overview

As an emerging growth company, we have opted to comply with the executive compensation disclosure rules applicable to “smaller reporting companies,” as such term is defined in the rules promulgated under the Securities Act. This section provides an overview of the compensation awarded to and earned by each individual who served as our principal executive officer at any time during our fiscal years ended December 31, 2018 and 2017 and to our next two most highly compensated executive officers in respect of their service to our company for our fiscal years ended December 31, 2018 and 2017. We refer to these individuals as our named executive officers. Our named executive officers are:

- Garry Menzel, our President and Chief Executive Officer;
- Robert Hofmeister, our Chief Scientific Officer; and
- Alfonso Quintás Cardama, our Chief Medical Officer.

Our executive compensation program is based on a pay-for-performance philosophy. Compensation for our executive officers is composed primarily of the following main components: base salary, bonus and equity incentives in the form of stock options. Our executive officers, like all full-time employees, are eligible to participate in our health and welfare benefit plans. As we transition from a private company to a publicly traded company, we intend to evaluate our compensation values and philosophy and compensation plans and arrangements as circumstances require.

Summary Compensation Table

The following table sets forth information regarding compensation awarded to and earned by our named executive officers for services rendered to us in all capacities during our fiscal years ended December 31, 2018 and 2017. On February 1, 2019, we effected a reverse stock split of shares of our common stock at a ratio of one-for-6.1938 pursuant to an amendment to our amended and restated certificate of incorporation approved by our board of directors and stockholders. All issued and outstanding common shares and per share amounts have been retroactively adjusted to reflect this reverse stock split for all periods presented.

NAME AND PRINCIPAL POSITION	YEAR	SALARY ($)	BONUS ($)	OPTION AWARDS ($) [1]	NON-EQUITY PLAN COMPENSATION $ [2]	ALL OTHER COMPENSATION ($)	TOTAL ($)
Garry Menzel, *President and Chief Executive Officer*	2018	$ 435,845	—	$ 2,398,230	$ 343,750 [3]	—	$ 3,177,825
	2017	423,150	—	190,129	179,204	—	792,483
Robert Hofmeister, *Chief Scientific Officer*	2018	320,114	—	502,304	182,875 [3]	—	1,005,293
	2017	297,000	—	55,920	89,843	—	442,763
Alfonso Quintás Cardama, *Chief Medical Officer*	2018	362,484	60,000 [5]	502,273	206,938 [3]	—	1,131,695
	2017	82,500 [4]	60,000 [5]	89,625	25,047 [4]	—	257,172

[1] The amounts reported in the "Option Awards" column reflects the aggregate grant date fair value of share-based compensation awarded during the indicated year computed in accordance with the provisions of Financial Accounting Standards Board Accounting Standards Codification (ASC) Topic 718. See Note 10 to our consolidated financial statements appearing elsewhere in this Annual Report regarding assumptions underlying the valuation of equity awards.

[2] Except where noted, the amounts reported reflect annual bonuses earned based upon achievement of company and individual performance metrics.

[3] These amounts were paid in 2019 for services provided during the year ended December 31, 2018.

[4] Dr. Quintás Cardama commenced his employment with us in October 2017. His annual salary and annual bonus for 2017 were prorated to reflect his partial year of service.

[5] Dr. Quintás Cardama received a $120,000 sign-on bonus with 50% paid upon commencement of employment in October 2017 and the other 50% paid upon the six-month anniversary of his continued employment in April 2018.

Narrative to the Summary Compensation Table

Base Salary

We use base salaries to recognize the experience, skills, knowledge and responsibilities required of all our employees, including our named executive officers. Base salaries are reviewed annually, typically in connection with our annual performance review process, and adjusted from time to time to realign salaries with market levels after taking into account individual responsibilities, performance and experience.

Annual Bonus

We do not have a formal performance-based bonus plan. Our employment arrangements with our named executive officers provide that the executive may be eligible to earn an annual performance bonus of up to a target percentage of the executive's base salary, as described further below under the section entitled "—Employment Arrangements and Severance Agreements with our Named Executive Officers". From time to time, our board of directors or compensation committee may approve additional annual bonuses for our named executive officers based on individual performance, company performance or as otherwise determined to be appropriate. We have also adopted a senior executive cash bonus plan.

Equity Compensation

Although we do not have a formal policy with respect to the grant of equity incentive awards to our executive officers, or any formal equity ownership guidelines applicable to them, we believe that equity grants provide our executive officers with a strong link to our long-term performance, create an ownership culture and help to align the interests of our executive officers and our stockholders. In addition, we believe that equity grants with a time-based vesting feature promote executive retention because this feature incentives our executive officers to remain in our employment during the vesting period. Accordingly, our board of directors periodically reviews the equity incentive compensation of our executives, including our named executive officers, and from time to time may grant equity incentive awards to them in the form of stock options.

We typically grant stock option awards at the start of employment to each executive officer and our other employees as well as on an annual basis for retention purposes. We award our stock options on the date our

board of directors approves the grant. We set the option exercise price equal to the fair market value of our common stock on the date of grant.

401(k) Plan

We maintain a tax-qualified retirement plan (the 401(k) Plan) that provides eligible U.S. employees with an opportunity to save for retirement on a tax advantaged basis. Eligible employees are able to defer eligible compensation subject to applicable annual Code limits. Employees' pre-tax or Roth contributions are allocated to each participant's individual account and are then invested in selected investment alternatives according to the participants' directions. Employees are immediately and fully vested in their contributions. Our 401(k) Plan is intended to be qualified under Section 401(a) of the Code with our 401(k) Plan's related trust intended to be tax exempt under Section 501(a) of the Code. As a tax-qualified retirement plan, contributions to our 401(k) Plan and earnings on those contributions are not taxable to the employees until distributed from our 401(k) Plan.

Limitations on Liability and Indemnification

As permitted by Delaware law, provisions in our amended and restated certificate of incorporation and amended and restated bylaws limit or eliminate the personal liability of directors for a breach of their fiduciary duty of care as a director. The duty of care generally requires that, when acting on behalf of the corporation, a director exercise an informed business judgment based on all material information reasonably available to him or her. Consequently, a director will not be personally liable to us or our stockholders for monetary damages or breach of fiduciary duty as a director, except for liability for:

- any breach of the director's duty of loyalty to us or our stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- any act related to unlawful stock repurchases, redemptions or other distributions or payments of dividends; or
- any transaction from which the director derived an improper personal benefit.

These limitations of liability do not limit or eliminate our rights or any stockholder's rights to seek non-monetary relief, such as injunctive relief or rescission. These provisions will not alter a director's liability under other laws, such as the federal securities laws or other state or federal laws. Our amended and restated certificate of incorporation also authorizes us to indemnify our officers, directors and other agents to the fullest extent permitted under Delaware law.

As permitted by Delaware law, our amended and restated bylaws provide that:

- we will indemnify our directors, officers, employees and other agents to the fullest extent permitted by law;
- we must advance expenses to our directors and officers, and may advance expenses to our employees and other agents, in connection with a legal proceeding to the fullest extent permitted by law; and
- the rights provided in our amended and restated bylaws are not exclusive.

If Delaware law is amended to authorize corporate action further eliminating or limiting the personal liability of a director or officer, then the liability of our directors or officers will be so eliminated or limited to the fullest extent permitted by Delaware law, as so amended. Our amended and restated bylaws will also permit us to secure insurance on behalf of any officer, director, employee or other agent for any liability arising out of his or her actions in connection with their services to us, regardless of whether our bylaws permit such indemnification. We have obtained such insurance.

In addition to the indemnification that is provided for in our amended and restated certificate of incorporation and amended and restated bylaws, we have entered into indemnification agreements with each of our directors and executive officers, which may be broader than the specific indemnification provisions contained in the Delaware General Corporation Law. These indemnification agreements may require us, among other things, to indemnify our directors and executive officers for some expenses, including attorneys' fees, expenses, judgments, fines and settlement amounts incurred by a director or executive officer in any action or proceeding arising out of his service as one of our directors or executive officers or any other company or enterprise to

which the person provides services at our request. We believe that these provisions and agreements are necessary to attract and retain qualified individuals to serve as directors and executive officers.

This description of the indemnification provisions of our amended and restated certificate of incorporation, our amended and restated bylaws and our indemnification agreements is qualified in its entirety by reference to these documents, each of which is attached as an exhibit to this Annual Report.

Insofar as indemnification for liabilities arising under the Securities Act of 1933, as amended (the Securities Act), may be permitted to our directors, officers and controlling persons pursuant to the foregoing provisions, or otherwise, we have been advised that, in the opinion of the SEC, such indemnification is against public policy as expressed in the Securities Act, and is, therefore, unenforceable.

There is no pending litigation or proceeding naming any of our directors or officers as to which indemnification is being sought, nor are we aware of any pending or threatened litigation that may result in claims for indemnification by any director or officer.

Health and Welfare Benefits

All of our named executive officers are eligible to participate in our employee benefit plans, including our medical, dental and vision insurance plans, in each case on the same basis as all of our other full-time employees.

We believe the perquisites described above are necessary and appropriate to provide a competitive compensation package to our named executive officers.

Rule 10b5-1 Sales Plans

Our directors and executive officers may adopt written plans, known as Rule 10b5-1 plans, in which they will contract with a broker to buy or sell shares of our common stock on a periodic basis. Under a Rule 10b5-1 plan, a broker executes trades pursuant to parameters established by the director or officer when entering into the plan, without further direction from the director or officer. The director or officer may amend or terminate the plan in some circumstances. Our directors and executive officers may also buy or sell additional shares outside of a Rule 10b5-1 plan when they are not in possession of material, nonpublic information.

Employment Arrangements and Severance Agreements with our Named Executive Officers

We have entered into employment agreements with each of our named executive officers.

Garry Menzel

We entered into an offer letter with Dr. Garry Menzel, our President and Chief Executive Officer, on July 22, 2016, pursuant to which Dr. Menzel was entitled to receive an annual base salary of $420,000, an annual target bonus of 35% of his annual base salary based upon our board of directors' assessment of Dr. Menzel's performance and our attainment of targeted goals approved by the board of directors. Dr. Menzel also received, pursuant to the offer letter, an equity grant equal to 4.25% of our fully-diluted capitalization as of the date Dr. Menzel commenced employment with us. The offer letter also required that Dr. Menzel sign an Employee Confidentiality and Assignment Agreement, pursuant to which Dr. Menzel agreed to refrain from disclosing our confidential information and agrees not to compete with us during the term of his employment and for two years following termination of his employment for any reason. Dr. Menzel was also eligible to participate in the employee benefit plans available to our employees, subject to the terms of those plans. Dr. Menzel's offer letter provided that, in the event that his employment is terminated by us without "cause" or by him for "good reason" (as each term is defined in the offer letter), subject to the execution and effectiveness of a release of claims, he would be entitled to receive (in addition to accrued compensation and benefits through the date of termination) (i) salary continuation based on his then-current base salary for 12 months following termination and (ii) continuation of COBRA premium payments for 12 months following termination.

In December 2018, we entered into an employment agreement with Dr. Menzel, effective upon the closing of the IPO, pursuant to which Dr. Menzel is entitled to receive an annual base salary of $500,000 and an annual

target bonus equal to 50% of his annual base salary based upon our board of directors' or the compensation committee of the board of directors' assessment of Dr. Menzel's performance and our performance. This employment agreement also includes a reaffirmation of Dr. Menzel's Employee Confidentiality and Assignment Agreement, which contains continuing obligations to us, including provisions on proprietary information, assignment of inventions, non-competition and non-solicitation of customers and employees. Dr. Menzel's employment agreement provides that, in the event that his employment is terminated by us without "cause" or by him for "good reason," then subject to the execution and effectiveness of a separation agreement and release, he will be entitled to receive (i) an amount equal to (x) 12 months of base salary payable on our normal payroll cycle if such termination is not in connection with a "change in control" or (y) 18 months of base salary if such termination is in connection with a "change in control," payable on our normal payroll cycle, provided that in either case, if Dr. Menzel commences new employment, all payments shall cease; and (ii) payment of the monthly employer COBRA premium for the same level of group health coverage as in effect for Dr. Menzel on the date of termination up to (x) 12 months if such termination is not in connection with a "change in control," and (y) 18 months if such termination is in connection with a "change in control." In addition, if within 12 months following a "change in control," Dr. Menzel's employment is terminated by us without "cause" or he resigns for "good reason," then subject to the execution of the separation agreement and release, all time-based stock options and other time-based stock-based awards held by Dr. Menzel will accelerate and vest immediately.

Robert Hofmeister

We entered into an offer letter with Dr. Robert Hofmeister, our Chief Scientific Officer, on September 16, 2015, pursuant to which Dr. Hofmeister was entitled to receive an annual base salary of $270,000, an annual target bonus of 20% of his annual base salary based upon our board of directors' assessment of Dr. Hofmeister's performance and our attainment of targeted goals approved by the board of directors. Dr. Hofmeister also received, pursuant to the offer letter, an equity grant equal to 1.25% of our fully diluted capitalization at the conclusion of the first tranche of our Series A preferred stock financing. The offer letter also required that Dr. Hofmeister sign an Employee Confidentiality and Assignment Agreement, pursuant to which Dr. Hofmeister agreed to refrain from disclosing our confidential information and agrees not to compete with us during the term of his employment and for two years following termination of his employment for any reason. Dr. Hofmeister was also eligible to participate in the employee benefit plans available to our employees, subject to the terms of those plans. Dr. Hofmeister's offer letter provided that, in the event that his employment was terminated by us without "cause" or by him for "good reason" (as each term is defined in the offer letter), subject to the execution and effectiveness of a release of claims, he would be entitled to receive (in addition to accrued compensation and benefits through the date of termination) (i) salary continuation based on his then-current base salary for nine months following termination and (ii) continuation of COBRA premium payments for six months following termination.

In December 2018, we entered into an employment agreement with Dr. Hofmeister, effective upon the closing of the IPO, pursuant to which Dr. Hofmeister is entitled to receive an annual base salary of $380,000 and an annual target bonus equal to 35% of his annual base salary based upon our board of directors' or the compensation committee of the board of directors' assessment of Dr. Hofmeister's performance and our performance. This employment agreement also includes a reaffirmation of Dr. Hofmeister's Employee Confidentiality and Assignment Agreement, which contains continuing obligations to us, including provisions on proprietary information, assignment of inventions, non-competition and non-solicitation of customers and employees. Dr. Hofmeister's employment agreement provides that, in the event that his employment is terminated by us without "cause" or by him for "good reason," then subject to the execution and effectiveness of a separation agreement and release, he will be entitled to receive (i) an amount equal to (x) nine months of base salary payable on our normal payroll cycle if such termination is not in connection with a "change in control" or (y) 12 months of base salary if such termination is in connection with a "change in control," payable on our normal payroll cycle, provided that in either case, if Dr. Hofmeister commences new employment, all payments shall cease; and (ii) payment of the monthly employer COBRA premium for the same level of group health coverage as in effect for Dr. Hofmeister on the date of termination for up to (x) nine months if such termination is not in connection with a "change in control," and (y) 12 months if such termination is in connection with a "change in control." In addition, if within 12 months following a "change in control," Dr. Hofmeister's employment is terminated by us without "cause" or he resigns for "good reason," then subject to the execution of the separation agreement and release, all time-based stock options and other time-based stock-based awards held by Dr. Hofmeister will accelerate and vest immediately.

Alfonso Quintás Cardama

We entered into an offer letter with Dr. Alfonso Quintás Cardama, our Chief Medical Officer, on July 20, 2017, pursuant to which Dr. Quintás Cardama was entitled to receive an annual base salary of $360,000, a one-time bonus of $120,000, with 50% awarded upon commencement of employment and the other 50% awarded upon the six-month anniversary of his continued employment, an annual target bonus of 25% of his annual base salary based upon the our board of directors' assessment of Dr. Quintás Cardama's performance and our attainment of targeted goals approved by the board of directors. Dr. Quintás Cardama also received, pursuant to the offer letter, an equity grant equal to 1.25% of our fully-diluted capitalization on the date of grant. This offer letter also required that Dr. Quintás Cardama sign an Employee Confidentiality and Assignment Agreement, pursuant to which Dr. Quintás Cardama agreed to refrain from disclosing our confidential information and agrees not to compete with us during the term of his employment and for two years following termination of his employment for any reason. Dr. Quintás Cardama was also eligible to participate in the employee benefit plans available to our employees, subject to the terms of those plans.

In December 2018, we entered into an employment agreement with Dr. Quintás Cardama, effective upon the closing of the IPO, pursuant to which Dr. Quintás Cardama is entitled to receive an annual base salary of $430,000 and an annual target bonus equal to 35% of his annual base salary based upon our board of directors' or the compensation committee of the board of directors' assessment of Dr. Quintás Cardama's performance and our performance. This employment agreement also includes a reaffirmation of Dr. Quintás Cardama's Employee Confidentiality and Assignment Agreement, which contains continuing obligations to us including provisions on proprietary information, assignment of inventions, non-competition and non-solicitation of customers and employees. Dr. Quintás Cardama's employment agreement provides that, in the event that his employment is terminated by us without "cause" or by him for "good reason," then subject to the execution and effectiveness of a separation agreement and release, he will be entitled to receive (i) an amount equal to (x) nine months of base salary payable on our normal payroll cycle if such termination is not in connection with a "change in control" or (y) 12 months of base salary if such termination is in connection with a "change in control," payable on our normal payroll cycle, provided that in either case, if Dr. Quintás Cardama commences new employment, all payments shall cease; and (ii) payment of the monthly employer COBRA premium for the same level of group health coverage as in effect for Dr. Quintás Cardama on the date of termination for up to (x) nine months if such termination is not in connection with a "change in control," and (y) 12 months if such termination is in connection with a "change in control." In addition, if within 12 months following a "change in control," Dr. Quintás Cardama's employment is terminated by us without "cause" or he resigns for "good reason," then subject to the execution of the separation agreement and release, all time-based stock options and other time-based stock-based awards held by Dr. Quintás Cardama will accelerate and vest immediately.

Outstanding Equity Awards at 2018 Fiscal Year-End

The following table sets forth information concerning outstanding equity awards held by our named executive officers as of December 31, 2018.

	OPTION AWARDS							STOCK AWARDS	
NAME	VESTING START DATE	NUMBER OF SECURITIES ACQUIRED ON EXERCISE	VALUE REALIZED UPON EXERCISE	NUMBER OF SECURITIES UNDERLYING UNEXERCISED OPTIONS (#) EXERCISABLE	NUMBER OF SECURITIES UNDERLYING UNEXERCISED OPTIONS (#) UNEXERCISABLE	OPTION EXERCISE PRICE ($)	OPTION EXPIRATION DATE	NUMBER OF SHARES OR UNITS OF STOCK THAT HAVE NOT VESTED (#)	MARKET VALUE OF SHARES OR UNITS OF STOCK THAT HAVE NOT VESTED ($) (6)
Garry Menzel	10/17/16	84,527	$ 434,469	52,829 (1)	116,225 (1)	$ 0.74	12/12/2026	—	—
	12/6/17	—	$ —	35,994	107,983 (2)	$ 0.74	12/6/2027	—	—
	7/26/18	—	$ —	—	433,037 (3)	$ 5.88	7/25/2028	—	—
Robert Hofmeister	12/13/16	14,713	$ 75,625	10,509 (1)	25,223 (1)	$ 0.74	12/12/2026	6,036 (5)	$ 90,540
	12/6/17	—	$ —	10,586	31,760 (2)	$ 0.74	12/6/2027	—	—
	7/26/18	—	$ —	—	90,720 (3)	$ 5.88	7/25/2028	—	—
Alfonso Quintás Cardama	10/10/17	—	$ —	21,753	52,829 (4)	$ 0.74	9/11/2027	—	—
	12/6/17	—	$ —	10,586	31,760 (2)	$ 0.74	12/6/2027	—	—
	7/26/18	—	$ —	—	90,720 (3)	$ 5.88	7/25/2028	—	—

Unless otherwise specified, all option awards vest over four years, with 25% vesting on the first anniversary of the vesting commencement date, and the remainder vesting in 36 equal monthly installments thereafter, subject to continued employment with us.

(1) Represents stock option granted on December 13, 2016.
(2) Represents stock option granted on December 7, 2017.
(3) Represents stock option granted on July 26, 2018.
(4) Represents stock option granted on October 10, 2017.
(5) Represents shares of restricted stock granted on October 1, 2015, with 25% vesting on the first anniversary of the grant date, and the remainder vesting in 12 equal quarterly installments through October 1, 2019.
(6) Market value was calculated using $15.00, the offering price at the time of the IPO, as we did not have a public market for our common stock as of December 31, 2018.

Compensation Risk Assessment

We believe that although a portion of the compensation provided to our executive officers and other employees is performance-based, our executive compensation program does not encourage excessive or unnecessary risk taking.

This is primarily due to the fact that our compensation programs are designed to encourage our executive officers and other employees to remain focused on both short-term and long-term strategic goals. As a result, we do not believe that our compensation programs are reasonably likely to have a material adverse effect on us.

Director Compensation

The following table presents the total compensation for each person who served as a non-employee member of our board of directors and received compensation for such service during the fiscal year ended December 31, 2018. Other than as set forth in the table and described more fully below, we did not pay any compensation, make any equity awards to, or pay any other compensation to any of the non-employee members of our board of directors in 2018. Dr. Menzel, our President and Chief Executive Officer, did not receive any compensation for his service as a member of our board of directors during 2018. Dr. Menzel's compensation for service as an employee for fiscal year 2018 is presented in "Executive Compensation—Summary Compensation Table." We reimburse non-employee

members of our board of directors for reasonable travel and out-of-pocket expenses incurred in connection with attending board of directors and committee meetings.

Director Compensation Table—2018

NAME	FEES EARNED OR PAID IN CASH ($)	WARRANT AWARDS ($)	STOCK AWARDS ($)	OPTION AWARDS ($)(2)	ALL OTHER COMPENSATION ($) (4)	TOTAL ($)
Ansbert Gadicke [1]	$ —	$ —	$ —	$ —	$ —	$ —
Andrew Allen	—	—	—	48,997	4,634	53,631
Patrick Baeuerle [3]	—	—	—	—	76,134	76,134
Mitchell Finer [1][3]	—	—	—	—	76,029	76,029
Neil Gibson	—	—	—	48,997	6,412	55,409
Morana Jovan-Embiricos [1][3]	—	—	—	—	126,757	126,757

(1) Investor-appointed directors did not receive fees, as directors, or other equity compensation for their service on our board of directors.
(2) Represents stock options granted on December 31, 2018. In accordance with SEC rules, these columns reflect the aggregate grant date fair value of the option awards granted during 2018 computed in accordance with Financial Accounting Standard Board ASC Topic 718 for stock-based compensation transactions.
(3) Each of Drs. Baeuerle, Finer and Jovan-Embiricos provided services to us pursuant to the terms of the consulting agreements with Dr. Baeuerle, Dr. Finer and Pattern Recognition Ventures, and Globeways Holdings Limited, respectively. The cash fees presented above are related to these services for the period ended December 31, 2018. For more information regarding these consulting arrangements, see “Certain Relationships and Related Person Transactions, and Director Independence”.
(4) Includes reimbursement for travel expenses.

Non-Employee Director Compensation Policy

Our board of directors has adopted a non-employee director compensation policy, effective as of the completion of our initial public offering, that is designed to enable us to attract and retain, on a long-term basis, highly qualified non-employee directors. Under the policy, each director who is not an employee will be paid cash compensation from and after the completion of our initial public offering, as set forth below:

	MEMBER ANNUAL FEE ($)	CHAIRMAN ADDITIONAL ANNUAL FEE ($)
Board of Directors	$ 35,000	$ 25,000
Audit Committee	7,500	7,500
Compensation Committee	5,000	5,000
Nominating and Corporate Governance Committee	4,000	3,500
Finance and Strategy Committee	—	—

In addition, each non-employee director elected or appointed to our board of directors following the closing of our initial public offering will be granted options to purchase 8,072 shares of common stock on the date of such director’s election or appointment to the board of directors, which will vest in three equal annual installments, subject to continued service through such vesting date(s). On the date of each annual meeting of stockholders of our company, each non-employee director will be granted options to purchase shares of common stock, which will vest on the earlier of the date that is one year from the date of grant or the date of the first annual meeting of our stockholders held after the date of grant subject to continued service as a director through such vesting date(s).

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

Securities authorized for issuance under equity compensation plans

The following table provides information relating to our equity compensation plans as of December 31, 2018. As of December 31, 2018, we had one equity compensation plan, our 2015 Plan, which was approved by our Board of Directors and our stockholders.

	Equity Compensation Plans		
	Number of securities to be issued upon exercise of outstanding options, warrants and rights	Weighted-average exercise price of outstanding options, warrants, and rights	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a)
	(a)	(b)	(c)
Equity compensation plans approved by stockholders	2,094,816	$ 3.79	268,393
Equity compensation plans not approved by stockholders	—		—
Total	2,094,816		268,393

As described in Note 13 to our consolidated financial statements, in connection with our IPO our Board of Directors and stockholders approved two new equity compensation plans, the 2018 Plan and the 2018 ESPP. The 2018 Plan and 2018 ESPP became effective on February 13, 2019.

Security Ownership of Certain Beneficial Owners

The following table sets forth certain information known to us regarding beneficial ownership of our capital stock outstanding as of March 1, 2019 for:

- each person, or group of affiliated persons, who is known by us to be the beneficial owner of five percent or more of our outstanding common stock (on an as-converted to common stock basis);
- each of our directors;
- each of our named executive officers; and
- all of our current directors and executive officers as a group.

We have determined beneficial ownership in accordance with the rules of the SEC, and the information is not necessarily indicative of beneficial ownership for any other purpose. These rules generally attribute beneficial ownership of securities to persons who possess sole or shared voting power or investment power with respect to those securities as well as any shares of common stock that the person has the right to acquire within 60 days of March 1, 2019 through the exercise of stock options or other rights. These shares are deemed to be outstanding and beneficially owned by the person holding those options for the purpose of computing the percentage ownership of that person, but they are not treated as outstanding for the purpose of computing the percentage ownership of any other person. Unless otherwise indicated, the persons or entities identified in this table have sole voting and investment power with respect to all shares shown as beneficially owned by them. Each individual or entity shown on the table has furnished information with respect to beneficial ownership. Except as otherwise indicated below, the address of each officer, director and five percent stockholder listed below is c/o TCR^2 Therapeutics Inc., 100 Binney Street, Suite 710, Cambridge, MA 02142.

The percentage of beneficial ownership in the table below is based on 23,939,901 shares of common stock deemed to be outstanding as of March 1, 2019.

	COMMON STOCK BENEFICIALLY OWNED	
	SHARES	PERCENTAGE
5% or Greater Stockholders		
Entities affiliated with MPM Capital [1]	4,229,134	17.54%
Entities affiliated with F2 Capital [2]	3,571,261	14.92%
UBS Oncology Impact Fund, L.P. [3]	3,370,982	14.08%
Entities affiliated with Cathay Fortune Corporation [4]	2,137,419	8.93%
Entities affiliated with 6 Dimensions Capital [5]	1,614,516	6.74%
Directors, Named Executive Officers and Other Executive Officers		
Garry Menzel [6]	206,480	*
Robert Hofmeister [7]	67,678	*
Alfonso Quintás Cardama [8]	42,083	*
Ansbert Gadicke [9]	7,600,116	31.51%
Andrew Allen [14]	—	0
Patrick Baeuerle [10]	467,715	1.95%
Mitchell Finer [11]	52,687	*
Neil Gibson [13]	706,351	2.95%
Morana Jovan-Embiricos [12]	3,571,261	14.92%
All executive officers and directors as a group (10 persons) [15]	12,714,371	52.26%

* Less than one percent.

[1] Based solely on a Schedule 13D filed by MPM Asset Management on March 4, 2019, consists of (i) 110,859 shares of common stock held by MPM Asset Management Investors BV2014 LLC, (ii) 62,916 shares of common stock held by MPM Asset Management Investors SunStates Fund LLC, (iii) 195,902 shares of common stock and warrants to purchase 178,269 shares of common stock exercisable within 60 days of March 1, 2019, in each case held by MPM Asset Management LLC, (iv) 203,846 shares of common stock held by MPM BioVentures 2014 (B), L.P., (v) 3,056,272 shares of common stock held by MPM BioVentures 2014, L.P., and (vi) 421,070 shares of common stock held by MPM SunStates Fund, L.P. MPM Bioventures 2014 GP LLC is the general partner of MPM BioVentures 2014, L.P. and MPM BioVentures 2014 (B), L.P. MPM Bioventures 2014 LLC is the managing member of MPM Bioventures 2014 GP LLC and the manager of MPM Asset Management Investors BV2014 LLC. MPM SunStates Fund GP LLC is the general partner of MPM SunStates Fund, L.P. MPM SunStates GP Managing Member LLC is the managing member of MPM SunStates Fund GP LLC and the manager of MPM Asset Management Investors SunStates Fund LLC. MPM Asset Management LLC was retained as a manager to manage the operations of MPM BioVentures 2014, L.P., MPM BioVentures 2014 (B), L.P., MPM Asset Management Investors BV2014 LLC, MPM SunStates Fund, L.P., and MPM Asset Management SunStates Fund LLC. Dr. Ansbert Gadicke is a member of MPM BioVentures 2014 LLC, MPM SunStates GP Managing Member LLC, and MPM Capital, formerly known as MPM Asset Management LLC, and collectively with the other members of such entities makes investment decisions with respect to shares held by such entities. Each of the entities and individuals 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 and individuals is 450 Kendall Street, Cambridge, MA 02142.

[2] Consists of (i) 193,742 shares of common stock held by F2 Bioscience II 2017 Limited, (ii) 1,614,515 shares of common stock held by F2 Capital I 2015 Limited, (iii) 410,168 shares of common stock held by F2 Capital I 2017 Limited, (iv) 449,207 shares of common stock held by F2 MG Limited, and (v) 536,962 shares of common stock held by F2-TPO Investments, LLC, (vi) 200,000 shares of common stock held by F2 BBG LLC and (vii) 166,667 shares of common stock held by F2 Capital I 2019, LLC. Dr. Morana Jovan-Embiricos is a member of our board of directors and is the founding director of Globeways Holdings Limited, which is the appointed manager of each of F2 Bioscience II 2017 Limited, F2 Capital I 2015 Limited, F2 Capital I 2017 Limited, F2 MG Limited, F2-TPO Investments, LLC, F2 BBG LLC and F2 Capital I 2019, LLC and makes investment decisions on behalf of such entities with respect to shares held by such entities. Dr. Morana Jovan-Embiricos expressly disclaims beneficial ownership of the securities listed

above except to the extent of any pecuniary interest therein. The address of these entities and individuals for correspondence is 8, Rue Saint-Leger, 04-1205, Geneva, Switzerland.

(3) Based solely on a Schedule 13D filed by MPM Asset Management on March 4, 2019, consists of 3,370,982 shares of common stock held by UBS Oncology Impact Fund, L.P. The general partner of UBS Oncology Impact Fund, L.P. is Oncology Impact Fund (Cayman) Management L.P. The general partner of Oncology Impact Fund (Cayman) Management L.P. is MPM Oncology Impact Management LP. The general partner of MPM Oncology Impact Management LP is MPM Oncology Impact Management GP LLC. Dr. Ansbert Gadicke is a managing member and the managing director of MPM Oncology Impact Management GP LLC. Each of the entities and individuals 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 and individuals is Durell House, 28 New Street, St Helier, Jersey, JE1 4FS.

(4) Based solely on a Schedule 13D filed by China Molybdenum Co., Ltd. on February 22, 2019, consists of (i) 2,137,419 shares of common stock held by an entity affiliated with Cathay Fortune Corporation. The address of this entity is Vistra Corporate Services Centre, Wickham's Cay II, Road Town, Tortola, VG1110, British Virgin Islands.

(5) Consists of (i) 80,725 shares of common stock held by 6 Dimensions Affiliates Fund, L.P. and (ii) 1,533,791 shares of common stock held by 6 Dimensions Capital, L.P. The general partner of 6 Dimensions Affiliates Fund, L.P. and 6 Dimensions Capital, L.P. is 6 Dimensions Capital GP, LLC. Wei Li was a member of our board of directors from February 2018 to December 2018 and is a Director of 6 Dimensions Capital GP, LLC. Each of the entities and individuals 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 and individuals is P.O. Box 309, Ugland House, Grand Cayman, Cayman Islands, KY 1-1104.

(6) Consists of (i) options to purchase 121,953 shares of common stock exercisable within 60 days of March 1, 2019 and (ii) 84,527 shares of common stock held by Dr. Garry Menzel, as Trustee of the Garry E. Menzel and Mary E. Henshall Family Trust, under instrument of trust dated July 29, 2010. Dr. Menzel is the trustee of the Garry E. Menzel and Mary E. Henshall Family Trust and may be deemed to beneficially own these securities.

(7) Consists of (i) 38,850 shares of common stock, of which 3,018 will remain unvested within 60 days of March 1, 2019 and subject to a right of repurchase in our favor upon Dr. Robert Hofmeister's cessation of service prior to vesting, and (ii) options to purchase 28,828 shares of common stock exercisable within 60 days of March 1, 2019.

(8) Consists of options to purchase 42,083 shares of common stock exercisable within 60 days of March 1, 2019.

(9) See notes (1) and (3) above.

(10) Consists of 467,715 shares of common stock held by APAK Solutions GmbH, of which 137,497 shares will remain unvested within 60 days of March 1, 2019 and subject to a right of repurchase in our favor upon APAK Solutions GmbH's and/or Dr. Patrick Baeuerle's cessation of service prior to vesting. Dr. Baeuerle is a managing director of APAK Solutions GmbH and shares voting and investment power with respect to these shares. Each of the entities and individuals 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 and individuals is c/o MPM Capital, 450 Kendall Street, Cambridge, MA 02142.

(11) Consists of (i) 36,731 shares of common stock held by Dr. Mitchell Finer, of which 2,295 shares will remain unvested within 60 days of March 1, 2019 and subject to a right of repurchase in our favor upon Dr. Finer's cessation of service prior to vesting, and (ii) options to purchase 4,676 shares of common stock exercisable within 60 days of March 1, 2019 and warrants to purchase 11,280 shares of common stock exercisable within 60 days of March 1, 2019, in each case held by Pattern Recognition Ventures. Dr. Finer is a managing member of Pattern Recognition Ventures and shares voting and investment power with respect to these shares. Each of the entities and individuals 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 and individuals is 450 Kendall Street, Cambridge, MA 02142.

(12) See note (2) above.

(13) Consists of 706,351 shares of common stock held by Curative Ventures CT LLC. Dr. Neil Gibson is a partner at Curative Ventures CT LLC and shares voting and investment power with respect to these shares. Each of the entities and individuals listed above expressly disclaims beneficial ownership of the securities listed above except to the extent of any pecuniary interest therein. The address of Curative Ventures CT LLC is 5949 Sherry Lane, Suite 820, Dallas, TX 75225,.

(14) Dr. Allen was appointed to our board of directors in December 2018.

(15) Includes options to purchase 197,540 shares of common stock exercisable within 60 days of March 1, 2019 and warrants to purchase 189,549 shares of common stock exercisable within 60 days of March 1, 2019, held by ten executive officers, directors and entities affiliated with such executive officers and directors, as described in notes (7) through (14) above.

Communications with the Board of Directors

Stockholders who want to communicate with members of the Board, including the independent directors, individually or as a group, should address their communications to the Board, the Board members or the Board committee, as the case may be, and send them by mail to c/o TCR2 Therapeutics Inc., 100 Binney Street, Suite 710, Cambridge, Massachusetts 02142. The Chair of the Audit Committee will forward all such communications directly to such Board members. Any such communications may be made on an anonymous and confidential basis.

A copy of any such written communication may also be forwarded to the Company's legal counsel and a copy of such communication may be retained for a reasonable period of time. The director may discuss the matter with the Company's legal counsel, with independent advisors, with non-management directors, or with the Company's management, or may take other action or no action as the director determines in good faith, using reasonable judgment, and applying his or her own discretion.

The Audit Committee oversees the procedures for the receipt, retention, and treatment of complaints received by the Company regarding accounting, internal accounting controls, or audit matters, and the confidential, anonymous submission by employees of concerns regarding questionable accounting, internal accounting controls or auditing matters. The Company has also established a toll-free telephone number for the reporting of such activity, which is 877-865-0978.

Board Committees

Our Board of Directors has established an Audit Committee, a Compensation Committee and a Nominating and Corporate Governance committee, each of which operates pursuant to a charter adopted by our Board of Directors. Our Board of Directors has also established a Finance and Strategy committee. We believe that the composition and functioning of all of our committees will comply with the applicable requirements of Nasdaq, the Sarbanes-Oxley Act of 2002 and SEC rules and regulations that will be applicable to us. We intend to comply with future requirements to the extent they become applicable to us.

The full text of our Audit Committee charter, Compensation Committee charter, and Nominating and Corporate Governance charter are posted on the investor relations portion of our website at www.tcr2.com. We do not incorporate the information contained on, or accessible through, our corporate website into this Annual Report, and you should not consider it a part of this Annual Report.

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

The following is a description of transactions or series of transactions since January 1, 2017 through the year ended December 31, 2018, to which we were or will be a party, in which:

- the amount involved in the transaction exceeds, or will exceed, $120,000; and
- in which any of our executive officers, directors or holder of five percent or more of any class of our capital stock, including their immediate family members or affiliated entities, had or will have a direct or indirect material interest.

Compensation arrangements for our named executive officers and our directors are described elsewhere in this Annual Report under "Director Compensation" and "Executive Compensation."

All amounts in thousands unless otherwise noted

Consulting Arrangements

On October 1, 2015, we entered into a consulting agreement with Dr. Patrick Baeuerle. Pursuant to the consulting agreement, Dr. Baeuerle agreed to perform such consulting, advisory and related services to and for us as may be reasonably requested. In exchange, we agreed to pay Dr. Baeuerle a consulting fee of €15 per month. On November 1, 2016, we amended the consulting agreement to revise Dr. Baeuerle's consulting fee to be €3 per month. Dr. Baeuerle is also eligible for an annual bonus equal to 33% of the annual fees paid under the consulting agreement, subject to the discretion of our board of directors based on Dr. Baeuerle's performance and our performance. The term of the agreement is one year, and automatically extends for additional one-year periods unless terminated. During the fiscal years ended December 31, 2018 and 2017, we incurred fees and travel related expenses to Dr. Baeuerle in the amount of $76 and $71, respectively, under the consulting agreement. Dr. Baeuerle is a member of our board of directors and is a managing director at MPM Capital, the beneficial owner of more than 5% of our voting securities.

On March 2, 2016, we entered into a consulting agreement with Dr. Mitchell Finer (the Original Finer Agreement), which was amended and restated on May 9, 2017 to, among other things, add Pattern Recognition Ventures as a party. Pursuant to the amended and restated consulting agreement, Pattern Recognition Ventures agreed to perform scientific consulting, advisory and related services to and for us as may be reasonably requested, including making Dr. Finer available to serve as Chairman of our Scientific Advisory Board. Pursuant to the amended and restated consulting agreement, we agreed (i) to pay Pattern Recognition Ventures a consulting fee of $19 per quarter for services provided under the agreement, commencing on July 1, 2017, (ii) to pay Pattern Recognition Ventures an amount equal to $38 for services performed from January 1, 2017 through July 1, 2017, and (iii) to grant Pattern Recognition Ventures an option to purchase 8,017 shares of our common stock, which option is subject to vesting. During the fiscal years ended December 31, 2018 and 2017, we incurred fees and travel-related expenses to Pattern Recognition Ventures in the amount of $76 and $77, respectively. Dr. Finer has a financial interest in Pattern Recognition Ventures and is its managing member. Dr. Finer is also a member of our board of directors and is an executive partner at MPM Capital, the beneficial owner of more than 5% of our voting securities.

On October 1, 2017, we entered into a consulting agreement with Globeways Holdings Limited. Dr. Morana Jovan-Embiricos has financial interests in Globeways Holdings Limited and is its founding director. Pursuant to the consulting agreement, Globeways Holdings Limited provides consulting, advisory and related services in exchange for consulting fees of $0.1 million per year. During the fiscal year ended December 31, 2018 and 2017, we incurred fees and travel-related expenses to Globeways Holdings Limited in the amount of $0.1 million for each period. Dr. Jovan is also a member of our board of directors and Globeways Holdings Limited is the appointed manager of certain affiliates of F2 Capital that collectively beneficially own more than 5% of our voting securities.

The majority investor in the Company is MPM Capital (MPM). In September 2015, the Company began receiving consulting and management services pursuant to agreements with three Managing Directors at MPM. For the years ended December 31, 2018 and 2017, the Company incurred approximately $0 and $0.5 million, respectively, for management and advisory services in connection with those agreements. These amounts were recorded in general and administrative expenses in the consolidated statements of operations.

Leasing Arrangements

Following its inception, the Company began leasing office space pursuant to an unwritten shared facilities and services agreement with MPM. For the years ended December 31, 2018 and 2017, the Company incurred approximately $0 and $7, respectively, for facilities costs in connection with that agreement, which were recorded in general and administrative and research and development expense in the

statement of operations and comprehensive loss. The Company ended its lease with MPM in January 2017.

Private Placements of Securities

Option and Warrant Grants

On December 6, 2017, we granted MPM Asset Management LLC a warrant to purchase 135,508 shares of our common stock at an exercise price of $0.74 per share for an aggregate exercise price of $100,276.

On December 6, 2017, we granted APAK Solutions Gmbh a warrant to purchase 169,385 shares of our common stock at an exercise price of $0.74 per share for an aggregate exercise price of $125,345. Dr. Baeuerle has a financial interest in APAK Solutions Gmbh, and he serves as the managing director of APAK Solutions Gmbh. Dr. Baeuerle is a member of our board of directors and is a managing director at MPM Capital, the beneficial owner of more than 5% of our voting securities.

On December 6, 2017, we granted Pattern Recognition Ventures a warrant to purchase 25,407 shares of our common stock at an exercise price of $0.74 per share for an aggregate exercise price of $18,801. On May 9, 2017, we entered into a Non-Qualified Stock Option Agreement with Pattern Recognition Ventures pursuant to which Pattern Recognition Ventures has the option to purchase 8,017 shares of our common stock at an exercise price of $0.74 per share for an aggregate exercise price of $5,933. Dr. Finer has a financial interest in Pattern Recognition Ventures and is its managing member. Dr. Finer is also a member of our board of directors and is an executive partner at MPM Capital, the beneficial owner of more than 5% of our voting securities.

Series B Preferred Stock Financing

In February 2018, with subsequent closings in March 2018 and April 2018, we sold an aggregate of 62,500,000 shares of our Series B preferred stock at a purchase price of $2.00 per share for an aggregate amount of $125.0 million. The following table summarizes purchases of our Series B preferred stock by related persons:

	SHARES OF SERIES B PREFERRED STOCK		TOTAL PURCHASE PRICE
Entities affiliated with MPM Capital (1)	2,000,000	$	4,000,000
Entities affiliated with F2 Capital (2)	7,990,500	$	15,981,000
UBS Oncology Impact Fund L.P. (3)	1,750,000	$	3,500,000
Entities affiliated with 6 Dimensions Capital (4)	10,000,000	$	20,000,000
Entities affiliated with Curative Ventures (5)	4,375,000	$	8,750,000

(1) Represents 57,552 shares of Series B preferred stock purchased by MPM Asset Management Investors BV2014 LLC, 32,500 shares of Series B preferred stock purchased by MPM Asset Management Investors SunStates Fund LLC, 105,825 shares of Series B preferred stock purchased by MPM Bioventures 2014 (B), L.P., 1,586,623 shares of Series B preferred stock purchased by MPM BioVentures 2014, L.P., and 217,500 shares of Series B preferred stock purchased by MPM SunStates Fund, L.P. Each of Patrick Baeuerle, Ansbert Gadicke and Mitchell Finer serves as an officer or director of the Company and is an affiliate of MPM Capital, of which MPM Asset Management Investors BV2014 LLC, MPM Asset Management Investors SunStates Fund LLC, MPM Bioventures 2014 (B), L.P., MPM BioVentures 2014, L.P., and MPM SunStates Fund, L.P are affiliated funds. Entities affiliated with MPM Capital collectively hold more than 5% of our voting securities.

(2) Represents 1,200,000 shares of Series B preferred stock purchased by F2 Bioscience II 2017 Limited, 2,540,500 shares of Series B preferred stock purchased by F2 Capital I 2017 Limited, 1,750,000 shares of Series B preferred stock purchased by F2 MG Limited, and 2,500,000 shares of Series B preferred stock purchased by F2-TPO Investments, LLC. Morana Jovan-Embiricos serves as a director of the company and is the Managing Partner of F2 Capital, of which F2 Bioscience II 2017 Limited, F2 Capital I 2017 Limited, F2 MG Limited, and F2-TPO Investments, LLC are affiliated funds. Entities affiliated with F2 Capital collectively hold more than 5% of our voting securities.

(3) Represents 1,750,000 shares of Series B preferred stock purchased by UBS Oncology Impact Fund L.P. Each of Patrick Baeuerle, Ansbert Gadicke and Mitchell Finer serves as an officer or director of the Company and is an affiliate of UBS Oncology Impact Fund L.P. UBS Oncology Impact Fund L.P. is a holder of more than 5% of our voting securities.

(4) Represents 500,000 shares of Series B preferred stock purchased by 6 Dimensions Affiliates Fund, L.P. and 9,500,000 shares of Series B preferred stock purchased by 6 Dimensions Capital, L.P. Wei Li was a director of the company from February 2018 to December 2018 and is a Managing Partner of 6 Dimensions Capital, of which 6 Dimensions Affiliates Fund, L.P. and 6 Dimensions Capital, L.P. are affiliated funds. Entities affiliated with 6 Dimensions Capital collectively hold more than 5% of our voting securities.

(5) Represents 4,375,000 shares of Series B preferred stock purchased by Curative Ventures CT LLC. Neil Gibson is a director of the Company and is a partner of Curative Ventures CT LLC.

Participation in our Initial Public Offering

Certain of our directors, executive officers and our 5% stockholders purchased shares of our common stock in our IPO at the initial public offering price. The following table sets forth the number of shares of our common stock purchased by directors, executive officers and 5% stockholders and their affiliates and the aggregate purchase price paid for such shares.

	Shares of Common Stock Purchased		Aggregate Cash Purchase Price
Entities affiliated with MPM Capital	1,373,333	$	20,599,995
Entities affiliated with F2 Capital	666,667	$	10,000,005
UBS Oncology Impact Fund L.P.	666,667	$	10,000,005
Entities affiliated with 6 Dimensions Capital	333,333	$	4,999,995
Entities affiliated with Cathay Fortune Corporation	200,000	$	3,000,000

Harpoon Therapeutics, Inc. License Agreement

In June 2017, we entered into a license agreement with Harpoon Therapeutics, Inc. (Harpoon), under which Harpoon provides us with rights to use certain Harpoon intellectual property relating to antibody-based protein binders and related know-how developed by Harpoon. In return, we provide Harpoon with the right to use antibody-based protein binders developed by us. Each license granted under this Harpoon license agreement is non-exclusive. Affiliates of MPM Capital that own shares of our preferred and common stock are founding stockholders in Harpoon, and Dr. Patrick Baeuerle, one of our directors and co-founders, is a director and co-founder of Harpoon.

Amended and Restated Investors' Rights Agreement

We are a party to an amended and restated investors' rights agreement, or the Investors' Rights Agreement, dated as of February 28, 2018, with holders of our previously-outstanding Series A preferred stock and Series B preferred stock, including certain of our 5% stockholders and their affiliates and entities affiliated with certain of our officers and directors. The Investors' Rights Agreement provides these holders the right to demand that we file a registration statement or request that their shares be covered by a registration statement that we are otherwise filing.

Employment Agreements

We have entered into employment agreements with certain of our executive officers. See "Item 11-Executive Compensation—Employment Arrangements and Severance Agreements with our Named Executive Officers"

Equity Grants

We have granted stock options and warrants to certain of our executive officers and members of our board of directors. See "Item 11-Executive Compensation"

Indemnification Agreements

As permitted by Delaware law, provisions in our amended and restated certificate of incorporation and amended and restated bylaws limit or eliminate the personal liability of directors for a breach of their fiduciary duty of care as a director. In addition, we have entered into indemnification agreements with each of our executive officers and the members of our board of directors which may require us to indemnify them. See “Item 11-Executive Compensation—Limitations on Liability and Indemnification”

Policies for Approval of Related Party Transactions

Our board of directors reviews and approves transactions with directors, officers and holders of 5% or more of our voting securities and their affiliates, each a related party. Prior to our initial public offering, the material facts as to the related party’s relationship or interest in the transaction were disclosed to our board of directors prior to their consideration of such transaction, and the transaction was not considered approved by our board of directors unless a majority of the directors who are not interested in the transaction approved the transaction. Further, when stockholders were entitled to vote on a transaction with a related party, the material facts of the related party’s relationship or interest in the transaction were disclosed to the stockholders, who must have approved the transaction in good faith.

In connection with our initial public offering, our board of directors adopted a written related party transactions policy. Pursuant to this policy, the audit committee has the primary responsibility for reviewing and approving or disapproving “related party transactions,” which are transactions between us and related persons in which the aggregate amount involved exceeds or may be expected to exceed $120,000 and in which a related person has or will have a direct or indirect material interest. For purposes of this policy, a related person will be defined as a director, executive officer, nominee for director, or greater than 5% beneficial owner of our common stock, in each case since the beginning of the most recently completed year, and their immediate family members.

Director Independence

Under the Nasdaq listing rules, independent directors must comprise a majority of a listed company’s board of directors within twelve months from the date of listing. In addition, the Nasdaq listing rules require that, subject to specified exceptions, each member of a listed company’s audit, compensation and nominating and governance committees be independent within twelve months from the date of listing. Audit committee members must also satisfy additional independence criteria, including those set forth in Rule 10A-3 under the Securities Exchange Act of 1934, as amended (the Exchange Act), and compensation committee members must also satisfy the independence criteria set forth in Rule 10C-1 under the Exchange Act. Under Nasdaq listing rules, a director will only qualify as an “independent director” 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. In order to be considered independent for purposes of Rule 10A-3 under the Exchange Act, 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, other than compensation for board service; or (2) be an affiliated person of the listed company or any of its subsidiaries. In order to be considered independent for purposes of Rule 10C-1, the board of directors must consider, for each member of a compensation committee of a listed company, all factors specifically relevant to determining whether a director has a relationship to such company which is material to that director’s ability to be independent from management in connection with the duties of a compensation committee member, including, but not limited to: the source of compensation of the director, including any consulting advisory or other compensatory fee paid by such company to the director, and whether the director is affiliated with the company or any of its subsidiaries or affiliates.

In October, 2018, our board of directors undertook a review of the composition of our board of directors and its committees and the independence of each director. Based upon information requested from and provided by each director concerning his background, employment and affiliations, including family relationships, our board of directors has determined that all members of our board of directors, except Garry Menzel and Patrick Baeuerle, are independent directors, including for purposes of Nasdaq and SEC rules. In making that determination, our board of directors considered the relationships that each director has with us and all other facts and circumstances the board of directors deemed relevant in determining independence, including the potential deemed beneficial ownership of our capital stock by each director, including non-employee directors that are affiliated with certain of our major stockholders. There are no family relationships among any of our directors or executive officers.

Audit Committee

As of March 15, 2019, our audit committee consists of Morana Jovan-Embiricos, Mitchell Finer and Neil Gibson and is chaired by Morana Jovan-Embiricos. The functions of the audit committee include:

- appointing, approving the compensation of and assessing the independence of our independent registered public accounting firm;
- pre-approving auditing and permissible non-audit services, and the terms of such services, to be provided by our independent registered public accounting firm;
- reviewing the overall audit plan with our independent registered public accounting firm and members of management responsible for preparing our consolidated financial statements;
- reviewing and discussing with management and our independent registered public accounting firm our annual and quarterly consolidated financial statements and related disclosures as well as critical accounting policies and practices used by us;
- coordinating the oversight and reviewing the adequacy of our internal control over financial reporting;
- establishing policies and procedures for the receipt and retention of accounting-related complaints and concerns;
- recommending based upon the audit committee's review and discussions with management and our independent registered public accounting firm whether our audited consolidated financial statements shall be included in our Annual Report on Form 10-K;
- monitoring the integrity of our consolidated financial statements and our compliance with legal and regulatory requirements as they relate to our consolidated financial statements and accounting matters;
- preparing the audit committee report required by SEC rules to be included in our annual proxy statement;
- reviewing all related party transactions for potential conflict of interest situations and approving all such transactions; and
- reviewing quarterly earnings releases.

All members of our audit committee will meet the requirements for financial literacy under the applicable rules and regulations of the SEC and the Nasdaq listing rules. Our board of directors has determined that Neil Gibson is "independent" for audit committee purposes as that term is defined in the rules of the SEC and the current listing standards of Nasdaq. The transition rules of the SEC require (1) one independent member at the time of listing, (2) a majority of independent members within 90 days of listing and (3) all independent members within one year of listing. Our board of directors intends to cause our audit committee to comply with the transition rules within the applicable time periods. There is not an "audit committee financial expert" (within the meaning of applicable SEC regulations) currently serving on our audit committee. Our board of directors does not believe that any of our current directors have the qualifications or experience to be considered an audit committee financial expert. However, the members of our board of directors individually and collectively have vast educational and business financial experience and training. Additionally, both our independent registered public accounting firm and management will periodically meet privately with our audit committee. At this time, no qualified candidates

to serve on our audit committee as an “audit committee financial expert” have been identified, and there can be no assurance that we can attract and retain an independent director to act as our qualified financial expert.

The audit committee held three meetings during 2018. The audit committee operates under a written charter that satisfies the applicable standards of the SEC and Nasdaq. A copy of the audit committee charter is available on our website at investors.tcr2.com/corporate-governance/governance-overview. We do not incorporate the information contained on, or accessible through, our corporate website into this Annual Report, and you should not consider it a part of this Annual Report.

Compensation Committee

As of March 15, 2019, our compensation committee consists of Ansbert Gadicke, Andrew Allen and Neil Gibson, and is chaired by Neil Gibson. The functions of the compensation committee include:

- annually reviewing and recommending to the board of directors the corporate goals and objectives relevant to the compensation of our Chief Executive Officer;
- evaluating the performance of our Chief Executive Officer in light of such corporate goals and objectives and based on such evaluation (i) reviewing and determining the cash compensation of our Chief Executive Officer and (ii) reviewing and approving grants and awards to our Chief Executive Officer under our equity-based plans;
- reviewing and approving the compensation of our other executive officers;
- reviewing and establishing our overall management compensation, philosophy and policy;
- overseeing and administering our compensation and similar plans;
- evaluating and assessing potential and current compensation advisors in accordance with the independence standards identified in the applicable Nasdaq listing rules;
- reviewing and approving our policies and procedures for the grant of equity-based awards;
- reviewing and recommending to the board of directors the compensation of our directors;
- preparing our compensation committee report if and when required by SEC rules;
- reviewing and discussing annually with management our “Compensation Discussion and Analysis,” if and when required, to be included in our annual proxy statement; and
- reviewing and approving the retention or termination of any consulting firm or outside adviser to assist in the evaluation of compensation matters.

Each member of our compensation committee will be a non-employee director, as defined in Rule 16b-3 promulgated under the Exchange Act, and an outside director, as defined pursuant to Section 162(m) of the Internal Revenue Code of 1986, as amended (the Code).

The compensation committee held four meetings during 2018. The compensation committee operates under a written charter that satisfies the applicable standards of the SEC and Nasdaq. A copy of the compensation committee charter is available on our website at investors.tcr2.com/corporate-governance/governance-overview. We do not incorporate the information contained on, or accessible through, our corporate website into this Annual Report, and you should not consider it a part of this Annual Report.

Nominating and Corporate Governance Committee

As of March 15, 2019, our nominating and corporate governance committee consists of Ansbert Gadicke, Mitchell Finer and Neil Gibson and is chaired by Ansbert Gadicke. The functions of the nominating and corporate governance committee include:

- developing and recommending to the board of directors criteria for board and committee membership;
- establishing procedures for identifying and evaluating board of director candidates, including nominees recommended by stockholders;

- reviewing the composition of the board of directors to ensure that it is composed of members containing the appropriate skills and expertise to advise us;
- identifying individuals qualified to become members of the board of directors;
- recommending to the board of directors the persons to be nominated for election as directors and to each of the board's committees;
- developing and recommending to the board of directors a code of business conduct and ethics and a set of corporate governance guidelines; and
- overseeing the evaluation of our board of directors and management.

The nominating and corporate committee held four meetings during 2018. The nominating and corporate committee operates under a written charter that satisfies the applicable standards of the SEC and Nasdaq. A copy of the nominating and corporate committee charter is available on our website at investors.tcr2.com/corporate-governance/governance-overview. We do not incorporate the information contained on, or accessible through, our corporate website into this Annual Report, and you should not consider it a part of this Annual Report.

Finance and Strategy Committee

Our finance and strategy committee consists of Ansbert Gadicke and Morana Jovan-Embiricos and is chaired by Ansbert Gadicke. The purpose of the finance and strategy committee is to consider and make recommendations to our board of directors regarding issues impacting our financial structure and strategic direction, including, but not limited to, our capital structure, business development activities and financing strategy, as well as the overall scope and focus of our business and operations. The finance and strategy committee held two meetings during 2018.

Our board of directors may from time to time establish other committees.

Director Affiliations

Some of our directors are affiliated with and serve on the board of directors as representatives of entities which beneficially own or owned 5% or more of our common stock, as indicated below:

Name	Principal Stockholder
Ansbert Gadicke	MPM Capital and UBS Oncology Impact Fund, L.P.
Patrick Baeuerle	MPM Capital
Mitchell Finer	MPM Capital
Morana Jovan-Embiricos	F2 Capital

Item 14. Principal Accountant Fees and Services

The Audit Committee has selected KPMG LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2018. In addition to retaining KPMG LLP to audit our consolidated financial statements for fiscal 2018, we may engaged the firm from time to time during the year to perform other services.

The following table sets forth the aggregate fees billed by KPMG LLP in connection with services rendered during the last two fiscal years.

	For the Year Ended	
	2018	2017
Audit fees	$ 1,007,500	$ 252,330
Audit-related fees	—	—
Tax fees	—	—
Other fees	1,780	1,780
	$ 1,009,280	$ 254,110

Audit Fees consist of fees for professional services rendered in connection with the audit of our annual consolidated financial statements, the review of the interim consolidated financial statements included in quarterly reports, services rendered in connection with the Company's initial public offering, and services that are normally provided by KPMG LLP, such as comfort letters, in connection with statutory and regulatory filings or engagements.

All Other Fees consist of accounting research software license fees.

In fiscal 2018 and 2017, no services other than those discussed above were provided by KPMG LLP.

The Audit Committee has adopted a policy requiring pre-approval of all audit and non-audit related services to be performed by the Company's independent auditor regardless of amount. These services may include audit services, audit-related services, tax services and other related services. KPMG LLP and management are required to periodically report to the Audit Committee regarding the extent of services provided by KPMG LLP in accordance with this pre-approval and the fees for the services performed to date. The Audit Committee may also pre-approve particular services on a case-by-case basis.

The Audit Committee annually evaluates the qualifications, performance and independence of the Company's independent registered public accounting firm. It selected KPMG as the Company's independent registered public accounting firm for 2018. This selection was subsequently approved by the Board. The Audit Committee has reviewed and discussed with management and with KPMG the Company's audited consolidated financial statements for the year ended December 31, 2018. In addition, the Audit Committee has discussed with KPMG the matters that independent registered public accounting firms must communicate to audit committees under applicable PCAOB standards.

The Audit Committee has also discussed and confirmed with KPMG its independence from the Company and received all written disclosures and correspondence required by the PCAOB Ethics and Independence requirements. The Audit Committee has evaluated and concluded the non-audit services provided by KPMG to the Company do not impair KPMG's independence.

Based on the reviews and discussions referred to above, the Audit Committee recommended to our Board that the audited consolidated financial statements for the year ended December 31, 2018 and the related footnotes be included in the Company's Annual Report on Form 10-K for the year ended December 31, 2018.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

3. *Exhibits*

The exhibits required by Item 601 of Regulation S-K and Item 15(b) of this Annual Report on Form 10-K are listed in the Exhibit Index immediately preceding the signature page of this Annual Report on Form 10-K. The exhibits listed in the Exhibit Index are incorporated by reference herein.

ITEM 16. FORM 10-K SUMMARY

Not applicable.

EXHIBIT INDEX

Number	EXHIBIT DESCRIPTION	FORM	FILE NO.	EXHIBIT	FILING DATE	FILED HEREWITH
3.1	Amended and Restated Certificate of Incorporation of the Registrant	8-K	001-38811	3.1	2/25/2019	
3.2	Amended and Restated By-laws of the Registrant	8-K	001-38811	3.2	2/25/2019	
4.1	Amended and Restated Investors' Rights Agreement among the Registrant and certain of its stockholders, dated February 28, 2018	S-1	333-229066	4.1	12/28/2018	
4.2	Form of Specimen Common Stock Certificate	S-1	333-229066	4.2	2/1/2019	
4.3	Form of Common Stock Warrant	S-1	333-229066	4.3	12/28/2018	
10.1#	2015 Stock Option and Grant Plan and forms of award agreements thereunder	S-1	333-229066	10.1	12/28/2018	
10.2#	2018 Stock Option and Incentive Plan and forms of award agreements thereunder	S-1	333-229066	10.2	2/1/2019	
10.3#	Senior Executive Cash Incentive Bonus Plan	S-1	333-229066	10.3	12/28/2018	
10.4#	2018 Employee Stock Purchase Plan	S-1	333-229066	10.4	2/1/2019	
10.5#	Form of Director Indemnification Agreement	S-1	333-229066	10.5	12/28/2018	
10.6#	Form of Officer Indemnification Agreement	S-1	333-229066	10.6	12/28/2018	
10.7	Lease Agreement, dated as of June 30, 2017, by and between ARE-MA Region No. 45, LLC and the Registrant	S-1	333-229066	10.7	12/28/2018	
10.8#	Form of Amended and Restated Employment Agreement	S-1	333-229066	10.8	12/28/2018	
10.9†	License Agreement, dated as of June 21, 2017, by and between Harpoon Therapeutics, Inc. and the Registrant	S-1	333-229066	10.9	12/28/2018	
10.10#	Consulting Agreement, dated as of October 1, 2015, by and between the Registrant and Patrick Baeuerle, as amended	S-1	333-229066	10.10	12/28/2018	
10.11#	Amended and Restated Consulting Agreement, dated as of May 9, 2017, by and between the Registrant, Mitchell Finer and Pattern Recognition Ventures	S-1	333-229066	10.11	12/28/2018	
10.12#	Consulting Agreement, dated as of October 1, 2017, by and between the Registrant and Globeways Holdings Limited	S-1	333-229066	10.12	12/28/2018	
10.13	Royalty Transfer Agreement, dated as of May 26, 2016, by and among the Registrant, MPM Oncology Charitable Foundation, Inc. and the UBS Optimus Foundation	S-1	333-229066	10.13	12/28/2018	
10.14	Letter Agreement, dated as of May 26, 2016, by and among the Registrant, MPM Oncology Charitable Foundation, the UBS Optimus Foundation and UBS Oncology Impact Fund L.P.	S-1	333-229066	10.14	12/28/2018	
10.15†	Collaboration Agreement, dated as of December 18, 2018, by and between the Registrant and Cell Therapy Catapult Limited	S-1	333-229066	10.15	12/28/2018	
21.1	Subsidiaries of the Registrant	S-1	333-229066	21.1	2/1/2019	
23.1	Consent of KPMG LLP, Independent Registered Public Accounting Firm					X
31.1	Certification of Principal Executive Officer pursuant to Rule 13a-14(a) / Rule 15d-14(a) of the Securities Exchange Act of 1934, as amended					X
31.2	Certification of Principal Financial Officer pursuant to Rule 13a-14(a) / Rule 15d-14(a) of the Securities Exchange Act of 1934, as amended					X
32.1	Certifications of the Principal Executive Officer and Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002					X

Indicates a management contract or any compensatory plan, contract or arrangement

† Confidential treatment has been granted as to certain portions of this exhibit, which portions have been omitted and submitted separately to the Securities and Exchange Commission.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

TCR^2 THERAPEUTICS INC.

March 29, 2019

By: /s/ Garry E. Menzel

Garry E. Menzel

President, Chief Executive Officer and Director (Principal Executive Officer)

POWER OF ATTORNEY

Each person whose individual signature appears below hereby authorizes and appoints Garry E. Menzel and Mayur (Ian) Somaiya, and each of them, with full power of substitution and resubstitution and full power to act without the other, as his or her true and lawful attorney-in-fact and agent to act in his or her name, place and stead and to execute in the name and on behalf of each person, individually and in each capacity stated below, and to file any and all amendments to this annual report on Form 10-K and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing, ratifying and confirming all that said attorneys-in-fact and agents or any of them or their or his substitute or substitutes may lawfully do or cause to be done by virtue thereof.

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

Signature	Title	Date
/s/ Garry E. Menzel		
Garry E. Menzel	President, Chief Executive Officer and Director (Principal Executive Officer)	March 29, 2019
/s/ Mayur (Ian) Somaiya		
Mayur (Ian) Somaiya	Chief Financial Officer (Principal Financial and Accounting Officer)	March 29, 2019
/s/ Ansbert Gadicke		
Ansbert Gadicke	Director	March 29, 2019
/s/ Andrew Allen		
Andrew Allen	Director	March 29, 2019
/s/ Patrick Baeuerle		
Patrick Baeuerle	Director	March 29, 2019
/s/ Mitchell Finer		
Mitchell Finer	Director	March 29, 2019
/s/ Neil Gibson		
Neil Gibson	Director	March 29, 2019
/s/ Morana Jovan-Embiricos		
Morana Jovan-Embiricos	Director	March 29, 2019

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

The Board of Directors
TCR^2 Therapeutics Inc.:

We consent to the incorporation by reference in the registration statement (No. 333-229691) on Form S-8 of TCR^2 Therapeutics Inc. of our report dated March 29, 2019, with respect to the consolidated balance sheets of TCR^2 Therapeutics Inc. as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive loss, redeemable convertible preferred stock and stockholders' equity (deficit), and cash flows for each of the years then ended, and the related notes, which report appears in the December 31, 2018 annual report on Form 10-K of TCR^2 Therapeutics Inc.

/s/ KPMG LLP

Cambridge, Massachusetts
March 29, 2019

Exhibit 31.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER PURSUANT TO RULE 13A-14(A) / RULE 15D-14(A) OF THE SECURITIES EXCHANGE ACT OF 1934, AS AMENDED

I, Garry E. Menzel, certify that:

1. I have reviewed this Annual Report on Form 10-K of TCR^2 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 and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) (Paragraph omitted pursuant to SEC Release Nos. 33-8238/34-47986 and 33-8392/34-49313);

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 29, 2019

/s/ Garry E. Menzel
Garry E. Menzel
President, Chief Executive Officer and Director
(Principal Executive Officer)

Exhibit 31.2

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER PURSUANT TO RULE 13A-14(A) / RULE 15D-14(A) OF THE SECURITIES EXCHANGE ACT OF 1934, AS AMENDED

I, Mayur (Ian) Somaiya, certify that:

1. I have reviewed this Annual Report on Form 10-K of TCR^2 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 and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) (Paragraph omitted pursuant to SEC Release Nos. 33-8238/34-47986 and 33-8392/34-49313);

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 29, 2019

/s/ Mayur (Ian) Somaiya
Mayur (Ian) Somaiya
Chief Financial Officer
(Principal Financial and Accounting Officer)

Exhibit 32.1

CERTIFICATIONS OF PRINCIPAL EXECUTIVE OFFICER AND PRINCIPAL FINANCIAL OFFICER PURSUANT TO 18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with this Annual Report on Form 10-K of TCR^2 Therapeutics Inc. (the "Company") for the fiscal year ended December 31, 2018 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), each of the undersigned, hereby certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to the best of his or her knowledge:

1. the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

2. the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: March 29, 2019

/s/ Garry E. Menzel
Garry E. Menzel
President, Chief Executive Officer and Director
(Principal Executive Officer)

/s/ Mayur (Ian) Somaiya
Mayur (Ian) Somaiya
Chief Financial Officer
(Principal Financial and Accounting Officer)